COVER PAGE

Site Number: 0978020001
Site Name: Zion Site 1 Phase A Landfill
Category: 24D RCRA Permits Administrative Record
Document Date: 09/25/2025
Permit ID:
Permit Log: B-23R2

Volume 5 of 7

THIS PAGE FOR IMAGING PURPOSES

ADMINISTRATIVE RECORD

for

Zion Site 1 Landfill, Phase A

0978020001 – Lake County

ILD980700728

Log No. B-23R2

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Appendix E-4

Final Landfill Cap Design Specifications, July 31, 1996

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

Federal Express Air Bill No. 9386407041

July 31, 1996

Mr. Kevin D. Lesko, E.I.T.
Illinois Environmental Protection Agency
Division of Land
Permit Section - Hazardous Waste
2200 Churchill Road
Springfield, IL 62794-9276

RE: 0978020001 - Lake County
Browning-Ferris Industries of Illinois, Inc.
Zion Landfill Site 1 Phase A
ILD980700728
RCRA Permit Log No. B-23-M-16

Dear Mr. Lesko:

On behalf of Browning-Ferris Industries of Illinois, Inc. (BFIIL), Ries Environmental, Inc. has enclosed this request for a Class 3 Modification to BFIIL's RCRA Part B Permit. This Class 3 Modification request has been prepared in accordance with 35 IAC 703.283. An original and two copies are provided.

In this Class 3 Modification request, we are seeking approval to modify the currently permitted final cap design. Since the permitted cap has not yet been installed, BFIIL would like to take advantage of a new design which is a generally accepted configuration by today's standards. The new design is more protective of the environment than the former, outdated design.

A certification statement prepared in accordance with 35 IAC 702.126 is provided in Appendix 1. This certification applies to the contents of this Class 3 Modification request.

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's Jim Lewis or Mike Williams at 847/746-5777 or either of the undersigned at 815/568-3100.

Sincerely,

Patrick Ries, P.E., CHMM

Rebecca Ries, CHMM

pc: Jim Lewis w\enclosures

REQUEST FOR A CLASS 3 MODIFICATION (FINAL LANDFILL CAP DESIGN) BROWNING-FERRIS INDUSTRIES OF ILLINOIS, INC. ZION LANDFILL ILD980700728

PREPARED FOR:
Browning-Ferris Industries of Illinois, Inc.
701 Green Bay Road
Zion, IL 60099
847/746-5777

SUBMITTED TO:
The Illinois Environmental Protection Agency
Division of Land
Permit Section - Hazardous Waste
2200 Churchill Road
Springfield, IL 62794-9276

BY:
Ries Environmental, Inc.
2717 Miller Road
Marengo, Illinois 60152

July 1996

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REQUEST FOR A CLASS 3 MODIFICATION TO THE RCRA PART B PERMIT
BROWNING-FERRIS INDUSTRIES OF ILLINOIS, INC.
ZION, ILLINOIS
ILD980700728

703.283(a)(1) Describes the exact change to be made to the permit conditions and supporting document referenced in the permit;

BFIIL requests a change in the design of the final cap. Figures 1(a) and 1(b) show cross-sections of the currently permitted final cap and of the final cap proposed in this Class 3 Modification. Following are the specific changes (from bottom to top) requested with respect to the final cap:

1. Substitute 6-inches of compacted clay with two feet of compacted clay.
2. Substitute 40-mil polyvinyl chloride (PVC) with 40-mil linear low density polyethylene (LLDPE).
3. Add a geosynthetic drainage net and filter fabric (As a substitute for sand).
4. Substitute 30-inches of compacted clay with a 30-inch protective layer.
5. Delete a 6-inch sand layer.

The top layer remains a six-inch layer of soil capable of supporting vegetation.

703.283(a)(2) Identifies that the modification is a Class 3 Modification;

Section 703 Appendix A identifies the applicable modification. Specifically, under (J)(3), the modification of a final cover system is considered a Class 3 Modification. Since the cover system described in this request is slightly different from the cover system approved in the Part B Permit, a Class 3 Modification is the only modification available.

703.283(a)(3) Explains why the modification is needed;

As noted above, any change to the permitted cap design requires a Class 3 Modification. The permitted cap design that was submitted with the original RCRA Part B Permit Application was an early concept. At the time of the original submittal (1987), there was very little field history showing the effectiveness of a composite cap. Today, based on nearly a decade of experience (by the industry as well as by BFI), it is obvious that the permitted design has several flaws and is less protective than the design proposed in this Class 3 Modification request. In order to install the more contemporary cap that is more protective, this Class 3 Modification is required.

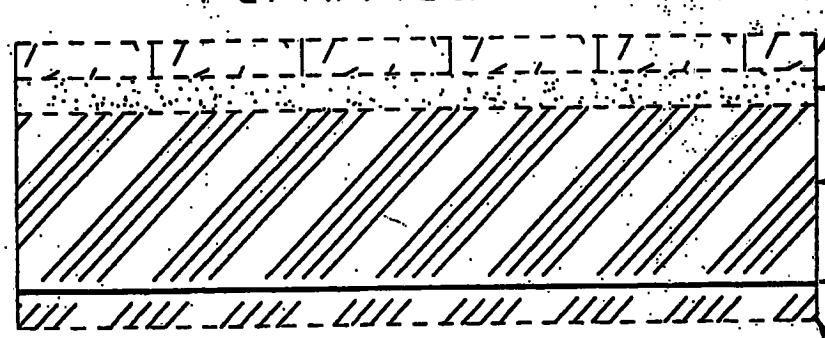
Following are specific advantages of the proposed design over the currently permitted design.

1. The new design proposes a thicker low permeable composite cap over refuse than the permitted design. The new design includes two feet of compacted clay together with the geosynthetic while the permitted design includes only six inches of compacted clay plus the geosynthetic.

FIGURE 1(a)

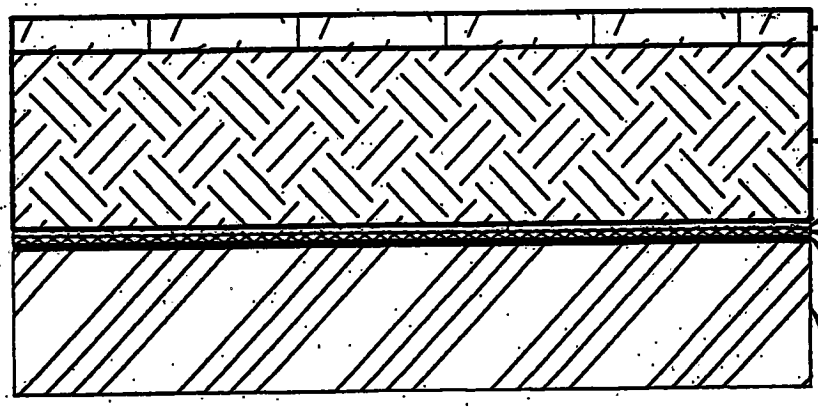
CROSS-SECTION OF ORIGINAL, PERMITTED CAP & PROPOSED CAP
(Flat Portions with FML)

Permitted Final Cover



Intermediate Cover

Proposed Final Cover



Intermediate Cover

Browning- Ferris Industries, Inc.
Zion Landfill

Final Cover Cross Sections
with Geomembrane

Figure 1a

Date: July 1996 | Project No. 9508077

Ries Environmental, Inc.
2717 Miller Road
Marengo, IL 60152

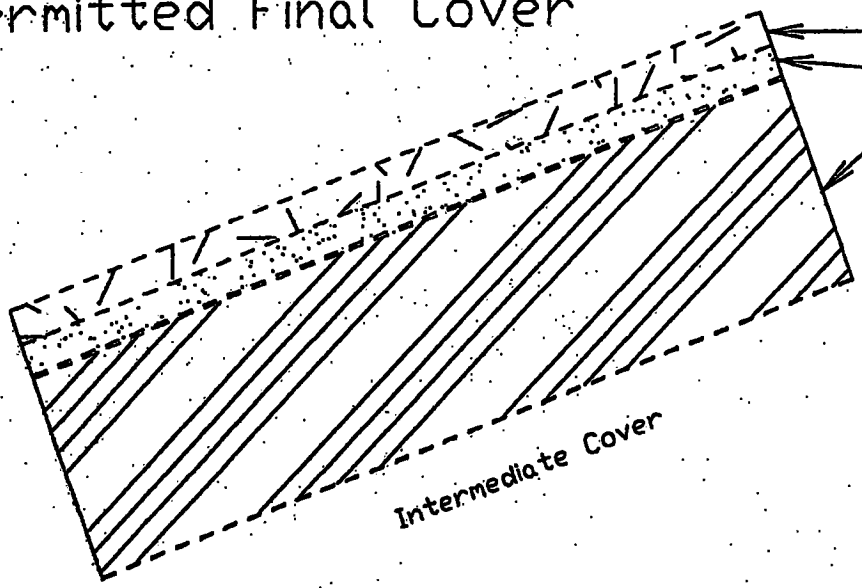
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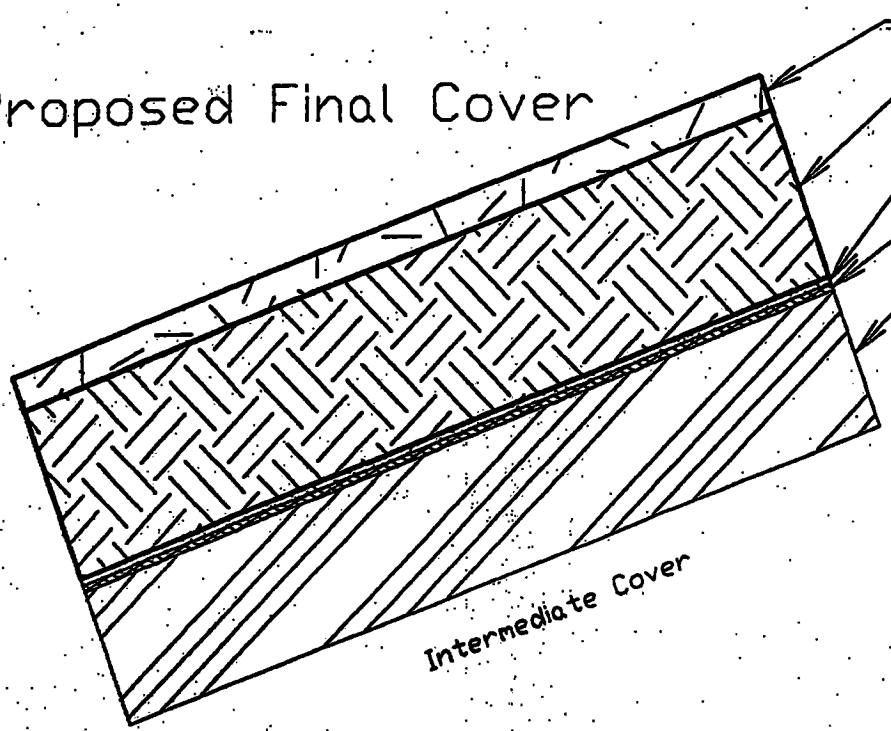
FIGURE 1(b)

CROSS-SECTION OF ORIGINAL, PERMITTED CAP & PROPOSED CAP
(Sideslopes without FML)

Permitted Final Cover



Proposed Final Cover



A15-6

Browning- Ferris Industries, Inc.
Zion Landfill

Final Cover Cross Sections
Sideslopes

Figure 1b

Date: July 1996	Project No. 9508077

Ries Environmental, Inc.
2717 Miller Road
Marengo, IL 60152

R 001537

2. The new design proposes a drainage net and filter fabric which has proven to be less subject to plugging than sand, which is the drainage material proposed in the permitted design. In addition, the proposed drainage layer lies directly over the geomembrane rather than near the surface, as is currently permitted.

3. Both new and permitted designs include 30-inches of soil over the low permeable layers. This permitted design indicated that this is to be compacted clay. The geosynthetic is very susceptible to damage using normal compacting equipment over the geosynthetic. The proposed design recognizes that the purpose of the top 30-inches is protection of the low permeable layer, and therefore, does not utilize potentially damaging compacting equipment.

4. Both new and permitted designs include a 6-inch vegetative layer. The new design places this vegetative layer over the protective, not highly compacted protective layer. This combination is preferable for maintaining a good vegetative growth. The shallow rooted plants are expected to "anchor" into the top surface of the protective layer, thereby minimizing erosion. By contrast, the permitted design includes the sand drainage layer directly under the vegetative layer. This combination is likely to promote excessive surface drying causing stress on the vegetative growth. If plant roots develop into the sand, they will be weak due to the non-fertile nature of sand. This potential for erosion under these conditions is obvious.

5. Both new and permitted designs include a geosynthetic to be installed over the flatter, top areas of the landfill. The new design proposes to use a linear low density polyethylene (LLDPE) rather than the permitted polyvinyl chloride (PVC). Both geosynthetics have similar protective features. LLDPE is more flexible for easier construction and tends to have more ability to stretch.

703.283(a)(4) Provides applicable information required by:

Section 703.181 - Contents of Part A

A revised Part A is provided in Appendix 2.

Section 703.182 - Contents of Part B

BFIIL intends to submit an application for a RCRA Part B Permit renewal by mid-November 1996. In the renewal application, each section of the Part B will be thoroughly reviewed and modified as necessary to reflect the closed and post-closure management of the landfill. At this time, however, there are no other changes regarding the Part B.

Section 703.183 - General Information

There are no changes at this time.

Section 703.184 - Facility Location Standards

There are no changes at this time.

Section 703.185 - Groundwater Protection Information

There are no changes at this time.

Section 703.186 - Exposure Information

There are no changes at this time.

Section 703.187 - Solid Waste Management Units

There are no changes at this time

Section 703.201 - Containers

Not applicable. This Class 3 Modification request does not apply to this type of unit.

Section 703.202 - Tank Systems

Not applicable. This Class 3 Modification request does not apply to this type of unit.

Section 703.203 - Surface Impoundments

Not applicable. This Class 3 Modification request does not apply to this type of unit.

Section 703.204 - Waste Piles

Not applicable. This Class 3 Modification request does not apply to this type of unit.

Section 703.205 - Incinerators

Not applicable. This Class 3 Modification request does not apply to this type of unit.

Section 703.206 - Land Treatment

Not applicable. This Class 3 Modification request does not apply to this type of unit.

Section 703.207 - Landfills

Sections 703.207(a) & 703.207(b) and 703.207(f) through 703.207(j)

Not applicable. This Class 3 Modification request does not apply to these sections of

the regulations.

Sections 703.207(c) & 703.207(d) A description of how the cover system will be inspected in order to meet the requirements of 35 IAC 724.403(a). This information must be included in the inspection plan submitted under Section 703.183(e) (NOTE: Only those portions of 703.207(c), 703.207(d) and 724.403 applicable to cover systems apply in this Class 3 Modification request. No changes to other systems are requested.)

Inspection of Geosynthetic Component

The LLDPE to be used in the final cover will be inspected several times. Initially, the materials will be inspected at the factory. Table 1 lists the types of inspections, frequency and minimum standards for the factory inspections.

TABLE 1
MANUFACTURERS SPECIFICATIONS
40 MIL SMOOTH LLDPE

PROPERTY	TEST METHOD	FREQUENCY (FT²)	PROPERTY VALUE	
THICKNESS(MILS)	ASTM D-5199	EVERY ROLL	AVERAGE MINIMUM	40 36
TENSILE (PPI)	ASTM D-638	25,000		
STRENGTH @ BREAK			145	
ELONGATION @ BREAK	2.5 INCH GAGE LENGTH, NSF MODIFIED		625%	
TEAR RESISTANCE (LBS)	ASTM D-1004	50,000	24	
PUNCTURE RESISTANCE	FTMS 101C/2065	50,000	40	
DENSITY TYP. (g/cc)	ASTM D-792	100,000	0.935	
CARBON BLACK CONTENT (%)	ASTM D-1603	100,000	2.0-3.0	
CARBON BLACK DISPERSION	ASTM D-3015	100,000	A1,A2,B1	
MELT INDEX (g/10 min.)	ASTM D-1238	100,000	<1.0	
DIMENSIONAL STABILITY (% CHANGE MAX.)	ASTM D- 1204	100,000	±2	
ENVIRONMENTAL STRESS CRACK (HR)	ASTM D-1693	RESIN BATCH	1,500	
LOW TEMPERATURE BRITTLENESS	ASTM D-746	RESIN BATCH	-60C°	
BONDED SEAM STRENGTH (PPI)	ASTM D-4437	SHEAR PEEL (FUSION) PEEL (EXTRUSION)	60 54 40	

After the LLDPE has arrived at the site, an independent construction quality assurance (CQA) contractor will perform inspections prior to, during and following installation.

The inspections prior to installation will include the following:

- Observe that the LLDPE materials delivered to the site are not damaged.
- Verify that the label of the LLDPE materials indicates the manufacturer, fabricator, type, thickness, and roll or component number and spot check the label information against the shipping manifest. Materials shall conform to the specifications listed in Table 1.
- Verify that pre-shipment testing was documented by the manufacturer (Table 1).
- Observe that the materials are unloaded and stored with a minimum amount of handling.
- Observe that the stored material remains free from damage or accumulated mud, soil, dirt, and debris.
- Verify that the material is from one manufacturer and was produced specifically for this work. Check that materials received are manufactured from resin types accepted for this project.
- Observe that the LLDPE material is supplied in continuous sheets with no factory seams.
- Observe that the largest manageable sheet is placed in the field thereby resulting in the fewest field seams.
- Review the field panel layout with the geomembrane contractor and agree on the identification code for each field panel.
- Observe that compacted clay surface on which geomembrane is free of irregularities, loose earth, and abrupt changes in grade.
- Observe the compacted clay surface with the geomembrane contractor for approval. Receive an acceptance of the surface condition from the geomembrane manufacturer.

During the installation of the LLDPE, the CQA contractor's inspection will include the following:

- Observe that the compacted clay surfaces are maintained in a smooth, uniform, and compacted condition during installation of the LLDPE. If drying, cracking, erosion, or other damage has occurred, observe that it is repaired before installing the liner.
- Verify that no membrane material is placed at the following times unless the geomembrane

contractor can demonstrate to the CQA's contractor's satisfaction that installation techniques compensate for these conditions:

- Air temperature is less than 20°F
- Air temperature is greater than 100°F
- Rain or snow weather conditions
- Frost is on the ground

- Observe that placement of lining panels avoids wrinkles, folds, or similar creases.
- Observe that adequate sandbags or other measures are used when necessary to temporarily anchor the LLDPE material in position during installation.
- Observe that the membrane is protected from equipment and other hazards. The membrane should be kept free of debris during placement.
- Observe that the lining is handled with care. Observe that the workers performing the installation are wearing either soft- or smooth-soled footwear. Shoes with patterned or lug soles should not be used.
- Verify that personnel are not smoking on the LLDPE surface.
- The geomembrane surface should not be used as a work area for storing tools and supplies, or other uses. A protective cover should be used as a work surface to prevent damage to the LLDPE. Observe that electric generators or other equipment are on protective cover and not directly on LLDPE surface. Equipment that must move across the LLDPE must have smooth wheels. Care shall be taken to prevent sudden stops or direction changes that could damage the lining.
- Observe that equipment is not dragged, dropped, or otherwise handled in a manner that could damage the lining.
- Observe geomembrane sheets, seams, and repairs for conformance to plan and specifications, and for defects.
- Observe that damaged areas are replaced or covered with an additional layer of membrane material and seamed. Record these locations and observe the seaming and testing of these mended areas.
- Record the locations of destructive samples.
- Record field test results including name of technician, welding machine number, welding machine configuration, date, time, temperature, and weather conditions. Note type of failures.

- Verify that one preweld was successfully completed by each seamer at the beginning of each day, every time a welding machine has been turned off, and if there have been significant changes in weather.

Observe seaming operations.

For extrusion welding:

- Observe that the welding apparatus indicates the temperature of the nozzle.
- Observe that the welder is purged of heat-degraded extrudate before beginning a seam.
- Observe that a minimum overlap of 3 inches is provided and that the surface to be welded is clean and roughened by grinding, if required. Observe that grinding is performed no more than an hour before welding.
- Observe that seams are extended to the ends of the sheets.

For fusion welding:

- Observe that an even overlap is maintained along the seam to be welded. Observe that lap joint contact surfaces are wiped clean to remove dirt, dust, moisture, and other foreign materials.
- Observe that the welding machine is in good operating condition. Observe that the wedge is undamaged.
- Observe that welding of performance seams is performed at the same temperature and speed as successful prewelds.
- Observe that seams are extended to the ends of the sheets.

After the LLDPE has been installed, inspections will continue to ensure nothing is placed on the LLDPE until the destructive and nondestructive testing, as described below, has been performed and accepted. In addition, the inspector(s) will monitor the placement of the protective soil material to avoid driving equipment directly on the geomembrane.

Testing the Geosynthetic Component

Two types of seam testing will be conducted.

Non-destructive testing of extrusion welds will be performed on all field seams and repair seams using

a vacuum box apparatus.

Non-destructive testing of each fusion welded field seam will be conducted using an air pressure test. A pressure of 25 to 30 psi must be maintained on the seam for a minimum of five minutes. A four psi drop is allowed to occur during the five minute test after stabilization; a drop in excess of four psi will require a retest or repair. The seam will be depressurized by placing a needle hole in the air space between the welds at the opposite end of the seam. If the pressure drops to zero within 30 seconds of depressurization, the seam is acceptable.

Destructive field seam testing will be performed at random intervals or when visual discontinuities are observed with a minimum frequency of one for every 500 feet of seaming performed for each machine. A sample of the field seam will be sent to an independent laboratory to be tested for the peel and tensile strength of the seam.

The pass/fail criteria of pre-welds and destructive samples are as follows:

Test	Type of Separation	Minimum Strength (lbs. per inch width)
Shear (ASTM D3083)	Film Tearing Bond	40
Peel (ASTM D413)	Film Tearing Bond	35

The following procedures shall be observed for test failures:

If a specimen fails in a preweld test, the field test will be rerun using two additional specimens from the same preweld sample. If both of the additional specimens do not pass, the technician must perform two new test samples. No seaming will be allowed by a technician or with a welding machine that has not performed a passing preweld for each new test sample.

If failure occurs in a production field seam, the field test will be rerun using another specimen from the same sample. If the second test fails, either cap the failed field seam between two previously passing seam test locations or take another seam sample on each side of the failed seam location (10-foot minimum distance away) and test both. If both pass, then cap the field seam between the two passing locations. Nondestructive testing of the cap seams is required for caps less than 150 feet in length. For cap seams 150 feet or longer, destructive testing of the cap seams is also required.

Inspection & Testing of Clay Cap Component

Currently, the entire hazardous waste landfill (Site 1 Phase A) has been covered with a low permeable, compacted clay layer. The source of this in-place clay was from on-site borrow areas. On-site clay, from stockpiles or borrow areas, will also be used to complete the clay component of the cap. To confirm that this clay has the proper soil characteristics, samples will be collected and

analyzed. One sample per each 5,000-cubic yards of clay to be placed will be collected and tested for the following:

Test	Test Method
Grain Size Distribution	ASTM D1140
Atterberg Limits	ASTM D4318
Moisture-Density	ASTM D2216
Hydraulic Conductivity	ASTM D5084

A total of five borrow source samples are anticipated.

Thickness verification of the in-place clay layer has been performed. Borings were installed on one-hundred foot centers over the entire surface of the hazardous waste landfill (Site 1 Phase A). The purpose of the borings was to verify the thickness of the in-place compacted clay and to obtain undisturbed samples for geotechnical testing. A total of 185 borings were installed and 43 undisturbed samples were obtained for testing.. Figure 2 shows the locations of borings and of the undisturbed samples and indicates the thickness of clay in each one-hundred foot grid. Table 2 shows the ranges of clay depths for all borings. BFIIL proposes to utilize this existing, in-place compacted clay, adding additional clay if necessary, to achieve the desired thickness. In addition to achieving the desired thickness, the addition of soil (or removal of soil where excess thickness occurs) as necessary to achieve appropriate slopes to ensure proper drainage will be conducted.

Vegetation currently covers much of the surface. In general, the vegetation will be stripped to prepare the surface for additional clay where necessary. The LLDPE will be installed over the compacted clay on the top, flatter surfaces. A geonet and filter fabric will be installed over the entire cap.

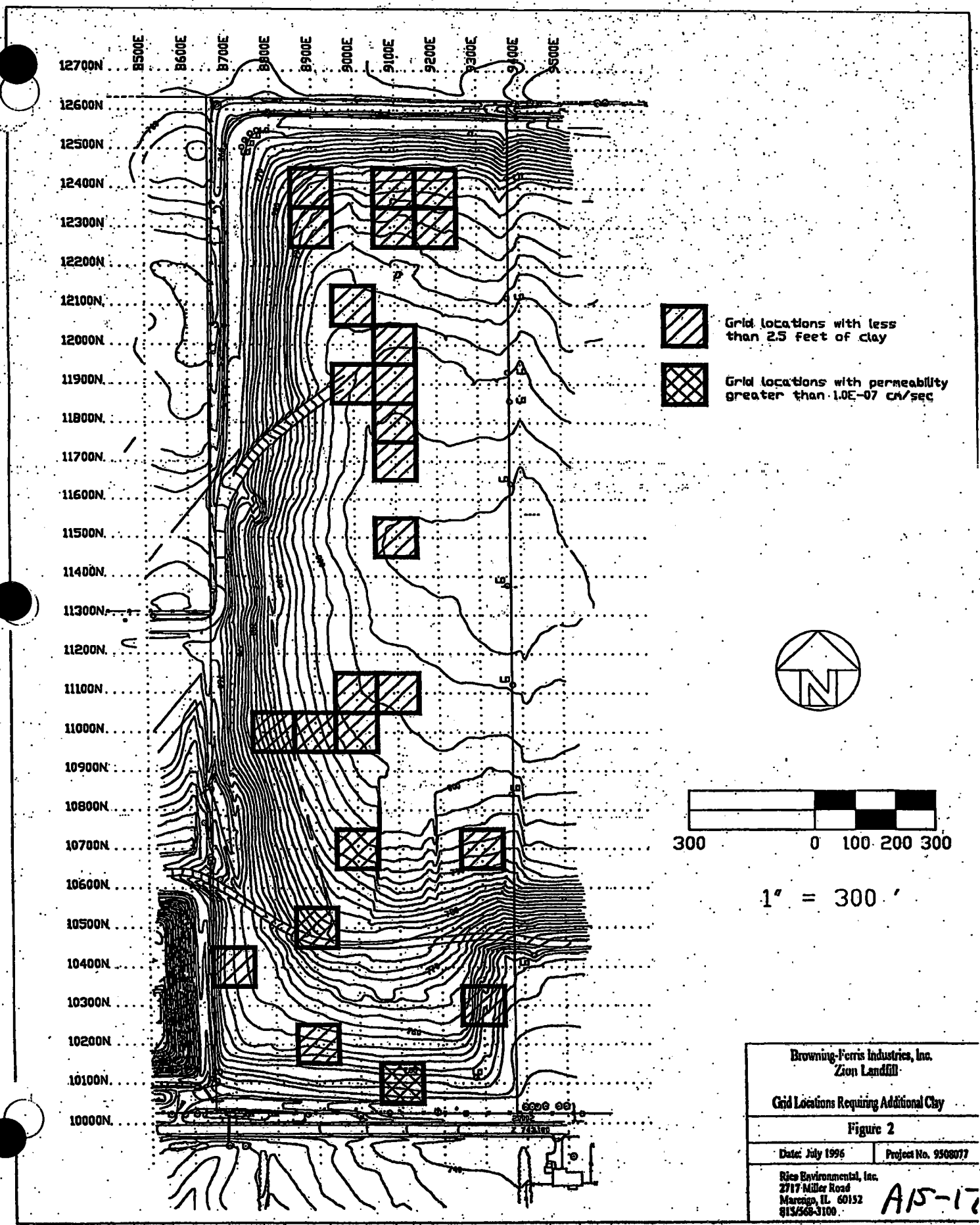
The proposed modified cap design calls for a minimum of two feet of compacted clay over refuse. To be conservative, all grid locations having less than 2½-feet of in-place clay will have additional clay applied as described below. All other locations, as shown on Figure 2, are considered complete with respect to clay thickness.

A total of twenty-four one-hundred-foot grids require additional clay. Following removal of the vegetation (if present) from these grids, a soil depth verification boring will be installed in the grid. A top of refuse elevation will be determined to be used as the reference for the final clay component elevation. Additional clay will be placed at each location to achieve a total thickness (in-place plus additional) of at least two-feet. The clay will be applied in loose lifts not to exceed nine-inches per lift. Each loose lift will then be compacted using traditional soil compacting equipment. Alternately, BFIIL may forgo installing a boring and may simply add two-feet (or more) of compacted clay, in lifts as described above. The final thickness will be verified by surveying the final elevations.

FIGURE 2

GRID LOCATIONS REQUIRING ADDITIONAL CLAY

A15-16



Browning-Ferris Industries, Inc.
Zion Landfill

Grid Locations Requiring Additional Clay

Figure 2

Date: July 1996 | Project No. 9508077

Rice Environmental, Inc.
2717 Miller Road
Marengo, IL 60152
815/568-3100

AP-17

TABLE 2

SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

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TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness (FT)	Permeability (cm/sec)
North	East	Surface (FT/MSL)	Refuse (FT/MSL)		
10100	8700	741.2	735.7	5.5	
10200	8700	752.5	748.9	3.6	
10300	8700	753.7	749.9	3.8	4.8E-08
10400	8700	754.2	752.5	1.7	3.9E-08
10500	8700	755.1	752.6	2.5	
10600	8700	756.5	752.9	3.6	
10700	8700	754.3	750.8	3.5	
10800	8700	753.2	750.7	2.5	
10900	8700	763.7	760.5	3.2	
11000	8700	768.0	765.5	2.5	1.4E-08
11100	8700	768.1	764.3	3.8	
11200	8700	767.1	762.3	4.8	
11300	8700	767.3	762.8	4.5	
11400	8700	766.9	761.6	5.3	
11500	8700	769.7	764.4	5.3	

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TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness	Permeability
North	East	Surface (FT/MSL)	Refuse (FT/MSL)	(FT)	(cm/sec)
10100	8800	744.1	738.6	5.5	
10200	8800	755.4	752.1	3.3	
10300	8800	758.1	754.9	3.2	
10400	8800	760.0	757.0	3.0	
10500	8800	765.4	760.9	4.5	
10600	8800	769.4	764.4	5.0	
10700	8800	773.3	768.1	5.2	1.6E-08
10800	8800	776.5	771.2	5.3	
10900	8800	781.2	775.7	5.5	
11000	8800	786.1	783.8	2.3	
11100	8800	788.7	784.2	4.5	
11200	8800	790.1	785.6	4.5	
11300	8800	790.1	784.6	5.5	4.5E-09
11400	8800	786.6	781.6	5.0	
11500	8800	788.3	785.8	2.5	
11700	8800	777.6	774.5	3.1	
11800	8800	780.9	775.2	5.7	2.6E-09
11900	8800	781.7	776.2	5.5	
12000	8800	780.2	774.4	5.8	
12100	8800	776.7	772.7	4.0	
12200	8800	777.8	772.5	5.3	7.0E-08
12300	8800	778.1	773.9	4.2	
12400	8800	775.9	772.8	3.1	
12500	8800	770.5	766.5	4.0	2.7E-08

TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness (FT)	Permeability (cm/sec)
North	East	Surface (FT/MSL)	Refuse (FT/MSL)		
10100	8900	745.7	740.2	5.5	
10200	8900	755.2	752.9	2.3	
10300	8900	761.5	758.1	3.4	
10400	8900	769.7	767.2	2.5	5.7E-08
10500	8900	775.6	774.8	0.8	
10600	8900	781.6	777.6	4.0	
10700	8900	785.8	782.4	3.4	2.3E-08
10800	8900	788.6	784.4	4.2	
10900	8900	791.6	788.3	3.3	
11000	8900	795.1	791.9	3.2	
11100	8900	796.3	795.0	1.3	4.2E-08
11200	8900	797.0	794.0	3.0	
11300	8900	798.6	795.3	3.3	
11400	8900	797.7	794.7	3.0	
11500	8900	799.2	796.2	3.0	7.9E-08
11600	8900	797.9	793.9	4.0	
11700	8900	795.3	791.3	4.0	7.3E-08
11800	8900	794.3	791.8	2.5	
11900	8900	796.6	786.6	10.0	1.6E-08
12000	8900	799.5	793.3	6.2	
12100	8900	798.3	792.1	6.2	
12200	8900	796.3	792.1	4.2	
12300	8900	797.4	795.7	1.7	3.7E-08
12400	8900	787.0	784.9	2.1	
12500	8900	773.2	769.8	3.4	

A15-21

TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness (FT)	Permeability (cm/sec)
North	East	Surface (FT/MSL)	Refuse (FT/MSL)		
10100	9000	745.6	740.1	5.5	
10200	9000	756.6	753.7	2.9	
10300	9000	764.1	759.9	4.2	2.2E-08
10400	9000	771.6	767.4	4.2	7.3E-08
10500	9000	778.3	775.5	2.8	
10600	9000	785.4	781.1	4.3	1.3E-08
10700	9000	789.8	787.9	1.9	
10800	9000	794.6	791.1	3.5	
10900	9000	798.2	794.8	3.4	9.8E-08
11000	9000	801.0	798.7	2.3	
11100	9000	801.7	799.9	1.8	
11200	9000	802.5	799.1	3.4	
11300	9000	801.9	798.4	3.5	
11400	9000	803.0	800.0	3.0	2.6E-08
11500	9000	804.0	801.5	2.5	
11600	9000	803.7	801.2	2.5	
11700	9000	802.2	799.2	3.0	
11800	9000	801.9	796.9	5.0	
11900	9000	801.1	799.1	2.0	
12000	9000	800.0	797.0	3.0	
12100	9000	798.6	796.6	2.0	
12200	9000	797.5	793.0	4.5	1.7E-08
12300	9000	793.8	790.3	3.5	
12400	9000	788.9	783.9	5.0	
12500	9000	774.4	769.5	4.9	

A15-22

TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness (FT)	Permeability (cm/sec)
North	East	Surface (FT/MSL)	Refuse (FT/MSL)		
10100	9100	746.4	742.4	4.0	1.3E-07
10200	9100	757.3	752.1	5.2	
10300	9100	764.9	761.1	3.8	
10400	9100	772.3	767.0	5.3	
10500	9100	778.4	773.7	4.7	2.4E-08
10600	9100	786.6	781.1	5.5	
10700	9100	794.5	789.5	5.0	
10800	9100	796.5	791.0	5.5	
10900	9100	799.8	796.6	3.2	
11000	9100	801.8	798.5	3.3	
11100	9100	802.7	801.3	1.4	2.8E-08
11200	9100	803.2	800.0	3.2	
11300	9100	803.9	800.4	3.5	6.8E-08
11400	9100	805.3	800.3	5.0	
11500	9100	805.5	803.5	2.0	5.2E-08
11600	9100	804.8	800.3	4.5	
11700	9100	803.9	801.9	2.0	9.2E-08
11800	9100	803.6	802.1	1.5	
11900	9100	802.9	800.9	2.0	3.2E-08
12000	9100	801.3	799.3	2.0	
12100	9100	798.2	795.7	2.5	
12200	9100	796.3	792.3	4.0	
12300	9100	793.1	791.6	1.5	
12400	9100	787.5	786.0	1.5	
12500	9100	776.4	770.4	6.0	7.4E-09

A15-23

TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness (FT)	Permeability (cm/sec)
North	East	Surface (FT/MSL)	Refuse (FT/MSL)		
10100	9200	746.4	742.4	4.0	
10200	9200	757.8	754.1	3.7	
10300	9200	764.2	760.0	4.2	4.7E-08
10400	9200	769.2	761.2	8.0	
10500	9200	776.3	770.0	6.3	3.4E-08
10600	9200	786.7	781.7	5.0	
10700	9200	795.3	791.3	4.0	
10800	9200	797.7	792.6	5.1	
10900	9200	800.7	793.7	7.0	
11000	9200	801.6	796.5	5.1	
11100	9200	802.6	795.6	7.0	
11200	9200	803.8	799.8	4.0	
11300	9200	804.9	798.9	6.0	
11400	9200	805.9	798.9	7.0	
11500	9200	806.2	799.7	6.5	
11600	9200	804.9	799.6	5.3	
11700	9200	804.9	799.9	5.0	
11800	9200	803.4	798.4	5.0	
11900	9200	802.7	796.7	6.0	
12000	9200	800.8	792.8	8.0	
12100	9200	797.3	793.3	4.0	
12200	9200	796.7	794.2	2.5	
12300	9200	791.4	789.4	2.0	
12400	9200	788.8	787.8	1.0	
12500	9200	775.3	771.1	4.2	

TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness (FT)	Permeability (cm/sec)
North	East	Surface (FT/MSL)	Refuse (FT/MSL)		
10100	9300	747.4	743.7	3.7	3.3E-09
10200	9300	750.8	747.5	3.3	
10300	9300	752.7	750.3	2.4	
10400	9300	758.6	754.1	4.5	
10500	9300	767.7	757.7	10.0	6.3E-08
10600	9300	783.9	778.9	5.0	
10700	9300	792.3	790.8	1.5	7.8E-08
10800	9300	796.8	793.8	3.0	
10900	9300	799.6	795.1	4.5	8.2E-08
11000	9300	801.4	797.4	4.0	
11100	9300	802.9	799.1	3.8	7.7E-08
11200	9300	804.9	801.4	3.5	
11300	9300	806.0	800.5	5.5	9.7E-08
11400	9300	806.6	800.6	6.0	
11500	9300	806.5	801.5	5.0	3.0E-08
11600	9300	805.2	800.7	4.5	
11700	9300	804.5	800.0	4.5	8.6E-08
11800	9300	803.0	797.0	6.0	
11900	9300	801.7	798.2	3.5	6.7E-08
12000	9300	799.8	796.3	3.5	
12100	9300	796.4	791.3	5.1	7.1E-08
12200	9300	792.8	786.3	6.5	
12300	9300	790.3	785.8	4.5	5.5E-08
12400	9300	787.1	784.3	2.8	
12500	9300	773.2	764.2	9.0	2.9E-08

A15-25

TABLE 2
SUMMARY OF CLAY THICKNESSES & PERMEABILITIES

Coordinates		Elevations		Clay Thickness (FT)	Permeability (cm/sec)
North	East	Surface (FT/MSL)	Refuse (FT/MSL)		
10500	9400	762.6	757.6	5.0	
10600	9400	785.8	779.8	6.0	
10700	9400	794.2	788.7	5.5	
10800	9400	798.3	793.3	5.0	
10900	9400	800.2	797.2	3.0	
11000	9400	802.5	798.5	4.0	
11100	9400	803.7	798.2	5.5	
11200	9400	805.3	801.3	4.0	
11300	9400	806.5	802.5	4.0	
11400	9400	807.3	804.3	3.0	
11500	9400	807.3	804.3	3.0	
11600	9400	806.5	802.5	4.0	
11700	9400	805.6	801.1	4.5	
11800	9400	803.7	799.7	4.0	
11900	9400	802.6	798.6	4.0	
12000	9400	800.6	796.1	4.5	
12100	9400	797.8	792.8	5.0	
12200	9400	794.9	789.9	5.0	
12300	9400	790.6	784.6	6.0	
12400	9400	785.8	780.8	5.0	
12500	9400	770.6	765.4	5.2	

A15-26

The originally permitted cap design specified permeabilities of no more than $1x10^{-7}$ cm/sec. As shown on Table 2, the permeabilities at every sampling location are far in excess of this specification. In fact, every sample is at least one order of magnitude less permeable than originally required. Of the 43 undisturbed samples obtained from the in-place clay cap, 36 samples were located in grids having sufficient in-place clay with adequate permeabilities. Additional testing for those areas will not be performed. For those areas where additional clay will be placed, permeability testing will be conducted.

Upon completion of the additional clay placement, the entire compacted clay component surface will be inspected and prepared for application of the geomembrane and/or protective layer, as applicable. The surface must be smooth and free of sharp objects. Significant erosion or desiccation cracks will be repaired as directed by the CQA contractor.

Section 703.207(e) Detailed plans and an engineering report describing the final cover to be applied at closure in accordance with 724.410(a). This information must be included in the closure plan submitted under Section 703.183(m) (NOTE: Post-closure inspection and maintenance requirements are not addressed in this Class 3 Modification.)

Minimization of Liquids Through Cap

The cap design proposed in this Class 3 Modification will minimize migration of liquids through the cap and into the landfill. To predict the amount of infiltration through this cap, a computer simulation model utilizing site specific inputs was performed. The Hydrologic Evaluation of Landfill Performance (HELP) model calculates daily, average, and peak estimates of water movement across, into, through and out of the landfill.. The HELP model was performed on the currently permitted cap design as well as for the proposed design. The results of the HELP model (Version 3.04) indicate that the proposed design results in less infiltration into the landfill. A print-out of the model results is provided in Appendix 3.

Minimum Maintenance

The final cap has been designed with the intent of long-term low maintenance. No structures will be constructed on the final cap and the area will be maintained as unused green space. The vegetation will be selected based on its hardiness, assuming an annual mowing.

Promotes Drainage & Minimizes Erosion

Drainage and erosion control are provided through appropriate grading and good vegetation. None of the final slopes on the landfill are excessively steep. The completion of the cap together with the addition of the active gas extraction system will facilitate a strong vegetative growth.

Calculations based on the Universal Soil Loss Equation were provided in the original Part B Permit Application (see Exhibit 10, Supplement 4 in original Application). Since there are no significant changes to the final slopes proposed in this Class 3 Modification, the original calculations for the 6-inch vegetative layer and the 30-inch protective layer remain valid. The 1987 calculations estimate that it will take more than 800 years to erode the entire vegetative layer and more than 5,600 years to erode the clay/protective layer.

Inspections of the cap will continue throughout closure and post-closure. Routine maintenance including mowing, seeding, fertilizing, gas management and surface water management will be performed. Repairs will be made as practical to correct observed ponding on the cap, erosion cracks and/or dead or distressed vegetation.

Accommodates Settlement and Subsidence

Calculations estimating the amount of settlement and subsidence were provided in the original Part B Permit Application (see Exhibit 10, Supplements 4, 5 & 8 in original Application). The conclusions based on those 1987 calculations were that no significant adverse impacts were expected due to settlement and/or subsidence. In it's Solid Waste Disposal Facility Criteria Technical Manual, November 1993, USEPA states that "the degree and rate of waste settlement are difficult to estimate" and that accurate methods for predicting differential settlement have not been developed. Further, USEPA suggests that post-closure care cost estimates include an assumed percent of the total landfill area will require regrading due to settlement. Since no new wastes have been placed in the BFIIL hazardous waste landfill (Site 1 Phase A) for more than five years, BFIIL assumes that the amount of future settlement will be very slight.

Inspections of the cap will continue throughout closure and post-closure. Settlement or subsidence that results in ponding on the cap will be repaired as soon as practical.

Permeability

Permeability tests were conducted on the liner soils beneath the Site 1 Phase A in 1975 in order to apply for development and operation permits for the landfill. The average permeability of these soils was 6.4×10^{-7} cm/sec. The soil test report containing these results was provided in the original Part B Permit Application (see Section 270.21 Supplement 1 of the original Application).

The proposed final cap includes at least two feet of compacted clay having a permeability of no more than 1×10^{-7} cm/sec. In addition, by adding an extra layer of non-permeable geomembrane to those areas most susceptible to infiltrations (i.e. the top, flat areas), the resulting cap is less permeable than the underlying liner.

Section 703.208 - Boiler and Industrial Furnaces Burning Hazardous Waste

Not applicable. This Class 3 Modification request does not apply to this type of unit.

A15-28

Section 703.209 - Miscellaneous Units

Not applicable. This Class 3 Modification request does not apply to this type of unit.

Sections 703.221 through 703.225 - Short Term & Phased Permits

Not applicable. This Class 3 Modification request does not request an emergency permit nor a short term, trail burn permit.

Section 703.230 - Land Treatment Demonstration

Not applicable. This Class 3 Modification request does not request approval for a land treatment demonstration.

Section 703.232 - Permits for Boilers & Industrial Furnaces Burning Hazardous Waste

Not applicable. This Class 3 Modification request does not apply to this type of unit.

703.283(b) Public Notice of Modification Request and Announcement of a 60-day Comment Period

BFIIL has submitted an announcement to the persons on the facility mailing list informing them of the Class 3 Modification request. The notification was sent today. A copy of the notification and the list of persons notified is provided in Appendix 4. BFIIL will send copies of the certified mail return receipts to IEPA as soon as they are received.

An announcement will also be published in the Waukegan News Sun and in the Zion-Benton News this week. A copy of the announcement is provided in Appendix 5. A clipping of the newspaper announcement will be sent to IEPA along with the certified mail return receipts.

APPENDIX 1
CERTIFICATION STATEMENT

CERTIFICATE STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

By: Robert F Platt

Title: District Manager

Date: 7/25/96

APPENDIX 2
REVISED PART A

4/29/96 2:58 PM

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Form Approved, OMB No. 2050-0034 Expires 9-30-98
GSA No. 0248-EPA-OT

For EPA Regional Use Only	EPA United States Environmental Protection Agency Washington, DC 20460 **Hazardous Waste Permit Application Part A** *(Read the Instructions before starting)*	
Date Received Month Day Year		

I. Installation's EPA ID Number *(Mark 'X' in the appropriate box)*

[ ] A. First Part A Submission

[X] B. Part A Amendment # 2

C. Installation's EPA ID Number	D. Secondary ID Number *(If applicable)*
ILD980700728	IL. 097802000-1 - Lake County

II. Name of Facility

Browning-Ferris Industries of Illinois, Inc. - Zion Landfill

III. Facility Location *(Physical address not P.O. Box or Route Number)*

A. Street

9th Street and Green Bay Road

Street *(Continued)*

City or Town	State	Zip Code
Zion	IL	60099

County Code *(If known)*	County Name
	Lake County

B. Land Type (Enter code)	C. Geographic Location LATITUDE (Degrees, Minutes, & Seconds)	LONGITUDE (Degrees, Minutes & Seconds)	D. Facility Existence Date Month Day Year
P	42 28 040	087 53 000	August 30, 1976

IV. Facility Mailing Address

Street or P.O. Box

701 Green Bay Road

City or Town	State	Zip Code
Zion	IL	60099

V. Facility Contact *(Person to be contacted regarding waste activities at facility)*

Name *(Last)*	*(First)*
Williams	Michael
Job Title	**Phone Number** *(Area Code and Number)*
Landfill Manager	847/746-5777

VI. Facility Contact Address *(See Instructions)*

A. Contact Address Location	Mailing	Other	B. Street or P.O. Box
[ ]	[X]	[ ]	

City or Town	State	Zip Code
		AIS-33

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EPA I.D. Number (Enter from page 1)	Secondary ID Number (Enter from page 1)
ILD980700728	IL. 097802000-1 - Lake County

VII. Operator Information (See Instructions)

Name of Operator			
Browning-Ferris Industries of Illinois, Inc.			
Street or P.O. Box			
701 Green Bay Road			
City or Town	**State**	**ZIP Code**	
Zion	IL	600099	

Phone Number (Area Code and Number)	B. Operator Type	C. Change of Operator Indicator	Date Changed Month Day Year
847/746-5777	P	Yes [ ] No [X]	

VIII. Facility Owner (See Instructions)

A. Name of Facility's Legal Owner			
Browning-Ferris Industries of Illinois, Inc.			
Street or P.O. Box			
701 Green Bay Road			
City or Town	**State**	**ZIP Code**	
Zion	IL	600099	

Phone Number (Area Code and Number)	B. Owner Type	C. Change of Owner Indicator	Date Changed Month Day Year
847/746-5777	P	Yes [ ] No [X]	

IX. SIC Codes (4-digit, in order of significance)

Primary		Secondary	
4953	(Description) Sanitary Landfill Operation		(Description)
Secondary		**Secondary**	
	(Description)		(Description)

X. Other Environmental Permits (See Instructions)

A. Permit Type (Enter code)	B. Permit Number	C. Description
N	IL0067725	Stormwater discharge permit
E	1980-24-OP(DE)	IL solid waste permit
E	93080012	Illinois air permit
E	1992-328-LFM	IL solid waste permit

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EPA I.D. Number *(Enter from page 1)*	Secondary ID Number *(Enter from page 1)*
ILD980700728	IL. 097802000-1 - Lake County

XI. Nature of Business *(Provide a brief description)*

The BFI Zion Landfill is an operating solid waste landfill (Site 2 and Site 1 Phase B). A separte portion of the site (Site 1, Phase A) is a hazardous waste landfill where hazardous waste were co-disposed with municipal solid wastes. Hazardous wastes are no longer accepted and RCRA closure is expected to commence in 1996-97.

XII. Process Codes and Design Capacities

A. **PROCESS CODE** - *Enter the code from the list of process codes below that best describes each process to be used at the facility. Thirteen lines are provided for entering codes. If more lines are needed, attach a separate sheet of paper with the additional information. For "other" processes (i.e., D99, S99, T04 and X99), describe the process (including its design capacity) in the space provided in Item XIII.*

B. **PROCESS DESIGN CAPACITY** - *For each code entered in column A, enter the capacity of the process.*
1. **AMOUNT** - *Enter the amount. In a case where design capacity is not applicable (such as in a closure/post-closure or enforcement action) enter the total amount of waste for that process.*
2. **UNIT OF MEASURE** - *For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.*

C. **PROCESS TOTAL NUMBER OF UNITS** - *Enter the total number of units used with the corresponding process code.*

PROCESS CODE	PROCESS	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
	Disposal:	
D79	Underground Injection	Gallons; Liters; Gallons Per Day; or Liters Per Day
D80	Landfill	Acre-feet or Hectare-meter
D81	Land Treatment	Acres or Hectares
D82	Ocean Disposal	Gallons Per Day r Liters Per Day
D83	Surface Impoundment	Gallons or Liters
D99	Other Disposal	Any Unit of Measure Listed Below
	Storage:	
S01	Container (Barrel, Drum, Etc.)	Gallons or Liters
S02	Tank	Gallons or Liters
S03	Waste Pile	Cubic Yards or Cubic Meters
S04	Surface Impoundment	Gallons or Liters
S05	Drip Pad	Gallons or Liters
S06	Containment Building-Storage	Cubic Yards or Cubic Meters
S99	Other Storage	Any Unit of Measure Listed Below
	Treatment:	
T01	Tank	Gallons Per Day or Liters Per Day
T02	Surface Impoundment	Gallons Per Day or Liters Per Day
T03	Incinerator	Short Tons Per Hour; Metric Tons Per Hour; Gallons Per Hour; Liters Per Hour; or Btu's Per Hour
T04	Other Treatment	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
T80	Boiler	Gallons or Liters
T81	Cement Kiln	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
T82	Lime Kiln	
T83	Aggregate Kiln	
T84	Phosphate Kiln	
T85	Coke Oven	
T86	Blast Furnace	
T87	Smelting, Melting, Or Refining Furnace	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
T88	Titanium Dioxide Chloride Process Oxidation Reactor	
T89	Methane Reforming Furnace	
T90	Pulping Liquor Recovery Furnace	
T91	Combustion Device Used In The Recovery Of Sulfur Values From Spent Sulfuric Acid	
T92	Halogen Acid Furnaces	
T93	Other Industrial Furnaces Listed in 40 CFR §280.10	
T94	Containment Building-Treatment	Cubic Yards or Cubic Meters
	Miscellaneous (Subpart X):	
X01	Open Burning/Open Detonation	Any Unit of Measure Listed Below
X02	Mechanical Processing	Short Tons Per Hour; Metric Tons Per Hour; Short Tons Per Day; Metric Tons Per Day; Pounds Per Hour; or Kilograms Per Hour
X03	Thermal Unit	Gallons Per Day; Liters Per Day; Pounds Per Hour; Short Tons Per Hour; Kilograms Per Hour; Metric Tons Per Day; Metric Tons Per Hour; Short Tons Per Day; or Btu's Per Hour
X04	Geologic Repository	Cubic Yards or Cubic Meters
X99	Other Subpart X	Any Unit of Measure Listed Below

UNIT OF MEASURE	UNIT OF MEASURE CODE
Gallons	G
Gallons Per Hour	E
Gallons Per Day	U
Liters	L
Liters Per Hour	H
Liters Per Day	V
Short Tons Per Hour	D
Metric Tons Per Hour	W
Short Tons Per Day	N
Metric Tons Per Day	S
Pounds Per Hour	J
Kilograms Per Hour	R
Cubic Yards	Y
Cubic Meters	C
Acres	B
Acre-feet	A
Hectares	Q
Hectare-meter	Q
Btu's Per Hour	I

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XII. Process Codes and Design Capabilities (Continued)

EXAMPLE FOR COMPLETING ITEM XII (Shown in line number X-1 below): A facility has a storage tank, which can hold 533.788 gallons.

Line Number	A. Process Code (From list above)	B. PROCESS DESIGN CAPACITY 1. Amount (Specify)	B. 2. Unit Of Measure (Enter code)	C. Process Total Number Of Units	For Official Use Only
X 1	S 0 2	533.788	G	0 0 1	
1	D 8 0	3200	A	1	
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

NOTE: If you need to list more than 13 process codes, attach an additional sheet(s) with the information in the same format as above. Number the lines sequentially, taking into account any lines that will be used for "other" processes (i.e., D99, S99, T04 and X99) in item XIII.

XIII. Other Processes (Follow instructions from Item XII for D99, S99, T04 and X99 process codes)

Line Number (Enter #s in seq w/XII)	A. Process Code (From list above)	B. PROCESS DESIGN CAPACITY 1. Amount (Specify)	B. 2. Unit Of Measure (Enter code)	C. Process Total Number Of Units	D. Description Of Process
X 1	T 0 4				In-situ Vitrification
1					
2					
3					
4					

A15-36

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Form Approved, OMB No. 2050-0034 Expires 9-30-96
GSA No. 0248-EPA-GT

EPA I.D. Number (Enter from page 1)	Secondary ID Number (Enter from page 1)
ILD980700728	IL. 097802000-1 - Lake County

XIV. Description of Hazardous Wastes

A. **EPA HAZARDOUS WASTE NUMBER** - *Enter the four-digit number from 40 CFR, Part 261 Subpart D of each listed hazardous waste you will handle. For hazardous wastes which are not listed in 40 CFR, Part 261 Subpart D, enter the four-digit number(s) from 40 CFR, Part 261 Subpart C that describes the characteristics and/or the toxic contaminants of those hazardous wastes.*

B. **ESTIMATED ANNUAL QUANTITY** - *For each listed waste entered in column A estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.*

C. **UNIT OF MEASURE** - *For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate codes are:*

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
POUNDS	P	KILOGRAMS	K
TONS	T	METRIC TONS	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. **PROCESSES**

1. **PROCESS CODES:**

For listed hazardous waste: For each listed hazardous waste entered in column A select the code(s) from the list of process codes contained in item XII A. on page 3 to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed hazardous waste: For each characteristic or toxic contaminant entered in column A, select the code(s) from the list of process codes contained in item XII A. on page 3 to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed hazardous wastes that possess that characteristic or toxic contaminant.

NOTE: THREE SPACES ARE PROVIDED FOR ENTERING PROCESS CODES. IF MORE ARE NEEDED:

1. *Enter the first two as described above.*
2. *Enter "000" in the extreme right box of item XIV-D(1).*
3. *Enter in the space provided on page 7, item XIV-E, the line number and the additional code(s).*

2. **PROCESS DESCRIPTION:** *If a code is not listed for a process that will be used, describe the process in the space provided on the form (D.(2)).*

NOTE: HAZARDOUS WASTES DESCRIBED BY MORE THAN ONE EPA HAZARDOUS WASTE NUMBER - Hazardous wastes that can be described by more than one EPA Hazardous Waste Number shall be described on the form as follows:

1. *Select one of the EPA Hazardous Waste Numbers and enter it in column A. On the same line complete columns B, C and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.*
2. *In column A of the next line enter the other EPA Hazardous Waste Number that can be used to describe the waste. In column D(2) on that line enter "included with above" and make no other entries on that line.*
3. *Repeat step 2 for each EPA Hazardous Waste Number that can be used to describe the hazardous waste.*

EXAMPLE FOR COMPLETING ITEM XIV (shown in line numbers X-1, X-2, X-3, and X-4 below) - A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste. The other waste is corrosive and ignitable and there will be an estimated 100 pounds per year of that waste. Treatment will be in an incinerator and disposal will be in a landfill.

Line Number	A. EPA HAZARD WASTE NO. (Enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (Enter code)	D. PROCESS (1) PROCESS CODES (Enter code)	D. PROCESS (2) PROCESS DESCRIPTION (If a code is not entered in D(1))
X 1	K 0 6 4	900	P	T 0 3 D 8 0	
X 2	D 0 0 2	400	P	T 0 3 D 8 0	AIS-37
X 3	D 0 0 1	100	P	T 0 3 D 8 0	
X 4	D 0 0 2				Included With Above

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Form Approved, OMB No. 2050-0034 Expires 9-30-96
GSA No. 0248-EPA-OT

EPA I.D. Number *(Enter from page 1)*: ILD980700728

Secondary ID Number *(Enter from page 1)*: IL. 097802000-1 - Lake County

XIV. Description of Hazardous Wastes *(Continued)*

Line Number	A. EPA HAZARD WASTE NO. (Enter code)	B. ESTIMATED ANNUAL QUANTITY OF WASTE	C. UNIT OF MEASURE (Enter code)	D. PROCESSES (1) PROCESS CODES (Enter code)	D. PROCESSES (2) PROCESS DESCRIPTION (If a code is not entered in D(1))
1	D002	0	NA	D80	
2	D005	0	NA	D80	
3	D006	0	NA	D80	
4	D007	0	NA	D80	
5	D008	0	NA	D80	
6	D009	0	NA	D80	
7	F001	0	NA	D80	
8	F002	0	NA	D80	
9	F003	0	NA	D80	
10	F005	0	NA	D80	
11	F006	0	NA	D80	
12	F008	0	NA	D80	
13	F009	0	NA	D80	
14	F019	0	NA	D80	
15	K052	0	NA	D80	
16	K061	0	NA	D80	
17	K062	0	NA	D80	
18	U019	0	NA	D80	
19	U036	0	NA	D80	
20	U044	0	NA	D80	
21	U061	0	NA	D80	
22	U083	0	NA	D80	
23	U210	0	NA	D80	
24	U220	0	NA	D80	
25	U228	0	NA	D80	
26	U239	0	NA	D80	
27	U226	0	NA	D80	
28	P004	0	NA	D80	
29	P029	0	NA	D80	
30					
31					
32					A15-38
33					

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Form Approved, OMB No. 2050-0034 Expires 9-30-96
GSA No. 0248-EPA-OT

EPA I.D. Number *(Enter from page 1)*	Secondary ID Number *(Enter from page 1)*
ILD980700728	il. 097802000-1 - Lake County

XV. Map

Attach to this application a topographic map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing and proposed intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all springs, rivers and other surface water bodies in this map area. See instructions for precise requirements.

XVI. Facility Drawing

All existing facilities must include a scale drawing of the facility (see instructions for more detail).

XVII. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

XVIII. Certification(s)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner Signature: Robert F. Pfister — Date Signed: 7/31/96

Name and Official Title (Type or print): Robert Pfister — Vice President

Owner Signature — Date Signed

Name and Official Title (Type or print)

Operator Signature: Michael C. Williams — Date Signed: 7/31/96

Name and Official Title (Type or print): Michael Williams — Landfill Manager

Operator Signature — Date Signed

Name and Official Title (Type or print)

XIX. Comments

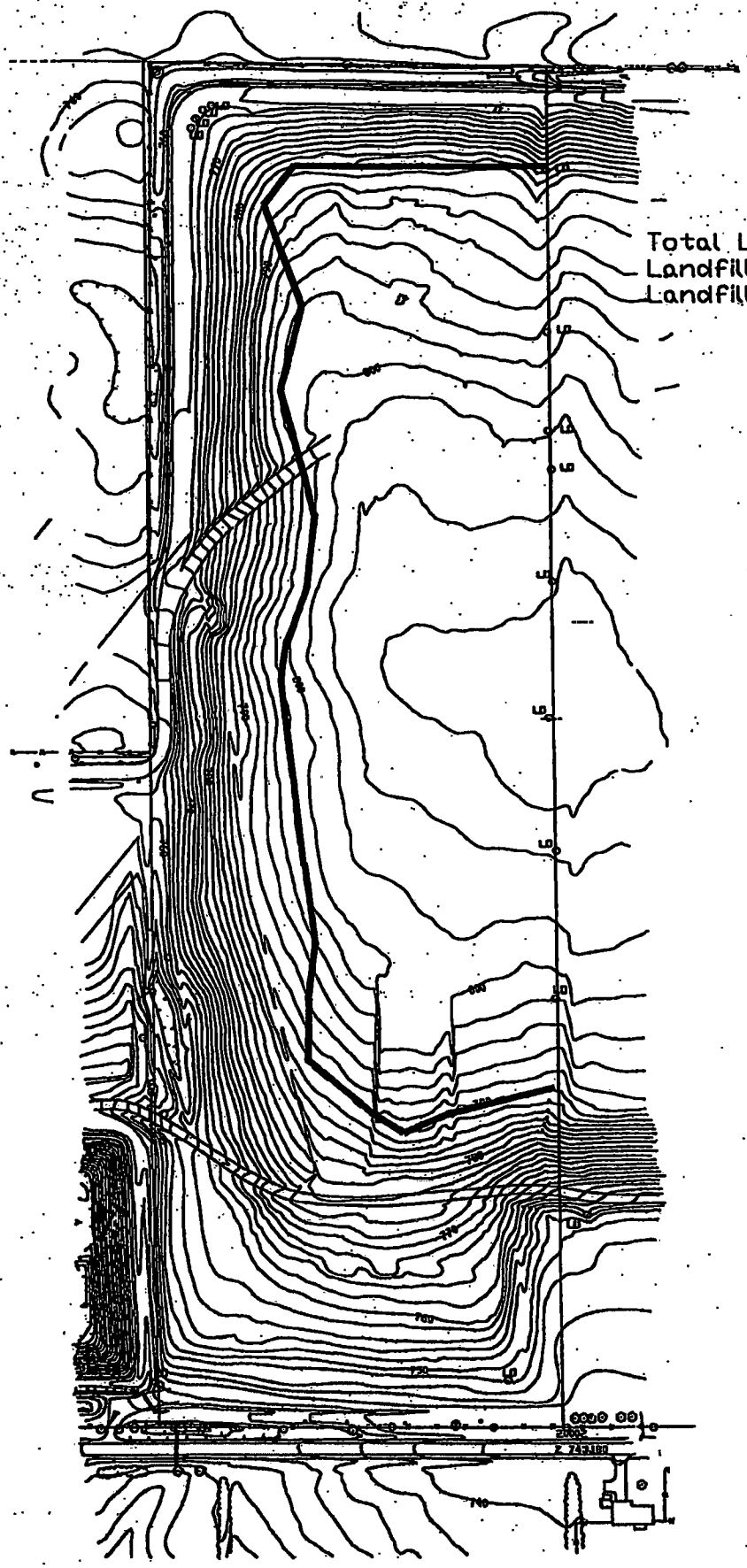
No new hazardous wastes will be accepted at this facility. Final closure & post-closure care are the expected activities. Some reconsolidation of wastes will be required during closure & post-closure.

The waste codes listed are those wastes that were accepted during the operating life of the landfill. The original Part A contained additional waste codes that were never accepted.

A15-39

Note: Mail completed form to the appropriate EPA Regional or State Office. (Refer to instructions for more information)

APPENDIX 3
HELP MODEL



Total Landfill Area = 40.6 Acres
Landfill Area w/FML = 18.8 Acres
Landfill Area w/o FML = 21.8 Acres

Extent of FML for the Cap

N

300 0 100 200 300

1" = 300 '

Browning-Ferris Industries, Inc. Zion Landfill	
HELP Model - Extent of FML	
Figure	
Date: July 1996	Project No. 9508077

Rice Environmental, Inc.
2717 Miller Road
Marengo, IL 60152
815/568-3100

A15-41

PROPOSED COVER DESIGN WITH FML

Average annual leachate generated - 0.943 cf or 7.05 gallons

HELP MODEL INPUT DATA SUMMARY
Version 3.04

Site Name: BFI-Zion Prepared by: PRC Date: _____

Landfilled Area: 19.8 Acres SCS Runoff CN: _____
State: IL City: Chicago
Vegetative Cover Description: Good Vegetative Cover
Vegetative Cover Number: _____
Evaporative Zone Depth: _____

Geomembrane Pinhole Density 1/Acre
Installation Defects - Good (1-9/Acre) Use 2
Geomembrane Placement Quality - Good: 3

SCS - Soil Texture - 6
Fair Stand of Grass
Surface Slope 2%
Slope Length = 1000'

Layer Number	Layer Type	Thickness (inches)	Texture	Compaction	Layer Description
1	1	6"	6	No	Topsoil
2	1	30"	12	No	Vegetative Soil Layer
3	2	0.2"	20	-	Geonet
4	4	0.04"	36	-	Geomembrane
5	3	24"	16	Yes	24" Compacted Clay

Type of Vegetative Cover.

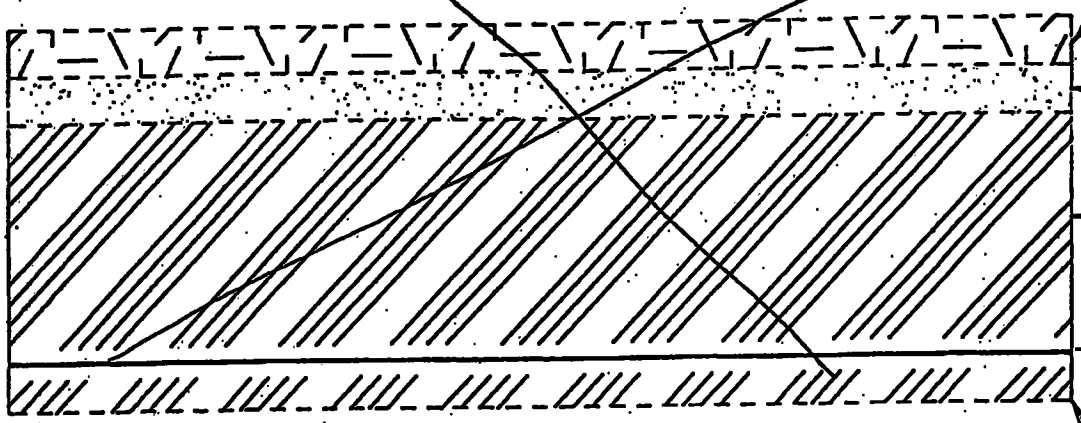
Enter 1 for Bare Ground
Enter 2 for Poor Grass
Enter 3 for Fair Grass
4 for Good Grass, and
5 for Excellent Grass

Layer Types

Enter 1 for a Vertical Percolation Layer
2 for a Lateral Drainage Layer
3 for a Barrier Soil Liner, or
4 for a geomembrane liner.

A15-43

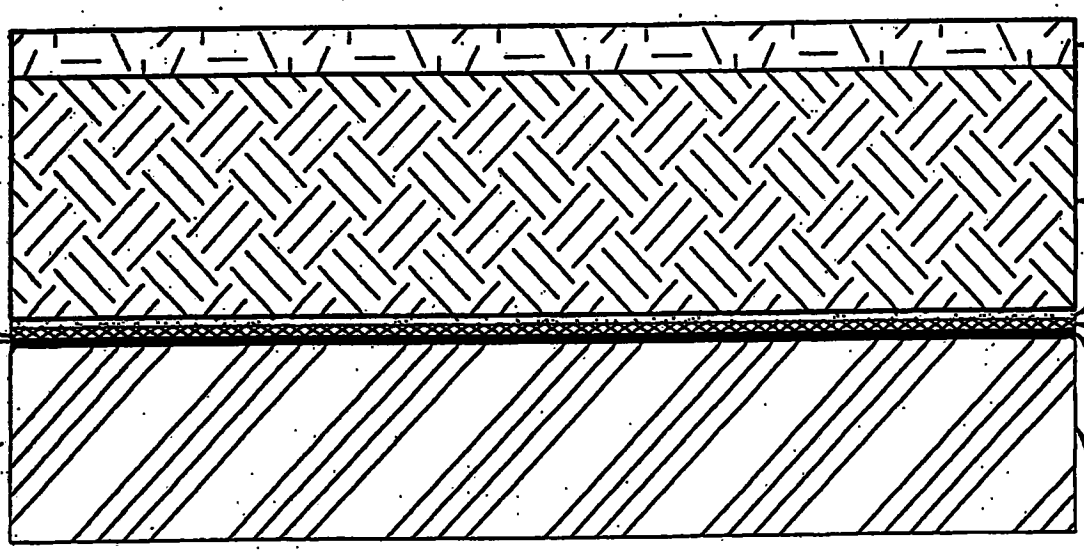
Permitted Final Cover



6" Vegetative layer
6" Sand Drainage Layer
30" Compacted Clay Layer
40 mil PVC
6" Compacted Clay Layer

Intermediate Cover

Proposed Final Cover



6" Topsoil layer
30" Protective Layer
Geotextile Filter Fabric
Geonet Drainage Layer
40 mil PE
24" Compacted Clay Layer

Intermediate Cover

R 001575

```
**********************************************************************
**********************************************************************
**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE       **
**                HELP MODEL VERSION 3.04   (13 MARCH 1995)         **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY            **
**                   USAE WATERWAYS EXPERIMENT STATION              **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY      **
**                                                                  **
**                                                                  **
**********************************************************************
**********************************************************************

PRECIPITATION DATA FILE:     E:\HELP3\data\bfizion\PREC.D4
TEMPERATURE DATA FILE:       E:\HELP3\data\bfizion\TEMP.D7
SOLAR RADIATION DATA FILE:   E:\HELP3\data\bfizion\SOLAR.D13
EVAPOTRANSPIRATION DATA:     e:\help3\data\bfizion\EVAP.D11
SOIL AND DESIGN DATA FILE:   e:\help3\data\bfizion\geomem.D10
OUTPUT DATA FILE:            E:\HELP3\data\bfizion\geomem.OUT

TIME:   9:28     DATE:   7/19/1996

**********************************************************************

    TITLE:  BFI Zion Site, Area 1A/Geomembrane Cap (18.8 Acres) - New

**********************************************************************

    NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
           COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                LAYER  1
                                --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER   6
      THICKNESS                      =      6.00   INCHES
      POROSITY                       =    0.4530 VOL/VOL
      FIELD CAPACITY                 =    0.1900 VOL/VOL
      WILTING POINT                  =    0.0850 VOL/VOL
      INITIAL SOIL WATER CONTENT     =    0.3118 VOL/VOL
      EFFECTIVE SAT. HYD. COND.      = 0.720000011000E-03 CM/SEC
    NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
           FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
```

A15-45

LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 12

THICKNESS	=	30.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3649	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.4199999970000E-04	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0709	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	5.00	PERCENT
DRAINAGE LENGTH	=	1000.0	FEET

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 36

THICKNESS	=	0.04	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.3999999930000E-12	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	2.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL

A15-46

INITIAL SOIL WATER CONTENT = 0.4270 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.1000000010000E-06 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 1000. FEET.

SCS RUNOFF CURVE NUMBER	=	67.60	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	18.800	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.583	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.660	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.930	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	23.081	INCHES
TOTAL INITIAL WATER	=	23.081	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM CHICAGO ILLINOIS

STATION LATITUDE	=	41.78	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

A15-47

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 41.78 DEGREES

****

ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	2078030.250	100.00
RUNOFF	1.101	75110.945	3.61
EVAPOTRANSPIRATION	22.526	1537290.370	73.98
DRAINAGE COLLECTED FROM LAYER 3	6.8229	465622.250	22.41
PERC./LEAKAGE THROUGH LAYER 5	0.000009	0.639	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0066		
CHANGE IN WATER STORAGE	0.000	5.467	0.00
SOIL WATER AT START OF YEAR	23.081	1575134.000	
SOIL WATER AT END OF YEAR	23.081	1575139.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.606	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT

A15-48

PRECIPITATION	35.90	2449959.750	100.00
RUNOFF	3.278	223685.109	9.13
EVAPOTRANSPIRATION	20.369	1390036.120	56.74
DRAINAGE COLLECTED FROM LAYER 3	10.4207	711148.937	29.03
PERC./LEAKAGE THROUGH LAYER 5	0.000058	3.951	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0950		
CHANGE IN WATER STORAGE	1.832	125024.055	5.10
SOIL WATER AT START OF YEAR	23.081	1575139.500	
SOIL WATER AT END OF YEAR	22.004	1501622.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.909	198541.562	8.10
ANNUAL WATER BUDGET BALANCE	0.0009	61.636	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.40	3030032.500	100.00
RUNOFF	8.092	552222.937	18.22
EVAPOTRANSPIRATION	27.524	1878358.500	61.99
DRAINAGE COLLECTED FROM LAYER 3	10.9199	745220.562	24.59
PERC./LEAKAGE THROUGH LAYER 5	0.000011	0.744	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0105		
CHANGE IN WATER STORAGE	-2.209	-150729.266	-4.97
SOIL WATER AT START OF YEAR	22.004	1501622.000	
SOIL WATER AT END OF YEAR	22.450	1532086.620	
SNOW WATER AT START OF YEAR	2.909	198541.562	6.55
SNOW WATER AT END OF YEAR	0.254	17347.678	0.57
ANNUAL WATER BUDGET BALANCE	0.0727	4958.979	0.16

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.12	2055509.250	100.00
RUNOFF	5.237	357424.750	17.39
EVAPOTRANSPIRATION	21.624	1475699.750	71.79
DRAINAGE COLLECTED FROM LAYER 3	3.8851	265136.875	12.90
PERC./LEAKAGE THROUGH LAYER 5	0.000006	0.399	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0037		
CHANGE IN WATER STORAGE	-0.626	-42752.520	-2.08
SOIL WATER AT START OF YEAR	22.450	1532086.620	
SOIL WATER AT END OF YEAR	22.078	1506681.750	
SNOW WATER AT START OF YEAR	0.254	17347.678	0.84
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.019	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.29	2203598.750	100.00
RUNOFF	3.937	268674.187	12.19
EVAPOTRANSPIRATION	21.968	1499193.750	68.03
DRAINAGE COLLECTED FROM LAYER 3	6.4280	438675.375	19.91
PERC./LEAKAGE THROUGH LAYER 5	0.000008	0.559	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0062		
CHANGE IN WATER STORAGE	-0.044	-3030.243	-0.14

A15-50

SOIL WATER AT START OF YEAR	22.078	1506681.750	
SOIL WATER AT END OF YEAR	22.033	1503651.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0012	85.041	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.58	2359878.000	100.00
RUNOFF	1.750	119460.625	5.06
EVAPOTRANSPIRATION	25.079	1711478.620	72.52
DRAINAGE COLLECTED FROM LAYER 3	7.8940	538716.437	22.83
PERC./LEAKAGE THROUGH LAYER 5	0.000010	0.703	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0076		
CHANGE IN WATER STORAGE	-0.147	-10017.086	-0.42
SOIL WATER AT START OF YEAR	22.033	1503651.500	
SOIL WATER AT END OF YEAR	21.853	1491354.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.033	2280.130	0.10
ANNUAL WATER BUDGET BALANCE	0.0035	238.659	0.01

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.24	2404918.500	100.00
RUNOFF	1.982	135282.266	5.63

A15-51

EVAPOTRANSPIRATION	22.748	1552392.000	64.55
DRAINAGE COLLECTED FROM LAYER 3	10.7157	731280.750	30.41
PERC./LEAKAGE THROUGH LAYER 5	0.000012	0.826	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0104		
CHANGE IN WATER STORAGE	-0.233	-15934.318	-0.66
SOIL WATER AT START OF YEAR	21.853	1491354.370	
SOIL WATER AT END OF YEAR	21.653	1477700.120	
SNOW WATER AT START OF YEAR	0.033	2280.130	0.09
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0278	1897.009	0.08

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.13	2397412.250	100.00
RUNOFF	3.962	270381.031	11.28
EVAPOTRANSPIRATION	21.002	1433242.870	59.78
DRAINAGE COLLECTED FROM LAYER 3	9.2162	628948.437	26.23
PERC./LEAKAGE THROUGH LAYER 5	0.000011	0.727	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0089		
CHANGE IN WATER STORAGE	0.950	64838.137	2.70
SOIL WATER AT START OF YEAR	21.653	1477700.120	
SOIL WATER AT END OF YEAR	22.190	1514332.620	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.413	28205.645	1.18
ANNUAL WATER BUDGET BALANCE	0.0000	0.973	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.61	2634900.750	100.00
RUNOFF	6.627	452225.812	17.16
EVAPOTRANSPIRATION	22.144	1511177.750	57.35
DRAINAGE COLLECTED FROM LAYER 3	10.0180	683670.375	25.95
PERC./LEAKAGE THROUGH LAYER 5	0.000011	0.751	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0096		
CHANGE IN WATER STORAGE	-0.178	-12173.861	-0.46
SOIL WATER AT START OF YEAR	22.190	1514332.620	
SOIL WATER AT END OF YEAR	22.425	1530364.370	
SNOW WATER AT START OF YEAR	0.413	28205.645	1.07
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.124	0.00

ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.75	2098503.250	100.00
RUNOFF	2.317	158118.781	7.53
EVAPOTRANSPIRATION	20.488	1398152.870	66.63
DRAINAGE COLLECTED FROM LAYER 3	8.3377	569000.562	27.11
PERC./LEAKAGE THROUGH LAYER 5	0.000010	0.664	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0080		
CHANGE IN WATER STORAGE	-0.392	-26770.014	-1.28
SOIL WATER AT START OF YEAR	22.425	1530364.370	
SOIL WATER AT END OF YEAR	22.033	1503594.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

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SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.427	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	25.85	1764107.370	100.00
RUNOFF	2.963	202224.078	11.46
EVAPOTRANSPIRATION	18.309	1249454.250	70.83
DRAINAGE COLLECTED FROM LAYER 3	4.5775	312385.531	17.71
PERC./LEAKAGE THROUGH LAYER 5	0.000007	0.469	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0044		
CHANGE IN WATER STORAGE	0.001	43.192	0.00
SOIL WATER AT START OF YEAR	22.033	1503594.370	
SOIL WATER AT END OF YEAR	21.612	1474869.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.422	28767.895	1.63
ANNUAL WATER BUDGET BALANCE	0.0000	-0.267	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	28.81	1966109.500	100.00
RUNOFF	1.551	105843.547	5.38
EVAPOTRANSPIRATION	21.446	1463558.000	74.44
DRAINAGE COLLECTED FROM LAYER 3	6.5877	449573.469	22.87
PERC./LEAKAGE THROUGH LAYER 5	0.000008	0.569	0.00

AVG. HEAD ON TOP OF LAYER 4	0.0063		
CHANGE IN WATER STORAGE	-0.775	-52866.918	-2.69
SOIL WATER AT START OF YEAR	21.612	1474869.750	
SOIL WATER AT END OF YEAR	21.259	1450770.620	
SNOW WATER AT START OF YEAR	0.422	28767.895	1.46
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.743	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.56	2153780.750	100.00
RUNOFF	2.711	185025.937	8.59
EVAPOTRANSPIRATION	21.128	1441859.370	66.95
DRAINAGE COLLECTED FROM LAYER 3	6.6141	451371.281	20.96
PERC./LEAKAGE THROUGH LAYER 5	0.000008	0.569	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0064		
CHANGE IN WATER STORAGE	1.100	75046.164	3.48
SOIL WATER AT START OF YEAR	21.259	1450770.620	
SOIL WATER AT END OF YEAR	22.358	1525816.870	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0070	477.364	0.02

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT

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PRECIPITATION	31.36	2140132.500	100.00
RUNOFF	1.413	96448.828	4.51
EVAPOTRANSPIRATION	18.003	1228587.500	57.41
DRAINAGE COLLECTED FROM LAYER 3	9.0971	620825.125	29.01
PERC./LEAKAGE THROUGH LAYER 5	0.000010	0.716	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0087		
CHANGE IN WATER STORAGE	2.847	194268.859	9.08
SOIL WATER AT START OF YEAR	22.358	1525816.870	
SOIL WATER AT END OF YEAR	21.579	1472637.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	3.626	247448.328	11.56
ANNUAL WATER BUDGET BALANCE	0.0000	1.293	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.36	1662424.370	100.00
RUNOFF	4.385	299228.312	18.00
EVAPOTRANSPIRATION	17.602	1201245.750	72.26
DRAINAGE COLLECTED FROM LAYER 3	4.9899	340530.187	20.48
PERC./LEAKAGE THROUGH LAYER 5	0.000007	0.446	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0048		
CHANGE IN WATER STORAGE	-2.677	-182655.656	-10.99
SOIL WATER AT START OF YEAR	21.579	1472637.370	
SOIL WATER AT END OF YEAR	22.528	1537430.000	
SNOW WATER AT START OF YEAR	3.626	247448.328	14.88
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0597	4075.284	0.25

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.70	2095090.620	100.00
RUNOFF	0.858	58583.578	2.80
EVAPOTRANSPIRATION	20.944	1429294.120	68.22
DRAINAGE COLLECTED FROM LAYER 3	8.7449	596785.000	28.48
PERC./LEAKAGE THROUGH LAYER 5	0.000051	3.489	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0795		
CHANGE IN WATER STORAGE	0.153	10424.271	0.50
SOIL WATER AT START OF YEAR	22.528	1537430.000	
SOIL WATER AT END OF YEAR	22.681	1547854.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.046	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.44	2623299.250	100.00
RUNOFF	2.928	199849.234	7.62
EVAPOTRANSPIRATION	25.607	1747509.250	66.61
DRAINAGE COLLECTED FROM LAYER 3	9.5238	649943.500	24.78
PERC./LEAKAGE THROUGH LAYER 5	0.000011	0.777	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0091		
CHANGE IN WATER STORAGE	0.371	25345.523	0.97

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SOIL WATER AT START OF YEAR	22.681	1547854.370	
SOIL WATER AT END OF YEAR	23.002	1569750.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.051	3449.413	0.13
ANNUAL WATER BUDGET BALANCE	0.0095	650.791	0.02

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.91	1699958.500	100.00
RUNOFF	3.909	266772.812	15.69
EVAPOTRANSPIRATION	17.689	1207148.500	71.01
DRAINAGE COLLECTED FROM LAYER 3	3.7773	257780.516	15.16
PERC./LEAKAGE THROUGH LAYER 5	0.000006	0.380	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0037		
CHANGE IN WATER STORAGE	-0.465	-31744.699	-1.87
SOIL WATER AT START OF YEAR	23.002	1569750.370	
SOIL WATER AT END OF YEAR	22.587	1541455.120	
SNOW WATER AT START OF YEAR	0.051	3449.413	0.20
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.992	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.41	2689495.000	100.00
RUNOFF	7.331	500265.906	18.60

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EVAPOTRANSPIRATION	20.693	1412151.250	52.51
DRAINAGE COLLECTED FROM LAYER 3	10.8715	741915.687	27.59
PERC./LEAKAGE THROUGH LAYER 5	0.000012	0.793	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0106		
CHANGE IN WATER STORAGE	0.509	34727.168	1.29
SOIL WATER AT START OF YEAR	22.587	1541455.120	
SOIL WATER AT END OF YEAR	23.024	1571222.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.073	4960.233	0.18
ANNUAL WATER BUDGET BALANCE	0.0064	433.991	0.02

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.99	2387857.000	100.00
RUNOFF	6.071	414289.125	17.35
EVAPOTRANSPIRATION	20.443	1395105.000	58.42
DRAINAGE COLLECTED FROM LAYER 3	8.5280	581985.250	24.37
PERC./LEAKAGE THROUGH LAYER 5	0.000010	0.697	0.00
AVG. HEAD ON TOP OF LAYER 4	0.0082		
CHANGE IN WATER STORAGE	-0.054	-3707.785	-0.16
SOIL WATER AT START OF YEAR	23.024	1571222.120	
SOIL WATER AT END OF YEAR	23.042	1572474.500	
SNOW WATER AT START OF YEAR	0.073	4960.233	0.21
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0027	184.691	0.01

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.56	1.42	2.51	3.11	3.62	3.94
	3.78	2.92	3.50	2.24	2.23	2.08
STD. DEVIATIONS	0.64	0.65	1.40	1.67	1.86	2.09
	1.75	1.72	1.68	1.27	1.02	1.00
RUNOFF						
TOTALS	0.534	0.810	1.786	0.198	0.002	0.056
	0.018	0.009	0.001	0.000	0.000	0.205
STD. DEVIATIONS	0.789	0.648	1.326	0.498	0.008	0.252
	0.073	0.042	0.004	0.000	0.000	0.319
EVAPOTRANSPIRATION						
TOTALS	0.457	0.417	0.796	2.611	2.951	3.041
	3.151	2.218	2.317	1.681	1.116	0.610
STD. DEVIATIONS	0.099	0.070	0.507	0.875	1.176	1.039
	1.162	1.171	0.876	0.631	0.307	0.185
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.2398	0.0004	0.3624	1.3699	0.8990	0.5442
	0.8284	0.6626	0.8296	0.8766	0.6369	0.6487
STD. DEVIATIONS	0.2527	0.0020	0.4097	0.7122	0.9939	0.5334
	1.0543	0.7553	0.7612	0.6372	0.7672	0.4337
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4						
AVERAGES	0.0027	0.0000	0.0041	0.0161	0.0103	0.0064
	0.0522	0.0076	0.0607	0.0100	0.0075	0.0074

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STD. DEVIATIONS	0.0029	0.0000	0.0047	0.0084	0.0113	0.0063
	0.1969	0.0086	0.2341	0.0073	0.0090	0.0049

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	32.89	(5.107)	2244750.0	100.00
RUNOFF	3.620	(2.1172)	247055.91	11.006
EVAPOTRANSPIRATION	21.367	(2.5729)	1458146.75	64.958
LATERAL DRAINAGE COLLECTED FROM LAYER 3	7.89851	(2.32996)	539025.812	24.01273
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00001	(0.00001)	0.943	0.00004
AVERAGE HEAD ON TOP OF LAYER 4	0.015	(0.025)		
CHANGE IN WATER STORAGE	-0.002	(1.2033)	-132.98	-0.006

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	4.09	279117.969
RUNOFF	1.801	122881.9920
DRAINAGE COLLECTED FROM LAYER 3	0.56567	38603.50780
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000021	1.46370
AVERAGE HEAD ON TOP OF LAYER 4	13.899	
MAXIMUM HEAD ON TOP OF LAYER 4	65.222	
SNOW WATER	4.36	297692.5000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4575
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1163

*** MAXIMUM HEADS ARE COMPUTED USING THE MOUND EQUATION. ***

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	1.4948	0.2491
2	11.2946	0.3765
3	0.0045	0.0227
4	0.0000	0.0000
5	10.2480	0.4270
SNOW WATER	0.000	

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CURRENTLY PERMITTED DESIGN WITH FML

Average annual leachate generated - 2910cf or 21,767 gallons

HELP MODEL INPUT DATA SUMMARY
Version 3.04

Site Name: BFI Zion Prepared by: P Rio Date: _____

Landfilled Area: 16.8 Acres SCS Runoff CN: _____
State: FL City: Chicago
Vegetative Cover Description: Good Vegetative Cover
Vegetative Cover Number: _____ OLD Design
Evaporative Zone Depth: _____
Geomembrane Pinhole Density 1/Acre
Installation Defects - Good (1-4/Acre) Use 2
Geomembrane placement quality - Good-3

Layer Number	Layer Type	Thickness (inches)	Texture	Compaction	Layer Desription
1	1	6"	6	No	Topsoil
2	2	6"	1	No	Sand Drainage Layer
3	3	30"	16	Yes	Compacted Clay
4	4	0.04"	37	No	40 mil PVC
5	#1	6"	16	Yes	Compacted Clay

Type of Vegetative Cover.

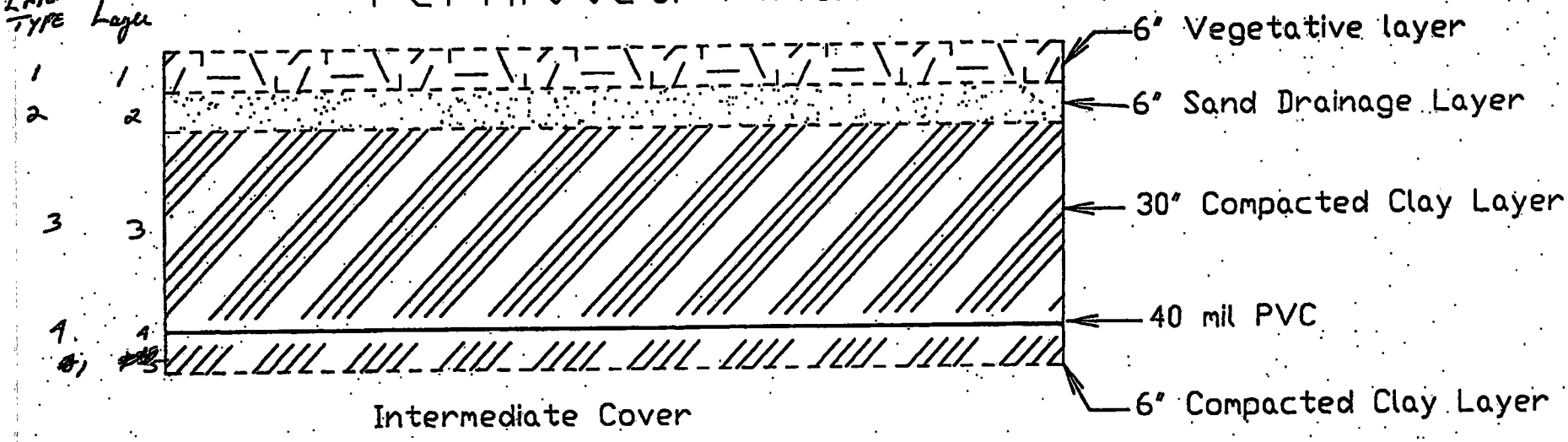
Enter 1 for Bare Ground
Enter 2 for Poor Grass
Enter 3 for Fair Grass
4 for Good Grass, and
5 for Excellent Grass

Layer Types

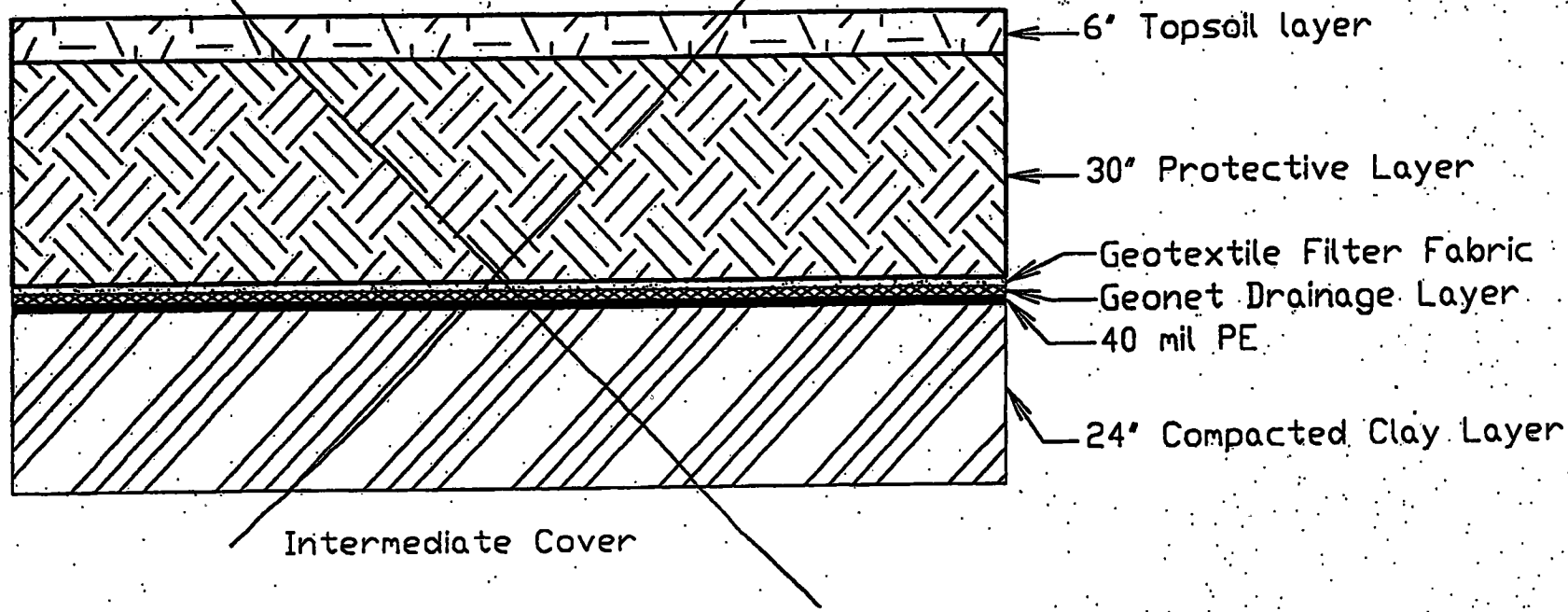
Enter 1 for a Vertical Percolation Layer
2 for a Lateral Drainage Layer
3 for a Barrier Soil Liner, or
4 for a geomembrane liner.

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Permitted Final Cover



Proposed Final Cover



A 15-66

R 001597

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE       **
**                   HELP MODEL VERSION 3.04  (13 MARCH 1995)       **
**                   DEVELOPED BY ENVIRONMENTAL LABORATORY          **
**                   USAE WATERWAYS EXPERIMENT STATION              **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY    **
**                                                                  **
**                                                                  **
**********************************************************************
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PRECIPITATION DATA FILE:     E:\HELP3\data\bfizion\PREC.D4
TEMPERATURE DATA FILE:       E:\HELP3\data\bfizion\TEMP.D7
SOLAR RADIATION DATA FILE:   E:\HELP3\data\bfizion\SOLAR.D13
EVAPOTRANSPIRATION DATA:     e:\help3\data\bfizion\EVAP.D11
SOIL AND DESIGN DATA FILE:   e:\help3\data\bfizion\OLDGEO.D10
OUTPUT DATA FILE:            E:\HELP3\data\bfizion\oldgeo.OUT

TIME:   8:58     DATE:   7/19/1996

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     TITLE:  BFI Zion Site, Area 1A/Existing Permitted Design

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
            COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

                              LAYER  1
                              --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER   6
          THICKNESS                     =      6.00   INCHES
          POROSITY                      =    0.4530 VOL/VOL
          FIELD CAPACITY                =    0.1900 VOL/VOL
          WILTING POINT                 =    0.0850 VOL/VOL
          INITIAL SOIL WATER CONTENT    =    0.4139 VOL/VOL
          EFFECTIVE SAT. HYD. COND.     =  0.720000011000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
               FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3952	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999978000E-02	CM/SEC
SLOPE	=	5.00	PERCENT
DRAINAGE LENGTH	=	1000.0	FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	30.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

LAYER 4

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 37

THICKNESS	=	0.04	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999999000E-10	CM/SEC
FML PINHOLE DENSITY	=	1.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	2.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 29

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4510	VOL/VOL
FIELD CAPACITY	=	0.4190	VOL/VOL
WILTING POINT	=	0.3320	VOL/VOL

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INITIAL SOIL WATER CONTENT = 0.3910 VOL/VOL
EFFECTIVE SAT. HYD. COND. = 0.680000028000E-06 CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 1000. FEET.

SCS RUNOFF CURVE NUMBER	=	67.60	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	18.800	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.329	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.552	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.546	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	20.011	INCHES
TOTAL INITIAL WATER	=	20.011	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM CHICAGO ILLINOIS

STATION LATITUDE	=	41.78	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

A15-69

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 41.78 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	2078030.250	100.00
RUNOFF	1.888	128811.875	6.20
EVAPOTRANSPIRATION	24.422	1666632.500	80.20
DRAINAGE COLLECTED FROM LAYER 2	4.0956	279500.750	13.45
PERC./LEAKAGE THROUGH LAYER 4	0.040251	2746.898	0.13
AVG. HEAD ON TOP OF LAYER 3	4.1825		
PERC./LEAKAGE THROUGH LAYER 5	0.053959	3682.390	0.18
CHANGE IN WATER STORAGE	-0.009	-597.588	-0.03
SOIL WATER AT START OF YEAR	20.011	1365597.120	
SOIL WATER AT END OF YEAR	20.002	1364999.620	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.290	0.00

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ANNUAL TOTALS FOR YEAR 2

A15-70

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.90	2449959.750	100.00
RUNOFF	7.227	493174.312	20.13
EVAPOTRANSPIRATION	23.653	1614196.750	65.89
DRAINAGE COLLECTED FROM LAYER 2	4.3365	295942.844	12.08
PERC./LEAKAGE THROUGH LAYER 4	0.045079	3076.366	0.13
AVG. HEAD ON TOP OF LAYER 3	4.9162		
PERC./LEAKAGE THROUGH LAYER 5	0.044981	3069.656	0.13
CHANGE IN WATER STORAGE	0.638	43513.508	1.78
SOIL WATER AT START OF YEAR	20.002	1364999.620	
SOIL WATER AT END OF YEAR	17.730	1209971.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.909	198541.562	8.10
ANNUAL WATER BUDGET BALANCE	0.0009	62.669	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.40	3030032.500	100.00
RUNOFF	10.861	741193.250	24.46
EVAPOTRANSPIRATION	31.465	2147271.750	70.87
DRAINAGE COLLECTED FROM LAYER 2	4.0515	276488.031	9.12
PERC./LEAKAGE THROUGH LAYER 4	0.041966	2863.908	0.09
AVG. HEAD ON TOP OF LAYER 3	4.4347		
PERC./LEAKAGE THROUGH LAYER 5	0.044291	3022.578	0.10
CHANGE IN WATER STORAGE	-2.094	-142902.047	-4.72
SOIL WATER AT START OF YEAR	17.730	1209971.500	
SOIL WATER AT END OF YEAR	18.291	1248263.370	

A-15-71

SNOW WATER AT START OF YEAR	2.909	198541.562	6.55
SNOW WATER AT END OF YEAR	0.254	17347.678	0.57
ANNUAL WATER BUDGET BALANCE	0.0727	4958.797	0.16

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.12	2055509.250	100.00
RUNOFF	5.130	350066.187	17.03
EVAPOTRANSPIRATION	22.383	1527509.120	74.31
DRAINAGE COLLECTED FROM LAYER 2	3.1283	213489.609	10.39
PERC./LEAKAGE THROUGH LAYER 4	0.032671	2229.570	0.11
AVG. HEAD ON TOP OF LAYER 3	3.0218		
PERC./LEAKAGE THROUGH LAYER 5	0.042916	2928.779	0.14
CHANGE IN WATER STORAGE	-0.564	-38484.930	-1.87
SOIL WATER AT START OF YEAR	18.291	1248263.370	
SOIL WATER AT END OF YEAR	17.981	1227126.120	
SNOW WATER AT START OF YEAR	0.254	17347.678	0.84
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.462	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.29	2203598.750	100.00
RUNOFF	3.880	264769.344	12.02
EVAPOTRANSPIRATION	24.925	1700958.750	77.19

A15-72

DRAINAGE COLLECTED FROM LAYER 2	3.6521	249236.359	11.31
PERC./LEAKAGE THROUGH LAYER 4	0.037198	2538.529	0.12
AVG. HEAD ON TOP OF LAYER 3	3.7213		
PERC./LEAKAGE THROUGH LAYER 5	0.036686	2503.579	0.11
CHANGE IN WATER STORAGE	-0.204	-13954.349	-0.63
SOIL WATER AT START OF YEAR	17.981	1227126.120	
SOIL WATER AT END OF YEAR	17.777	1213171.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0012	84.998	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.58	2359878.000	100.00
RUNOFF	1.745	119071.227	5.05
EVAPOTRANSPIRATION	27.731	1892450.870	80.19
DRAINAGE COLLECTED FROM LAYER 2	4.2755	291775.281	12.36
PERC./LEAKAGE THROUGH LAYER 4	0.041675	2844.073	0.12
AVG. HEAD ON TOP OF LAYER 3	4.3938		
PERC./LEAKAGE THROUGH LAYER 5	0.034708	2368.592	0.10
CHANGE IN WATER STORAGE	0.791	53975.457	2.29
SOIL WATER AT START OF YEAR	17.777	1213171.750	
SOIL WATER AT END OF YEAR	18.534	1264867.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.033	2280.130	0.10
ANNUAL WATER BUDGET BALANCE	0.0035	236.593	0.01

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A15-73

ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.24	2404918.500	100.00
RUNOFF	3.952	269728.281	11.22
EVAPOTRANSPIRATION	26.051	1777833.250	73.92
DRAINAGE COLLECTED FROM LAYER 2	4.8318	329743.031	13.71
PERC./LEAKAGE THROUGH LAYER 4	0.049312	3365.253	0.14
AVG. HEAD ON TOP OF LAYER 3	5.5485		
PERC./LEAKAGE THROUGH LAYER 5	0.035598	2429.351	0.10
CHANGE IN WATER STORAGE	0.341	23287.678	0.97
SOIL WATER AT START OF YEAR	18.534	1264867.120	
SOIL WATER AT END OF YEAR	18.909	1290434.870	
SNOW WATER AT START OF YEAR	0.033	2280.130	0.09
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0278	1896.958	0.08

ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.13	2397412.250	100.00
RUNOFF	5.789	395057.344	16.48
EVAPOTRANSPIRATION	23.320	1591455.000	66.38
DRAINAGE COLLECTED FROM LAYER 2	4.6555	317711.406	13.25
PERC./LEAKAGE THROUGH LAYER 4	0.047760	3259.350	0.14
AVG. HEAD ON TOP OF LAYER 3	5.2942		
PERC./LEAKAGE THROUGH LAYER 5	0.046567	3177.946	0.13
CHANGE IN WATER STORAGE	1.319	90009.203	3.75

A15-74

SOIL WATER AT START OF YEAR	18.909	1290434.870	
SOIL WATER AT END OF YEAR	19.815	1352238.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.413	28205.645	1.18
ANNUAL WATER BUDGET BALANCE	0.0000	1.230	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.61	2634900.750	100.00
RUNOFF	8.836	603005.062	22.89
EVAPOTRANSPIRATION	26.239	1790671.870	67.96
DRAINAGE COLLECTED FROM LAYER 2	4.5914	313333.812	11.89
PERC./LEAKAGE THROUGH LAYER 4	0.046847	3197.015	0.12
AVG. HEAD ON TOP OF LAYER 3	5.1767		
PERC./LEAKAGE THROUGH LAYER 5	0.051436	3510.228	0.13
CHANGE IN WATER STORAGE	-1.108	-75620.750	-2.87
SOIL WATER AT START OF YEAR	19.815	1352238.500	
SOIL WATER AT END OF YEAR	19.120	1304823.370	
SNOW WATER AT START OF YEAR	0.413	28205.645	1.07
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.430	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCEN
PRECIPITATION	30.75	2098503.250	100.00

A15-75

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

CERTIFIED MAIL - RETURN REQUESTED

July 31, 1996

Mr. Robert Churchill
976 Hillside Ave.
Antioch, IL 60002

Dear Mr. Churchill:

Browning-Ferris Industries of Illinois, Inc. (BFIIL) has, today, submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap.

Attached to this letter are drawings showing the currently permitted cap and the proposed cap. While the currently permitted cap is outdated and the proposed cap is an improvement and more protective of the environment, IEPA cannot approve the change unless BFIIL obtains a Permit Modification. This notice to you is required under the Permit Modification regulations (35 IAC 703.283).

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office from 7 a.m. to 4 p.m. Monday through Friday. BFIIL will hold a public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period begins today. Comments should be directed to the Illinois Environmental Protection Agency"s (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's James Lewis or Michael Williams at 708/746-5777.

Sincerely,

Rebecca Ries, CHMM

A15-133

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

CERTIFIED MAIL - RETURN REQUESTED

July 31, 1996

Mr. Michael Waller
Lake County Courthouse
18 N. County Street
Waukegan, IL 60085

Dear Mr. Waller:

Browning-Ferris Industries of Illinois, Inc. (BFIIL) has, today, submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap.

Attached to this letter are drawings showing the currently permitted cap and the proposed cap. While the currently permitted cap is outdated and the proposed cap is an improvement and more protective of the environment, IEPA cannot approve the change unless BFIIL obtains a Permit Modification. This notice to you is required under the Permit Modification regulations (35 IAC 703.283).

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office from 7 a.m. to 4 p.m. Monday through Friday. BFIIL will hold a public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period begins today. Comments should be directed to the Illinois Environmental Protection Agency"s (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's James Lewis or Michael Williams at 708/746-5777.

Sincerely,

Rebecca Ries, CHMM

A-15-134

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

CERTIFIED MAIL - RETURN REQUESTED

July 31, 1996

The Honorable A. Geo-Karis
2610 Sheridan Road, Suite 213
Zion, IL 60099

Dear Senator Geo-Karis:

Browning-Ferris Industries of Illinois, Inc. (BFIIL) has, today, submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap.

Attached to this letter are drawings showing the currently permitted cap and the proposed cap. While the currently permitted cap is outdated and the proposed cap is an improvement and more protective of the environment, IEPA cannot approve the change unless BFIIL obtains a Permit Modification. This notice to you is required under the Permit Modification regulations (35 IAC 703.283).

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office from 7 a.m. to 4 p.m. Monday through Friday. BFIIL will hold a public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period begins today. Comments should be directed to the Illinois Environmental Protection Agency"s (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's James Lewis or Michael Williams at 708/746-5777.

Sincerely,

Rebecca Ries, CHMM

A15-135

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

CERTIFIED MAIL - RETURN REQUESTED

July 31, 1996

Ms. Dawn McLain
Village of Winthrop Harbor
830 Sheridan Road
Winthrop Harbor, IL 60096

Dear Ms. McLain:

Browning-Ferris Industries of Illinois, Inc. (BFIIL) has, today, submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap.

Attached to this letter are drawings showing the currently permitted cap and the proposed cap. While the currently permitted cap is outdated and the proposed cap is an improvement and more protective of the environment, IEPA cannot approve the change unless BFIIL obtains a Permit Modification. This notice to you is required under the Permit Modification regulations (35 IAC 703.283).

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office from 7 a.m. to 4 p.m. Monday through Friday. BFIIL will hold a public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period begins today. Comments should be directed to the Illinois Environmental Protection Agency"s (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's James Lewis or Michael Williams at 708/746-5777.

Sincerely,

Rebecca Ries, CHMM

A15-136

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

CERTIFIED MAIL - RETURN REQUESTED

July 31, 1996

Village of Wadsworth
14155 W. Wadsworth Road
Wadsworth, IL 60083

To Whom It May Concern:

Browning-Ferris Industries of Illinois, Inc. (BFIIL) has, today, submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap.

Attached to this letter are drawings showing the currently permitted cap and the proposed cap. While the currently permitted cap is outdated and the proposed cap is an improvement and more protective of the environment, IEPA cannot approve the change unless BFIIL obtains a Permit Modification. This notice to you is required under the Permit Modification regulations (35 IAC 703.283).

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office from 7 a.m. to 4 p.m. Monday through Friday. BFIIL will hold a public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period begins today. Comments should be directed to the Illinois Environmental Protection Agency"s (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's James Lewis or Michael Williams at 708/746-5777.

Sincerely,

Rebecca Ries, CHMM

A15-137

APPENDIX 5
NEWSPAPER PUBLIC NOTICE

PUBLIC NOTICE

On July 31, 1996, Browning-Ferris Industries of Illinois, Inc. (BFIIL) submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap. The currently permitted cap is an outdated design. The proposed cap is an improvement and more protective of the environment.

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office between the hours of 7 a.m. and 4 p.m. Monday through Friday. A public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period began on July 31, 1996. Comments should be directed to the Illinois Environmental Protection Agency's (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

Questions can also be directed to BFIIL's contact person:

Mike Williams
701 Green Bay Road
Zion, IL 60099
847/746-5777

A15-139

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

August 7, 1996

Mr. Kevin D. Lesko, E.I.T.
Illinois Environmental Protection Agency
Division of Land
Permit Section - Hazardous Waste
2200 Churchill Road
Springfield, IL 62794-9276

RE: 0978020001 - Lake County
Browning-Ferris Industries of Illinois, Inc.
Zion Landfill Site 1 Phase A
ILD980700728
RCRA Permit Log No. B-23-M-16

Dear Mr. Lesko:

Attached are the return receipts from the notifications regarding the request for a Class 3 Modification to allow BFI to modify the final cap design for the referenced landfill. As indicated in the Class 3 Modification Application, the notifications were sent to the persons on the facility mailing list by certified mail. Notices were also placed in two local newspapers.

Please call BFIIL's Jim Lewis or Mike Williams at 708/746-5777 or either of the undersigned at 815/568-3100 if there are any questions.

Sincerely,

Rebecca Ries, CHMM

pc: J. Lewis w/enclosures

A15-140

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Michael Waller
Lake County Courthouse
18 N. County Street
Waukegan, IL 60085

4a. Article Number
P 302 392 973

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery
AUG - 2 1996

5. Received By: (Print Name)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature: (Addressee or Agent)
X

PS Form 3811, December 1994 Domestic Return Receipt

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Dawn McLain
Village of Winthrop Harbor
830 Sheridan Road
Winthrop Harbor, IL 60096

4a. Article Number
P 302 392 974

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery
8-2-96

5. Received By: (Print Name)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature: (Addressee or Agent)
X

PS Form 3811, December 1994 Domestic Return Receipt

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive t
following services (for
extra fee):
1. ☐ Addressee's A
2. ☐ Restricted Del

Consult postmaster fo

3. Article Addressed to:
The Honorable A. Geo-Karis
2610 Sheridan Road
Suite 213
Zion, IL 60099

4a. Article Number
P336 286 720

4b. Service Type
☐ Registered ☒
☐ Express Mail ☐
☐ Return Receipt for Merchandise ☐

7. Date of Delivery
8/2/96

5. Received By: (Print Name)

8. Addressee's Address (Only if req
and fee is paid)

6. Signature: (Addressee or Agent)
X

PS Form 3811, December 1994 Domestic Return

Is your RETURN ADDRESS completed on the reverse side?

A15-141

R 001615

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Robert Churchill
976 Hillside Ave
Antioch, IL 60002

4a. Article Number
P 302 392 976

4b. Service Type
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☑ Return Receipt for Merchandise

7. Date of Delivery
8-2-96

5. Signature (Addressee)
Deborah A Kerr

8. Addressee's Address (Only if requested and fee is paid)

6. Signature (Agent)

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

PS Form 3811, December 1991 ★ U.S.G.P.O. 1992-307-530 DOMESTIC RETURN RECEIPT

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
City of Zion, Clerk
2828 Sheridan Rd.
Zion, IL 60099

4a. Article Number
P 302 392 97

4b. Service Type
☐ Registered ☒ Ce
☐ Express Mail ☐ In
☐ Return Receipt for Merchandise ☐ C

7. Date of Delivery
8/2/96

5. Received By: (Print Name)
Sharon Hanson

8. Addressee's Address (Only if reque and fee is paid)
145-142

6. Signature: (Addressee or Agent)
X Sharon Hanson

Is your RETURN ADDRESS completed on the reverse side?

PS Form 3811, December 1994 Domestic Return Re

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, 4a, and 4b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:
Village of Wadsworth
14155 W. Wadsworth Rd
Wadsworth, IL 60083

4a. Article Number
P 302 392 975

4b. Service Type
☐ Registered ☒ Certified
☐ Express Mail ☐ Insured
☐ Return Receipt for Merchandise ☐ COD

7. Date of Delivery
8-02-96

5. Received By: (Print Name)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature: (Addressee or Agent)
X Debbie Mikesell Debbie Mikesell

Is your RETURN ADDRESS completed on the reverse side?

Thank you for using Return Receipt Service.

PS Form 3811, December 1994 Domestic Return Receipt

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

(I also wish to) receive following services (for an fee):
1. ☐ Addressee's Ad
2. ☐ Restricted Deliv

Consult postmaster for f

3. Article Addressed to:
Robert Depke
Lake County Courthouse
18 N County Street
Waukegan, IL 60085

4a. Article Number
P 302 392 9

4b. Service Type
☒ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Rece Merchandis

7. Date of Deliv AUG - 2 1996

5. Signature (Addressee)

8. Addressee's Address (Only if r and fee is paid)

6. Signature (Agent)

Is your RETURN ADDRESS completed on the reverse side?

PS Form 3811, December 1991 ★ U.S.G.P.O. 1992-307-530 DOMESTIC RETURN R

R 001616

Annexed Notice

#001758
PUBLIC NOTICE
On July 31, 1996, Browning-Ferris Industries of Illinois, Inc. (BFIIL) submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap. The currently permitted cap is an outdated design. The proposed cap is an improvement and more protective of the environment.

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office between the hours of 7 a.m. and 4 p.m. Monday through Friday. A public meeting to discuss the change will be held at the BFIIL-Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday, September 4, 1996 at 10 a.m.

The public may comment on the Class 3 Modification request. The 60-day comment period began on July 31, 1996. Comments should be directed to the Illinois Environmental Protection Agency's (IEPA) contact person (below). The permittee's compliance history during the life of the permit being modified is also available from the IEPA contact person.

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL
62794-9276
217/524-3271

Questions can also be directed to BFIIL's contact person:

Mike Williams
701 Green Bay Road
Zion, IL 60099
847/746-5777

August 2,2,5

W

Publisher's Certificate

THIS IS TO CERTIFY that the notice, a true copy of which is hereto annexed, was published in The News-Sun a secular newspaper of general circulation in the County of Lake and State of Illinois, published daily except Sunday in the City of Waukegan, Lake County and State of Illinois by The Copley Press, Inc., a corporation organized and existing under the laws of the State of Illinois, 3 times, once each ~~day~~ week, for 3 ~~weeks successively~~ days; that the date of the first publication was on the 2 day of Aug A.D. 19 96, and the date of the last publication was the 5 day of Aug, A.D. 19 96; said paper being authorized by law as a proper medium for the publication of legal notices in said county. The publisher does further certify that said News-Sun is a newspaper (a) which consists of not less than four (4) pages of printed matter and contains at least 130 square inches of printed matter per page; and (b) which is printed through the use of one of the conventional and generally recognized printing processes as defined by statue; and (c) which annually averages at least 25% news content per issue or which annually averages at least 1000 column inches of news content per issue, the term "news content" meaning any printed matter other than advertising; and (d) which publishes miscellaneous reading matter, legal or other announcements and notices, and news and information concerning current happenings and passing events of a political, social, religious, commercial, financial or legal nature, and advertisements or bulletins; and (e) which has been continuously published at regular intervals of at least once each week with a minimum of 50 issues per year for at least one year prior to the first publication of the annexed notice.

IN WITNESS WHEREOF said The Copley Press, Inc., publisher aforesaid, has hereunto caused its corporate name to be hereunto affixed on this the 6 day of Aug A.D. 19 96, by its duly authorized officer or agent.

THE COPLEY PRESS, INC.

By Steven F. Warneke

Its Accounting Manager

Publication Fee $ 160.80

Received payment of above fee of $ _____

4C 56000176

A15-143

Zion-
Thurs

LEGAL NOTICES

designed intend(s) to conduct the above named business from the location(s) indicated and that the true or real full name(s) of the person(s) owning, conducting or transacting the business are correct as shown.
s/Robert L. Hamden Sr.
7-23-96
The foregoing instrument was acknowledged before me by the person(s) intending to conduct the business this July 23, 1996.
s/Elizabeth R. Rios
Notary Public
Received July 23, 1996
Lake County Clerk
Willard R. Helander
8-1, 8-8, 8-15

LEGAL
ASSUMED BUSINESS NAME CERTIFICATE
NAME OF BUSINESS:
Great Lakes Locksmith
ADDRESS(ES) WHERE BUSINESS IS TO BE CONDUCTED OR TRANSACTED IN THIS COUNTY: 1922 Jackson St., North Chicago, IL 60064
NAME(S) AND POST OFFICE OR RESIDENCE ADDRESS(ES) OF THE PERSON(S) OWNING, CONDUCTING OR TRANSACTING BUSINESS: Robert L. Hamden Sr., 1922 Jackson St., North Chicago, IL 60064
STATE OF ILLINOIS,
COUNTY OF LAKE:
This is to certify that the undersigned intend(s) to conduct the above named business from the location(s) indicated and that the true or real full name(s) of the person(s) owning, conducting or transacting the business are correct as shown.
s/Robert L. Hamden Sr.
7-23-96
The foregoing instrument was acknowledged before me by the person(s) intending to conduct the business this July 23, 1996.
s/Elizabeth R. Rios
Notary Public
Received July 23, 1996
Lake County Clerk
Willard R. Helander
8-1, 8-8, 8-15

LEGAL
ASSUMED BUSINESS NAME CERTIFICATE
NAME OF BUSINESS:
Certified Locksmith
ADDRESS(ES) WHERE BUSINESS IS TO BE CONDUCTED OR TRANSACTED IN THIS COUNTY: 1922 Jackson St., North Chicago, IL 60064
NAME(S) AND POST OFFICE OR RESIDENCE ADDRESS(ES) OF THE PERSON(S) OWNING,

John Richtman,
Attorney
8-1, 8-8, 8-15

LEGAL
PUBLIC NOTICE
On July 31, 1996 Browning Ferris Industries of Illinois, Inc. (BFIIL) submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modifications request contains drawings and a written description of the proposed cap. The currently permitted cap is an outdated design. The proposed cap is an improvement and more protective for the environment.
A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office between the hours of 7 a.m. and 4 p.m. Monday through Friday. A public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday Sept. 4, 1996 at 10 a.m.
The public may comment on this Class 3 Modification request. The 60-day comment period began on July 31, 1996. Comments should be directed to the Illinois Environmental Protection Agency's (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person.
Kevin Leake
2200 Churchill Road
P.O. Box 19276
Springfield, IL
62794-9276
217/524-3271

Questions can also be directed to BFIIL's contact person:

Mike Williams
701 Green Bay Road
Zion, IL 60099
847/746-5777

8-1, 8-8

LEGAL
STATE OF ILLINOIS
COUNTY OF LAKE
IN THE CIRCUIT COURT
OF THE
NINETEENTH JUDICIAL
CIRCUIT
LAKE County

A15-104

LEGAL NOTICES

60030.
Claims against the estate may be filed in the Office of the Clerk of the Circuit Court, 18 N. County St., Room C-104, Waukegan, IL 60085, or with the representative, or both, on or before Jan. 27, 1997, which date is not less than six months from the date of the first publication of this Notice, and any claim not filed within that period is barred. Copies of a claim filed with the Clerk must be mailed or delivered to the representative and to the attorney within 10 days after it is filed.
Joseph H. Vogler,
Representative
John P. Richtman,
Attorney
7-25, 8-1, 8-8

LEGAL
STATE OF ILLINOIS
COUNTY OF LAKE
IN THE CIRCUIT COURT
OF THE
NINETEENTH JUDICIAL
CIRCUIT
LAKE COUNTY,
IN PROBATE
In the Matter of the
Estate of
Robert W. Dohner,
Deceased
Case No. 96 P 109
NOTICE TO UNKNOWN
HEIRS OF
ROBERT W. DOHNER
NOTICE IS GIVEN that an estate is currently pending in the Circuit Court of Lake County, 18 N. County St., Waukegan, IL 60085. Notice is given to all heirs of Robert W. Dohner that he died a resident of Round Lake, IL, Dec. 15, 1995. We are looking for relatives of Robert Dohner who was born Dec. 19, 1923 in Chicago. His parents were Oscar Dohner and Francis Dombroski Dohner, both of whom predeceased the decedent. If you are a direct descendant of Oscar Dohner or Francis Dombroski Dohner, you may be an heir to Robert Dohner's estate. Inquiries should be sent to Joseph H. Vogler, 2711 Grand Ave., Waukegan, IL 60085.
Joseph H. Vogler,
Representative
John P. Richtman,
Attorney
7-25, 8-1, 8-8

LEGAL
TAX SALE
TO: Igor Michael Gordon; Leo Nardelitsky; First National Bank of Morton Grove; Willard R. Helander, Lake County Clerk; their spouses, heirs, devi-

LEGAL NOTICES

matter described real estate
Tax Deed No. 93 TX 3
TAKE NOTICE
County of Lake,
State of Illinois
Date Premises Sold: De
6, 1993
Permanent Index No. 0
22-101-003
Sold for General Taxes
1992 and/or prior.
THIS PROPERTY HAS
BEEN SOLD FOR
DELINQUENT TAXES
The Property is located at
2141 Sheridan Rd., Zion, I
60099.
Legal Description/Permanent Index No. 04-28-104-023: That part of the north half of Section 22, Township 46 North, Range 12, East of the Third Principal Meridian formerly known as Lots 2 and 3, in Block 1 in Zion City subdivision in Section 22, township and range aforesaid, vacated by instrument recorded March 30, 1905 as Document No. 99059 in Book 159 of Mortgages, page 160, in Lake County, IL.
This notice is to advise you that the above property has been sold for delinquent taxes/and or special assessments and that the period of redemption from the sale will expire on Nov. 29, 1996. The amount to redeem is subject to increase at six month intervals from the date of sale and may be further increased if the purchaser at the tax sale of his assignee pays any subsequently accruing taxes or special assessments to redeem the property from subject forfeiture or tax sales. Check with the County Clerk as to exact amount you owe before redeeming.
This notice is also to advise you that a petition was filed on July 26, 1996 for a tax deed that will transfer title and right of possession of this property if redemption is not made on or before Nov. 29, 1996.
This matter is set for hearing in the Circuit Court of this County in Waukegan, IL., Dec. 19, 1996 at 2 p.m. Room C-150, 18 North County St., Waukegan, IL 60085.
You may be present at this hearing but your right to redeem will have already expired at that time.
YOU ARE URGED TO REDEEM IMMEDIATELY TO PREVENT LOSS OF PROPERTY.
Redemption may be made anytime on or before Nov. 29, 1996 by applying to the County Clerk of Lake [illegible]

Thursdays. North Shore Office: Methodist Church, Glencoe (657- ly, Libertyville: 680-4106

LEGAL NOTICE

#001758
NOTICE OF PUBLIC HEARING
VILLAGE OF MUNDELEIN, ILLINOIS
WASTEWATER TREATMENT PLANT IMPROVEMENTS

The Village of Mundelein is hereby soliciting public review and comment on the Village of Mundelein documents entitled Wastewater Treatment Plant Facility Plan Update, dated October 1994, Wastewater Treatment Plant Facility Plan Update, Amendment No. 1, dated May 1995, Value Engineering Study Report for Session No. 1, dated April 1995, Value Engineering Study Report for Session No. 2, dated August 1995 and the Preliminary Environmental Impacts Determination, dated July 22, 1996. The Village is seeking loan funds from the State of Illinois Water Pollution Control Revolving Fund and State compliance grant funds to assist with financing the construction of improvements to the wastewater treatment plant.

The documents will be available for review beginning August 5, 1996 at the Village Hall, 440 E. Hawley Street, Mundelein, Illinois 60060 and will remain on display for twenty-one (21) days until August 26, 1996. A Public Hearing will be held on August 26, 1996 at 8:00 P.M. at the Village Board Room for the purpose of receiving public comments on the scope and impact of the proposed project. The Village will continue to receive comments for fifteen (15) days (allowing the Public Hearing until September 10, 1996, at which time a summary of the public review process will be forwarded to the Illinois Environmental Protection Agency for final approval.
August 2

Your telephone is your link to the people who are looking to buy the items you want to sell. Call us to place your ad...then expect other calls to come your way.
NEWS SUN Classified
336-7270
or
362-2092.

LEGAL NOTICE

#001731
LEGAL NOTICE
NOTICE IS HEREBY GIVEN that a certain Ordinance adopted by the President and Board of Trustees of the Village of Lake Villa, Illinois, has been filed in the Circuit Court of Lake County, Illinois, under General No. 96 MC 2; that said Ordinance expresses a desire of the Corporate Authorities of the said Village to annex the territory described as follows, to-wit:

THOSE PARTS OF THE EAST 1/2 OF THE NORTHEAST 1/4 OF SECTION 33 AND OF THE WEST 1/2 OF THE NORTHWEST 1/4 OF SECTION 34, ALL IN TOWNSHIP 46 NORTH, RANGE 10 EAST OF THE 3RD PRINCIPAL MERIDIAN; BOUNDED BY A LINE DESCRIBED AS FOLLOWS TO-WIT: COMMENCING AT THE POINT WHERE THE NORTHERLY LINE OF WILLIAM WILLINGTONS 2ND SUBDIVISION AT DEEP LAKE, A SUBDIVISION RECORDED AS DOCUMENT NUMBER 135862 IN BOOK 1 OF PLATS, ON PAGE 10 IN THE OFFICE OF THE RECORDER OF DEEDS, INTERSECTS THE NORTH LINE OF NORTHEAST 1/4 OF SAID SECTION 33; THENCE SOUTHWESTERLY ALONG THE NORTHERLY LINE OF WILLIAM WILLINGTONS 2ND SUBDIVISION AT DEEP LAKE AND ALONG THE NORTHERLY LINE OF WILLIAM WILMINGTON'S 3RD SUBDIVISION AT DEEP LAKE, A SUBDIVISION RECORDED AS DOCUMENT NUMBER 215549 IN BOOK L OF PLATS, ON PAGE 31 IN THE OFFICE OF THE RECORDER OF DEEDS, TO THE WEST LINE OF THE EAST 1/2 OF THE NORTHEAST 1/4 OF SAID SECTION 33; THENCE SOUTHERLY, ALONG THE WEST LINE OF THE EAST 1/2 OF THE NORTHEAST 1/4 OF SAID SECTION 33, TO THE SOUTH LINE OF THE NORTHEAST 1/4 OF SAID SECTION 33; THENCE EASTERLY, ALONG THE SOUTH LINE OF THE NORTHEAST 1/4 OF SAID SECTION 33 AND CONTINUING EASTERLY, ALONG THE SOUTH LINE OF THE NORTHWEST 1/4 OF SECTION 34 AFORESAID, TO THE WESTERLY RIGHT OF WAY OF DEEP LAKE ROAD; THENCE NORTHWESTERLY ALONG THE WESTERLY RIGHT OF WAY LINE OF DEEP LAKE ROAD TO THE POINT OF INTERSECTION WITH THE NORTH LINE OF SEDGEWOOD COVE ESTATES EXTENDED WESTERLY; THENCE EASTERLY ALONG THE NORTH LINE OF SEDGEWOOD COVE ESTATES EXTENDED WESTERLY, TO THE EASTERLY RIGHT OF WAY LINE OF DEEP LAKE ROAD; THENCE NORTHWESTERLY, ALONG THE EASTERLY RIGHT OF WAY LINE OF DEEP LAKE ROAD, TO THE NORTH LINE OF THE NORTHWEST 1/4 OF SAID SECTION 34; THENCE WESTERLY ALONG THE NORTH LINE OF THE NORTHWEST 1/4 OF SAID SECTION 34, TO THE PLACE OF BEGINNING, ALL IN LAKE COUNTY, ILLINOIS.
and requests a referendum on said question; that the name of the annexing municipality is the Village of Lake Villa, Illinois and the date fixed for hearing is August 19, 1996, at 9:15 A.M. in the Circuit Court, Lake County, Illinois, Court Room C-402. Pursuant to statute, any and all objections shall be filed not less than five (5) days prior to the date fixed for hearing or the same shall be barred by law.
VILLAGE OF LAKE VILLA, ILLINOIS
Alice Brownlee
Village Clerk
John M. Mullen
Attorney for Petitioner
Suite 202
14048 Petronella Drive
Libertyville, Illinois 60048
(847) 367-7330
August 2

#001682
TAX DEED NO.93 TX 3
FILED: July 20, 1996
TO: Willard Helander, County Clerk of Lake County, Illinois; Sherrie L. Knutson; First National Bank of Antioch; Unknown Owners and other parties interested in or in possession of said land or lots;
TAKE NOTICE
COUNTY OF LAKE, STATE OF ILLINOIS
Date premises sold:
December 6, 1993
Sold for General Taxes of 1992
P.I.N.# 01-25-406-024
THIS PROPERTY HAS BEEN SOLD FOR DELINQUENT TAXES
Property located at: Lot 26 in Beachwood, being a Sub of part of the SE 1/4 of Section 25, Township 46 North, Range 9, East of the 3rd P.M., according to plat thereof 4/22/1926 as Doc. 277495, in Book P of Plats, page 23, in Lake County, Illinois.
Permanent Index No. 01-25-406-024

LEGAL NOTICE

WESTERLY RIGHT OF WAY LINE OF DEEP LAKE ROAD; THENCE NORTHWESTERLY ALONG THE WESTERLY RIGHT OF WAY LINE OF DEEP LAKE ROAD TO THE POINT OF INTERSECTION WITH THE NORTH LINE OF SEDGEWOOD COVE ESTATES EXTENDED WESTERLY; THENCE EASTERLY ALONG THE NORTH LINE OF SEDGEWOOD COVE ESTATES EXTENDED WESTERLY, TO THE EASTERLY RIGHT OF WAY LINE OF DEEP LAKE ROAD; THENCE NORTHWESTERLY, ALONG THE EASTERLY RIGHT OF WAY LINE OF DEEP LAKE ROAD, TO THE NORTH LINE OF THE NORTHWEST 1/4 OF SAID SECTION 34; THENCE WESTERLY ALONG THE NORTH LINE OF THE NORTHWEST 1/4 OF SAID SECTION 34, TO THE PLACE OF BEGINNING, ALL IN LAKE COUNTY, ILLINOIS.
and requests a referendum on said question; that the name of the annexing municipality is the Village of Lake Villa, Illinois and the date fixed for hearing is August 19, 1996, at 9:15 A.M. in the Circuit Court, Lake County, Illinois, Court Room C-402. Pursuant to statute, any and all objections shall be filed not less than five (5) days prior to the date fixed for hearing or the same shall be barred by law.
VILLAGE OF LAKE VILLA, ILLINOIS
Alice Brownlee
Village Clerk
John M. Mullen
Attorney for Petitioner
Suite 202
14048 Petronella Drive
Libertyville, Illinois 60048
(847) 367-7330
August 2

#001682
TAX DEED NO.93 TX 3
FILED: July 20, 1996
TO: Willard Helander, County Clerk of Lake County, Illinois; Sherrie L. Knutson; First National Bank of Antioch; Unknown Owners and other parties interested in or in possession of said land or lots;
TAKE NOTICE
COUNTY OF LAKE, STATE OF ILLINOIS
Date premises sold:
December 6, 1993
Sold for General Taxes of 1992
P.I.N.# 01-25-406-024
THIS PROPERTY HAS BEEN SOLD FOR DELINQUENT TAXES
Property located at: Lot 26 in Beachwood, being a Sub of part of the SE 1/4 of Section 25, Township 46 North, Range 9, East of the 3rd P.M., according to plat thereof 4/22/1926 as Doc. 277495, in Book P of Plats, page 23, in Lake County, Illinois.
Permanent Index No. 01-25-406-024
Claims against the estate may be filed in the office of the Clerk of Circuit Court at 18 County Street, Waukegan, Illinois 60085, Room 106 or with representative both, on or before January 28, 1997, which date is not less than 6 months from the date of the publication of this notice and any claim not filed within that period is barred. Copies of any claim filed with the Clerk must be mailed or delivered to the representative and to the attorney within 10 days after it has been filed.
/s/ Joseph Plotz
(Representative)
/s/ Joseph McGovern
(Attorney)
July 26
August 2, 9

#001758
PUBLIC NOTICE
On July 31, 1996, Browning-Ferris Industries of Illinois, Inc. (BFIIL) submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap. The currently permitted cap is an outdated design. The proposed cap is an improvement and more protective of the environment.

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office between the hours of 7 a.m. and 4 p.m. Monday through Friday. A public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday, September 4, 1996 at 10 a.m.
The public may comment on the Class 3 Modification request. The 60-day comment period began on July 31, 1996. Comments should be directed to the Illinois Environmental Protection Agency's (IEPA) contact person below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person.
Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL
62794-9276
217/524-3271
Questions can also be directed to BFIIL's contact person:
Mike Williams
701 Green Bay Road
Zion, IL 60099
847/746-5777
August 2,3,5

#001673
STATE OF ILLINOIS
COUNTY OF LAKE
)SS
IN THE CIRCUIT COURT OF THE NINETEENTH JUDICIAL CIRCUIT
LAKE COUNTY, ILLINOIS
IN THE MATTER OF THE
ESTATE OF
GEORGE L. ATSAVES
Deceased
General Number:
96 P 627
CLAIM NOTICE
Notice is given of the death of George L. Atsaves, of Buffalo Grove, Illinois. Letters of office were issued on July 19, 1996, to Phyllis Atsaves, 126 Wildflower Circle, Buffalo Grove, Illinois 60089 whose attorney is ADELINE J. GEO-KARIS & ASSOCIATES, LTD., 2613 Sheridan Road, Zion, Illinois 60099, Telephone: 847-746-1288, Facsimile: 847-872-0123.
Claims against the estate may be filed in the office of the Clerk of Circuit Court at 18 County Street, Waukegan, Illinois 60085, Room 106 or with representative both, on or before January 28, 1997, which date is not less than 6 months from the date of the publication of this notice and any claim not filed within that period is barred. Copies of any claim filed with the Clerk must be mailed or delivered to the representative and to the attorney within 10 days after it has been filed.
/s/ Phyllis Atsaves
(Representative)
/s/ Adeline J. Geo-Karis
(Attorney)
July 26
August 2, 9

#001759
IN THE CIRCUIT COURT FOR

LEGAL NOTICE

AS DOCUMENT 449213, IN BOOK X OF PLATS, PAGES 98 AND 99, IN LAKE COUNTY, ILLINOIS.
Permanent Index No. 02-21-411-020
This notice is to advise you that the above property has been sold for delinquent taxes and that the period of redemption from the sale has been extended and will expire on November 29, 1996. The amount to redeem is subject to increase at 6-month intervals from the date of sale and may be further increased if the purchaser at the tax sale or his assignee pays any subsequently accruing taxes or special assessments to redeem the property from subsequent forfeitures or tax sales. Check with the County Clerk as to the exact amount you owe before redeeming.
This notice is also to advise you that on July 26, 1996, a Petition was filed for a tax deed which will transfer title and the right to possession of this property if redemption is not made on or before November 29, 1996.
This matter is set for hearing before the Judge presiding in Room C150 in the Circuit Court of Lake County, Waukegan, Illinois at 2:00 P.M. on December 19, 1996. You may be present at this hearing but your right to redeem will already have expired at that time.
YOU ARE URGED TO REDEEM IMMEDIATELY TO PREVENT LOSS OF PROPERTY
Redemption can be made at any time on or before November 29, 1996 by applying to the County Clerk of Lake County, Illinois at the County Court House in Waukegan, Illinois.
For further information contact the County Clerk.
Law Offices of Thaddeus M. Bond Jr. & Associates, P.C.
200 N. Ulica St.
Suite 200
Waukegan, IL 60085
July 31
August 1, 2

#001673
STATE OF ILLINOIS
COUNTY OF LAKE
)SS
IN THE CIRCUIT COURT OF THE NINETEENTH JUDICIAL CIRCUIT
LAKE COUNTY, ILLINOIS
IN THE MATTER OF THE
ESTATE OF
GEORGE L. ATSAVES
Deceased
General Number:
96 P 627
CLAIM NOTICE
Notice is given of the death of George L. Atsaves, of Buffalo Grove, Illinois. Letters of office were issued on July 19, 1996, to Phyllis Atsaves, 126 Wildflower Circle, Buffalo Grove, Illinois 60089 whose attorney is ADELINE J. GEO-KARIS & ASSOCIATES, LTD., 2613 Sheridan Road, Zion, Illinois 60099, Telephone: 847-746-1288, Facsimile: 847-872-0123.
Claims against the estate may be filed in the office of the Clerk of Circuit Court at 18 County Street, Waukegan, Illinois 60085, Room 106 or with representative both, on or before January 28, 1997, which date is not less than 6 months from the date of the publication of this notice and any claim not filed within that period is barred. Copies of any claim filed with the Clerk must be mailed or delivered to the representative and to the attorney within 10 days after it has been filed.
/s/ Phyllis Atsaves
(Representative)
/s/ Adeline J. Geo-Karis
(Attorney)
July 26
August 2, 9

#001758
PUBLIC NOTICE
On July 31, 1996, Browning-Ferris Industries of Illinois, Inc. (BFIIL) submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap. The currently permitted cap is an outdated design. The proposed cap is an improvement and more protective of the environment.

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office between the hours of 7 a.m. and 4 p.m. Monday through Friday. A public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday, September 4, 1996 at 10 a.m.
The public may comment on the Class 3 Modification request. The 60-day comment period began on July 31, 1996. Comments should be directed to the Illinois Environmental Protection Agency's (IEPA) contact person below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person.
Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL
62794-9276
217/524-3271
Questions can also be directed to BFIIL's contact person:
Mike Williams
701 Green Bay Road
Zion, IL 60099
847/746-5777
August 2,3,5

#001759
IN THE CIRCUIT COURT FOR

LEGAL NOTICE

#001710
STATE OF ILLINOIS
IN THE CIRCUIT COURT OF THE NINETEENTH JUDICIAL CIRCUIT
LAKE COUNTY
IN PROBATE
In the Matter of the Estate of
Richard C. Keating
Deceased
No. 96 P 138
CLAIM NOTICE
Notice is given of the death of Richard C. Keating, of Gurnee, Illinois. Letters of office were issued on February 1996, to Joseph Plotz, Schiller Street, Elmhurst, Illinois 60126 whose attorney is Howlett and Associates, 180 W. Park Elmhurst, IL 60126.
Claims against the estate may be filed in the office of the Clerk of Circuit Court at 18 County Street, Waukegan, Illinois 60085 Room 106 or with representative both, on or before January 28, 1997 which date is not less than 6 months from the date of the publication of this notice and any claim not filed within that period is barred. Copies of any claim filed with the Clerk must be mailed or delivered to the representative and to the attorney within 10 days after it has been filed.
/s/ Joseph Plotz
(Representative)
/s/ Joseph McGovern
(Attorney)
July 26
August 2, 9

Waukegan News-Sun Friday Aug. 2, 1996 A15-145

PUBLISHER'S CERTIFICATE

THIS IS TO CERTIFY that the notice, a true copy of which is hereto annexed, was published in the Zion Benton NEWS a secular weekly newspaper of general circulation in the County of Lake and State of Illinois; published weekly in the City of Zion, County of Lake, and State of Illinois by United Communications a corporation organized and existing under the laws of the State of Delaware, 2 times, once each week, for 2 weeks successively; that the date of the first publication was on the 1 day of Aug, A.D. 19 96 and the date of the last publication was the 8 day of Aug, A.D. 19 96; said paper being authorized by law as a proper medium for the publication of legal notices in said county. The publisher does further certify that said Zion Benton News is a newspaper (a) which consists of not less than four (4) pages of printed matter and contains at least 130 square inches of printed matter per page; and (b) which is printed through the use of one of the conventional and generally recognized printing processes as defined by statute; and (c) which annually averages at least 25 percent news content per issue or which annually averages at least 1000 column inches of news content per issue, the term "news content" meaning any printed matter other than advertising; and (d) which publishes miscellaneous reading matter, legal or other announcements and notices, and news and information concerning current happenings and passing events of a political, social, religious, commercial, financial or legal nature, and advertisements or bulletins; and (e) which has been continuously published at regular intervals of at least once each week with a minimum of 50 issues per year for at least one year prior to the first publication of the annexed notice.

IN WITNESS WHEREOF of said United Communications, publisher aforesaid, has hereunto caused its corporate name to be hereunto affixed on this the Aug 8 day of A.D. 19 96, by its duly authorized officer or agent pursuant to a resolution heretofore adopted at a regular meeting of the Board of Directors of said United Communications, as follows:

RESOLVED, that a certificate of publication of legal notices may be signed on behalf of this corporation and in its corporate name with or without its corporate seal by the Manager and any or either of the following officers or agents: President, Vice-President, Secretary, Treasurer, or Cashier.

By _____

Its Publisher Frank Misureli

Publication Fee $ 33.00

ANNEXED NOTICE

LEGAL
PUBLIC NOTICE

On July 31, 1996 Browning-Ferris Industries of Illinois, Inc. (BFIIL) submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modifications request contains drawings and a written description of the proposed cap. The currently permitted cap is an outdated design. The proposed cap is an improvement and more protective for the environment.

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Questions can also be directed to BFIIL's contact person:

Mike Williams
701 Green Bay Road
Zion, IL 60099
847/746-3777

8-1, 8-8

A15-144

RUNOFF	3.348	228494.937	10.89
EVAPOTRANSPIRATION	23.123	1578025.870	75.20
DRAINAGE COLLECTED FROM LAYER 2	4.4638	304625.281	14.52
PERC./LEAKAGE THROUGH LAYER 4	0.044302	3023.343	0.14
AVG. HEAD ON TOP OF LAYER 3	4.7944		
PERC./LEAKAGE THROUGH LAYER 5	0.047113	3215.171	0.15
CHANGE IN WATER STORAGE	-0.232	-15858.273	-0.76
SOIL WATER AT START OF YEAR	19.120	1304823.370	
SOIL WATER AT END OF YEAR	18.888	1288965.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.248	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	25.85	1764107.370	100.00
RUNOFF	3.207	218834.891	12.40
EVAPOTRANSPIRATION	19.245	1313348.000	74.45
DRAINAGE COLLECTED FROM LAYER 2	3.8759	264508.375	14.99
PERC./LEAKAGE THROUGH LAYER 4	0.037907	2586.927	0.15
AVG. HEAD ON TOP OF LAYER 3	3.8249		
PERC./LEAKAGE THROUGH LAYER 5	0.046118	3147.302	0.18
CHANGE IN WATER STORAGE	-0.524	-35731.121	-2.03
SOIL WATER AT START OF YEAR	18.888	1288965.000	
SOIL WATER AT END OF YEAR	17.942	1224466.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.422	28767.895	1.63

A15-76

ANNUAL WATER BUDGET BALANCE	0.0000	-0.197	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	28.81	1966109.500	100.00
RUNOFF	1.816	123958.461	6.30
EVAPOTRANSPIRATION	22.483	1534355.000	78.04
DRAINAGE COLLECTED FROM LAYER 2	4.4496	303656.812	15.44
PERC./LEAKAGE THROUGH LAYER 4	0.044351	3026.670	0.15
AVG. HEAD ON TOP OF LAYER 3	4.7858		
PERC./LEAKAGE THROUGH LAYER 5	0.036651	2501.227	0.13
CHANGE IN WATER STORAGE	0.024	1637.890	0.08
SOIL WATER AT START OF YEAR	17.942	1224466.000	
SOIL WATER AT END OF YEAR	18.388	1254871.870	
SNOW WATER AT START OF YEAR	0.422	28767.895	1.46
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.101	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.56	2153780.750	100.00
RUNOFF	3.038	207296.953	9.62
EVAPOTRANSPIRATION	22.704	1549442.370	71.94
DRAINAGE COLLECTED FROM LAYER 2	4.3616	297655.781	13.82
PERC./LEAKAGE THROUGH LAYER 4	0.043499	2968.514	0.14

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AVG. HEAD ON TOP OF LAYER 3	4.6752		
PERC./LEAKAGE THROUGH LAYER 5	0.042374	2891.802	0.13
CHANGE IN WATER STORAGE	1.407	96017.187	4.46
SOIL WATER AT START OF YEAR	18.388	1254871.870	
SOIL WATER AT END OF YEAR	19.795	1350889.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0070	476.578	0.02

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.36	2140132.500	100.00
RUNOFF	4.306	293844.219	13.73
EVAPOTRANSPIRATION	20.855	1423220.870	66.50
DRAINAGE COLLECTED FROM LAYER 2	4.3480	296728.125	13.86
PERC./LEAKAGE THROUGH LAYER 4	0.042910	2928.365	0.14
AVG. HEAD ON TOP OF LAYER 3	4.5720		
PERC./LEAKAGE THROUGH LAYER 5	0.046826	3195.625	0.15
CHANGE IN WATER STORAGE	1.804	123142.359	5.75
SOIL WATER AT START OF YEAR	19.795	1350889.000	
SOIL WATER AT END OF YEAR	17.973	1226583.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	3.626	247448.328	11.56
ANNUAL WATER BUDGET BALANCE	0.0000	1.132	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.36	1662424.370	100.00
RUNOFF	4.331	295598.281	17.78
EVAPOTRANSPIRATION	18.751	1279627.000	76.97
DRAINAGE COLLECTED FROM LAYER 2	3.5610	243015.172	14.62
PERC./LEAKAGE THROUGH LAYER 4	0.035955	2453.706	0.15
AVG. HEAD ON TOP OF LAYER 3	3.5349		
PERC./LEAKAGE THROUGH LAYER 5	0.043720	2983.611	0.18
CHANGE IN WATER STORAGE	-2.387	-162875.641	-9.80
SOIL WATER AT START OF YEAR	17.973	1226583.000	
SOIL WATER AT END OF YEAR	19.213	1311155.750	
SNOW WATER AT START OF YEAR	3.626	247448.328	14.88
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0597	4075.893	0.25

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.70	2095090.620	100.00
RUNOFF	1.960	133741.531	6.38
EVAPOTRANSPIRATION	23.914	1631964.750	77.89
DRAINAGE COLLECTED FROM LAYER 2	4.5349	309481.031	14.77
PERC./LEAKAGE THROUGH LAYER 4	0.043987	3001.838	0.14
AVG. HEAD ON TOP OF LAYER 3	4.7252		
PERC./LEAKAGE THROUGH LAYER 5	0.036491	2490.323	0.12
CHANGE IN WATER STORAGE	0.255	17413.225	0.83
SOIL WATER AT START OF YEAR	19.213	1311155.750	
SOIL WATER AT END OF YEAR	19.468	1328569.000	

A15-79

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.257	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.44	2623299.250	100.00
RUNOFF	3.656	249509.766	9.51
EVAPOTRANSPIRATION	29.671	2024886.250	77.19
DRAINAGE COLLECTED FROM LAYER 2	4.5586	311096.937	11.86
PERC./LEAKAGE THROUGH LAYER 4	0.044378	3028.513	0.12
AVG. HEAD ON TOP OF LAYER 3	4.8001		
PERC./LEAKAGE THROUGH LAYER 5	0.041698	2845.632	0.11
CHANGE IN WATER STORAGE	0.503	34309.730	1.31
SOIL WATER AT START OF YEAR	19.468	1328569.000	
SOIL WATER AT END OF YEAR	19.920	1359429.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.051	3449.413	0.13
ANNUAL WATER BUDGET BALANCE	0.0095	650.711	0.02

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.91	1699958.500	100.00
RUNOFF	4.446	303398.875	17.85
EVAPOTRANSPIRATION	18.342	1251709.250	73.63

A15-80

DRAINAGE COLLECTED FROM LAYER 2	3.4753	237170.078	13.95
PERC./LEAKAGE THROUGH LAYER 4	0.035230	2404.257	0.14
AVG. HEAD ON TOP OF LAYER 3	3.4246		
PERC./LEAKAGE THROUGH LAYER 5	0.046161	3150.219	0.19
CHANGE IN WATER STORAGE	-1.399	-95470.664	-5.62
SOIL WATER AT START OF YEAR	19.920	1359429.250	
SOIL WATER AT END OF YEAR	18.572	1267408.000	
SNOW WATER AT START OF YEAR	0.051	3449.413	0.20
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.627	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.41	2689495.000	100.00
RUNOFF	10.119	690571.875	25.68
EVAPOTRANSPIRATION	23.153	1580046.620	58.75
DRAINAGE COLLECTED FROM LAYER 2	4.4331	302532.344	11.25
PERC./LEAKAGE THROUGH LAYER 4	0.046146	3149.159	0.12
AVG. HEAD ON TOP OF LAYER 3	5.0763		
PERC./LEAKAGE THROUGH LAYER 5	0.035720	2437.661	0.09
CHANGE IN WATER STORAGE	1.663	113473.141	4.22
SOIL WATER AT START OF YEAR	18.572	1267408.000	
SOIL WATER AT END OF YEAR	20.162	1375921.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.073	4960.233	0.18
ANNUAL WATER BUDGET BALANCE	0.0063	433.195	0.02

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A15-81

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.99	2387857.000	100.00
RUNOFF	7.675	523786.594	21.94
EVAPOTRANSPIRATION	22.847	1559150.250	65.29
DRAINAGE COLLECTED FROM LAYER 2	4.3120	294267.875	12.32
PERC./LEAKAGE THROUGH LAYER 4	0.044922	3065.643	0.13
AVG. HEAD ON TOP OF LAYER 3	4.8685		
PERC./LEAKAGE THROUGH LAYER 5	0.038913	2655.570	0.11
CHANGE IN WATER STORAGE	0.114	7811.305	0.33
SOIL WATER AT START OF YEAR	20.162	1375921.000	
SOIL WATER AT END OF YEAR	20.349	1388692.500	
SNOW WATER AT START OF YEAR	0.073	4960.233	0.21
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0027	185.381	0.01

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.56 3.78	1.42 2.92	2.51 3.50	3.11 2.24	3.62 2.23	3.94 2.08
STD. DEVIATIONS	0.64 1.75	0.65 1.72	1.40 1.68	1.67 1.27	1.86 1.02	2.09 1.00
RUNOFF						
TOTALS	0.576	0.894	1.923	0.381	0.181	0.17(

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	0.130	0.013	0.131	0.013	0.167	0.282
STD. DEVIATIONS	0.755	0.654	1.368	0.625	0.552	0.677
	0.394	0.041	0.402	0.056	0.377	0.453

EVAPOTRANSPIRATION

TOTALS	0.459	0.418	0.812	3.115	3.207	3.339
	3.554	2.435	2.578	2.061	1.155	0.631
STD. DEVIATIONS	0.099	0.070	0.521	0.717	1.187	1.254
	1.479	1.361	1.010	0.652	0.270	0.173

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS	0.2622	0.1869	0.2436	0.4375	0.4134	0.372
	0.3656	0.3489	0.3800	0.4131	0.3914	0.384
STD. DEVIATIONS	0.0429	0.0302	0.0873	0.0896	0.0884	0.077
	0.0787	0.0808	0.0994	0.0904	0.1092	0.099

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0028	0.0022	0.0028	0.0044	0.0040	0.003
	0.0036	0.0035	0.0038	0.0040	0.0040	0.003
STD. DEVIATIONS	0.0003	0.0002	0.0007	0.0010	0.0011	0.000
	0.0008	0.0008	0.0010	0.0010	0.0014	0.001

PERCOLATION/LEAKAGE THROUGH LAYER 5

TOTALS	0.0047	0.0043	0.0041	0.0024	0.0031	0.003
	0.0036	0.0037	0.0032	0.0033	0.0031	0.003
STD. DEVIATIONS	0.0007	0.0005	0.0008	0.0010	0.0010	0.000
	0.0010	0.0008	0.0009	0.0010	0.0012	0.000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	2.9671	2.3613	3.0791	6.1143	5.2613	4.674
	4.4817	4.2517	5.0569	5.2675	5.4568	4.890
STD. DEVIATIONS	0.4800	0.3820	1.3189	1.8692	1.9067	1.394
	1.4932	1.3398	1.8493	1.7875	2.4933	1.747

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES	CU. FEET	PERCENT

A15-83

PRECIPITATION	32.89 (5.107)	2244750.0	100.00
RUNOFF	4.860 (2.7385)	331695.66	14.777
EVAPOTRANSPIRATION	23.764 (3.3483)	1621737.75	72.246
LATERAL DRAINAGE COLLECTED FROM LAYER 2	4.19961 (0.44673)	286597.969	12.76748
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.04232 (0.00447)	2887.895	0.1286!
AVERAGE HEAD ON TOP OF LAYER 3	4.489 (0.674)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.04265 (0.00551)	2910.362	0.1296!
CHANGE IN WATER STORAGE	0.017 (1.1509)	1154.77	0.051

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A15-84

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	4.09	279117.969
RUNOFF	1.869	127571.0310
DRAINAGE COLLECTED FROM LAYER 2	0.01884	1285.44885
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000252	17.19010
AVERAGE HEAD ON TOP OF LAYER 3	12.000	
MAXIMUM HEAD ON TOP OF LAYER 3	60.511	
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000199	13.61117
SNOW WATER	4.36	297692.5000

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4440
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0683

*** MAXIMUM HEADS ARE COMPUTED USING THE MOUND EQUATION. ***

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A15-85

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	2.6853	0.4476
2	2.5139	0.4190
3	12.8100	0.4270
4	0.0000	0.0000
5	2.3397	0.3900
SNOW WATER	0.000	

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A15-86

PROPOSED COVER DESIGN WITHOUT FML

Average annual leachate generated - 53,972 cf or 403,710 gallons

HELP MODEL INPUT DATA SUMMARY
Version 3.04

Site Name: _____ Prepared by: _____ Date: _____

Landfilled Area: 21.9 Acres SCS Runoff CN: _____
State: _____ City: _____
Vegetative Cover Description: _____
Vegetative Cover Number: _____
Evaporative Zone Depth: _____

Layer Number	Layer Type	Thickness (inches)	Texture	Compaction	Layer Desription
1	1	6"	6	No	Topsoil
2	1	30"	12	No	Vegetative Soil Layer
3	2	0.2"	20	—	Geonet
4	3	24"	16	Yes	24" Compacted Clay

Type of Vegetative Cover.

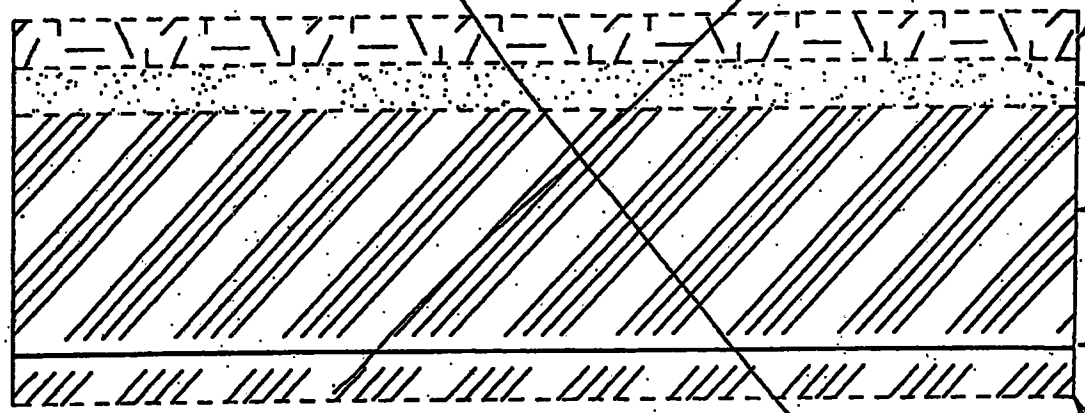
Enter 1 for Bare Ground
Enter 2 for Poor Grass
Enter 3 for Fair Grass
4 for Good Grass, and
5 for Excellent Grass

Layer Types

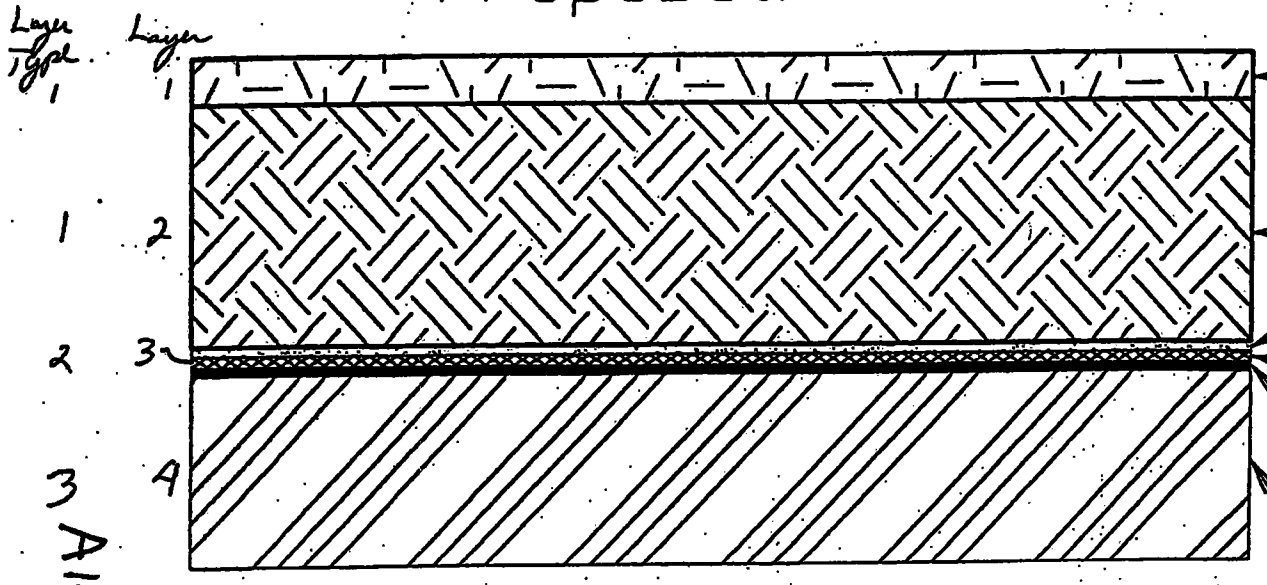
Enter 1 for a Vertical Percolation Layer
2 for a Lateral Drainage Layer
3 for a Barrier Soil Liner, or
4 for a geomembrane liner.

A15-88

Permitted Final Cover



Proposed Final Cover



68-SIA 3

R-001634

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE        **
**                HELP MODEL VERSION 3.04   (13 MARCH 1995)         **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY           **
**                    USAE WATERWAYS EXPERIMENT STATION             **
**                FOR USEPA RISK REDUCTION ENGINEERING LABORATORY    **
**                                                                  **
**                                                                  **
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PRECIPITATION DATA FILE: E:\HELP3\data\bfizion\PREC.D4
TEMPERATURE DATA FILE: E:\HELP3\data\bfizion\TEMP.D7
SOLAR RADIATION DATA FILE: E:\HELP3\data\bfizion\SOLAR.D13
EVAPOTRANSPIRATION DATA: e:\help3\data\bfizion\EVAP.D11
SOIL AND DESIGN DATA FILE: e:\help3\data\bfizion\CLANET1.D10
OUTPUT DATA FILE: E:\HELP3\data\bfizion\CLANET1.OUT

TIME: 9:53 DATE: 7/19/1996

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TITLE: BFI Zion Site, Area 1A/Clay Cap (21.8 Acres) - New

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NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 6

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4530	VOL/VOL
FIELD CAPACITY	=	0.1900	VOL/VOL
WILTING POINT	=	0.0850	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3168	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.720000011000E-03	CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 1.80 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

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LAYER 2

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 12

THICKNESS	=	30.00	INCHES
POROSITY	=	0.4710	VOL/VOL
FIELD CAPACITY	=	0.3420	VOL/VOL
WILTING POINT	=	0.2100	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.3665	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.419999997000E-04	CM/SEC

LAYER 3

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0175	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	20.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 20.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	70.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	21.800	ACRES

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EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.631	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.660	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.930	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	23.148	INCHES
TOTAL INITIAL WATER	=	23.148	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
CHICAGO ILLINOIS

STATION LATITUDE	=	41.78	DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00	
START OF GROWING SEASON (JULIAN DATE)	=	117	
END OF GROWING SEASON (JULIAN DATE)	=	290	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 41.78 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.45	2409631.000	100.00
RUNOFF	1.137	89962.539	3.73
EVAPOTRANSPIRATION	22.778	1802526.500	74.81
DRAINAGE COLLECTED FROM LAYER 3	5.7480	454861.312	18.88
PERC./LEAKAGE THROUGH LAYER 4	0.786991	62277.754	2.58
AVG. HEAD ON TOP OF LAYER 4	0.0007		
CHANGE IN WATER STORAGE	0.000	1.962	0.00
SOIL WATER AT START OF YEAR	23.148	1831784.500	
SOIL WATER AT END OF YEAR	23.148	1831786.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.745	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.90	2840911.000	100.00
RUNOFF	3.316	262439.281	9.24
EVAPOTRANSPIRATION	20.603	1630389.250	57.39
DRAINAGE COLLECTED FROM LAYER 3	9.5698	757295.437	26.66
PERC./LEAKAGE THROUGH LAYER 4	0.638278	50509.508	1.78
AVG. HEAD ON TOP OF LAYER 4	0.0012		
CHANGE IN WATER STORAGE	1.772	140204.828	4.94
SOIL WATER AT START OF YEAR	23.148	1831786.370	
SOIL WATER AT END OF YEAR	22.010	1741767.500	

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SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.909	230223.734	8.10
ANNUAL WATER BUDGET BALANCE	0.0009	72.544	0.00

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.40	3513548.500	100.00
RUNOFF	7.820	618852.562	17.61
EVAPOTRANSPIRATION	27.883	2206515.250	62.80
DRAINAGE COLLECTED FROM LAYER 3	10.2733	812964.562	23.14
PERC./LEAKAGE THROUGH LAYER 4	0.584057	46218.758	1.32
AVG. HEAD ON TOP OF LAYER 4	0.0013		
CHANGE IN WATER STORAGE	-2.234	-176752.437	-5.03
SOIL WATER AT START OF YEAR	22.010	1741767.500	
SOIL WATER AT END OF YEAR	22.432	1775122.870	
SNOW WATER AT START OF YEAR	2.909	230223.734	6.55
SNOW WATER AT END OF YEAR	0.254	20115.924	0.57
ANNUAL WATER BUDGET BALANCE	0.0727	5749.501	0.16

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.12	2383516.000	100.00
RUNOFF	5.225	413445.375	17.35
EVAPOTRANSPIRATION	22.073	1746698.870	73.28
DRAINAGE COLLECTED FROM LAYER 3	2.8749	227499.672	9.54

PERC./LEAKAGE THROUGH LAYER 4	0.565057	44715.184	1.88
AVG. HEAD ON TOP OF LAYER 4	0.0004		
CHANGE IN WATER STORAGE	-0.617	-48842.992	-2.05
SOIL WATER AT START OF YEAR	22.432	1775122.870	
SOIL WATER AT END OF YEAR	22.069	1746395.870	
SNOW WATER AT START OF YEAR	0.254	20115.924	0.84
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.104	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.29	2555236.750	100.00
RUNOFF	3.929	310908.125	12.17
EVAPOTRANSPIRATION	21.970	1738569.000	68.04
DRAINAGE COLLECTED FROM LAYER 3	5.7869	457943.875	17.92
PERC./LEAKAGE THROUGH LAYER 4	0.618175	48918.641	1.91
AVG. HEAD ON TOP OF LAYER 4	0.0007		
CHANGE IN WATER STORAGE	-0.015	-1200.244	-0.05
SOIL WATER AT START OF YEAR	22.069	1746395.870	
SOIL WATER AT END OF YEAR	22.054	1745195.620	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0012	97.373	0.00

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ANNUAL TOTALS FOR YEAR 6

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.58	2736454.250	100.00
RUNOFF	1.764	139622.969	5.10
EVAPOTRANSPIRATION	25.812	2042639.120	74.65
DRAINAGE COLLECTED FROM LAYER 3	6.3206	500178.187	18.28
PERC./LEAKAGE THROUGH LAYER 4	0.802602	63513.137	2.32
AVG. HEAD ON TOP OF LAYER 4	0.0008		
CHANGE IN WATER STORAGE	-0.124	-9775.043	-0.36
SOIL WATER AT START OF YEAR	22.054	1745195.620	
SOIL WATER AT END OF YEAR	21.897	1732776.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.033	2643.980	0.10
ANNUAL WATER BUDGET BALANCE	0.0035	275.897	0.01

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.24	2788682.250	100.00
RUNOFF	1.971	155945.453	5.59
EVAPOTRANSPIRATION	23.279	1842121.250	66.06
DRAINAGE COLLECTED FROM LAYER 3	9.3974	743650.750	26.67
PERC./LEAKAGE THROUGH LAYER 4	0.830430	65715.227	2.36
AVG. HEAD ON TOP OF LAYER 4	0.0012		
CHANGE IN WATER STORAGE	-0.265	-20949.814	-0.75
SOIL WATER AT START OF YEAR	21.897	1732776.500	
SOIL WATER AT END OF YEAR	21.665	1714470.750	
SNOW WATER AT START OF YEAR	0.033	2643.980	0.09
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

A15-96

ANNUAL WATER BUDGET BALANCE	0.0278	2199.276	0.08

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.13	2779978.000	100.00
RUNOFF	4.090	323668.531	11.64
EVAPOTRANSPIRATION	21.445	1697049.870	61.05
DRAINAGE COLLECTED FROM LAYER 3	7.9253	627164.000	22.56
PERC./LEAKAGE THROUGH LAYER 4	0.724420	57326.281	2.06
AVG. HEAD ON TOP OF LAYER 4	0.0010		
CHANGE IN WATER STORAGE	0.945	74768.211	2.69
SOIL WATER AT START OF YEAR	21.665	1714470.750	
SOIL WATER AT END OF YEAR	22.197	1756532.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.413	32706.545	1.18
ANNUAL WATER BUDGET BALANCE	0.0000	0.986	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.61	3055363.750	100.00
RUNOFF	6.640	525410.625	17.20
EVAPOTRANSPIRATION	22.552	1784640.120	58.41
DRAINAGE COLLECTED FROM LAYER 3	8.8247	698333.812	22.86
PERC./LEAKAGE THROUGH LAYER 4	0.691403	54713.480	1.79
AVG. HEAD ON TOP OF LAYER 4	0.0011		

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CHANGE IN WATER STORAGE	-0.098	-7733.863	-0.25
SOIL WATER AT START OF YEAR	22.197	1756532.370	
SOIL WATER AT END OF YEAR	22.513	1781505.120	
SNOW WATER AT START OF YEAR	0.413	32706.545	1.07
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.561	0.00

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.75	2433370.750	100.00
RUNOFF	2.465	195040.141	8.02
EVAPOTRANSPIRATION	20.866	1651229.370	67.86
DRAINAGE COLLECTED FROM LAYER 3	7.1955	569407.500	23.40
PERC./LEAKAGE THROUGH LAYER 4	0.655296	51856.219	2.13
AVG. HEAD ON TOP OF LAYER 4	0.0009		
CHANGE IN WATER STORAGE	-0.432	-34162.879	-1.40
SOIL WATER AT START OF YEAR	22.513	1781505.120	
SOIL WATER AT END OF YEAR	22.081	1747342.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.491	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	25.85	2045613.870	100.00

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RUNOFF	2.989	236544.516	11.56
EVAPOTRANSPIRATION	18.541	1467222.620	71.73
DRAINAGE COLLECTED FROM LAYER 3	3.6160	286151.750	13.99
PERC./LEAKAGE THROUGH LAYER 4	0.725154	57384.297	2.81
AVG. HEAD ON TOP OF LAYER 4	0.0005		
CHANGE IN WATER STORAGE	-0.021	-1689.152	-0.08
SOIL WATER AT START OF YEAR	22.081	1747342.250	
SOIL WATER AT END OF YEAR	21.638	1712294.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.422	33358.516	1.63
ANNUAL WATER BUDGET BALANCE	0.0000	-0.259	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	28.81	2279850.500	100.00
RUNOFF	1.563	123685.937	5.43
EVAPOTRANSPIRATION	21.676	1715286.500	75.24
DRAINAGE COLLECTED FROM LAYER 3	5.7223	452825.937	19.86
PERC./LEAKAGE THROUGH LAYER 4	0.632368	50041.832	2.19
AVG. HEAD ON TOP OF LAYER 4	0.0007		
CHANGE IN WATER STORAGE	-0.783	-61990.492	-2.72
SOIL WATER AT START OF YEAR	21.638	1712294.500	
SOIL WATER AT END OF YEAR	21.276	1683662.500	
SNOW WATER AT START OF YEAR	0.422	33358.516	1.46
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.651	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.56	2497469.250	100.00
RUNOFF	2.749	217503.797	8.71
EVAPOTRANSPIRATION	21.284	1684277.500	67.44
DRAINAGE COLLECTED FROM LAYER 3	5.7298	453419.531	18.16
PERC./LEAKAGE THROUGH LAYER 4	0.624677	49433.152	1.98
AVG. HEAD ON TOP OF LAYER 4	0.0007		
CHANGE IN WATER STORAGE	1.166	92281.891	3.70
SOIL WATER AT START OF YEAR	21.276	1683662.500	
SOIL WATER AT END OF YEAR	22.442	1775944.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0070	553.214	0.02

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.36	2481643.000	100.00
RUNOFF	1.505	119102.711	4.80
EVAPOTRANSPIRATION	18.185	1439064.370	57.99
DRAINAGE COLLECTED FROM LAYER 3	8.1178	642396.125	25.89
PERC./LEAKAGE THROUGH LAYER 4	0.758196	59999.074	2.42
AVG. HEAD ON TOP OF LAYER 4	0.0010		
CHANGE IN WATER STORAGE	2.794	221079.078	8.91
SOIL WATER AT START OF YEAR	22.442	1775944.500	
SOIL WATER AT END OF YEAR	21.610	1710088.750	

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SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	3.626	286934.750	11.56
ANNUAL WATER BUDGET BALANCE	0.0000	1.580	0.00

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.36	1927704.870	100.00
RUNOFF	4.407	348764.875	18.09
EVAPOTRANSPIRATION	17.883	1415156.750	73.41
DRAINAGE COLLECTED FROM LAYER 3	4.1882	331427.156	17.19
PERC./LEAKAGE THROUGH LAYER 4	0.493719	39069.953	2.03
AVG. HEAD ON TOP OF LAYER 4	0.0005		
CHANGE IN WATER STORAGE	-2.672	-211439.984	-10.97
SOIL WATER AT START OF YEAR	21.610	1710088.750	
SOIL WATER AT END OF YEAR	22.564	1785583.500	
SNOW WATER AT START OF YEAR	3.626	286934.750	14.88
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0597	4725.975	0.25

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.70	2429413.500	100.00
RUNOFF	1.092	86434.875	3.56
EVAPOTRANSPIRATION	21.404	1693821.870	69.72
DRAINAGE COLLECTED FROM LAYER 3	7.2495	573684.125	23.61

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PERC./LEAKAGE THROUGH LAYER 4	0.766533	60658.816	2.50
AVG. HEAD ON TOP OF LAYER 4	0.0009		
CHANGE IN WATER STORAGE	0.187	14813.625	0.61
SOIL WATER AT START OF YEAR	22.564	1785583.500	
SOIL WATER AT END OF YEAR	22.751	1800397.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.269	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.44	3041910.750	100.00
RUNOFF	2.998	237241.422	7.80
EVAPOTRANSPIRATION	26.304	2081568.870	68.43
DRAINAGE COLLECTED FROM LAYER 3	7.9716	630826.937	20.74
PERC./LEAKAGE THROUGH LAYER 4	0.828891	65593.492	2.16
AVG. HEAD ON TOP OF LAYER 4	0.0010		
CHANGE IN WATER STORAGE	0.328	25925.736	0.85
SOIL WATER AT START OF YEAR	22.751	1800397.120	
SOIL WATER AT END OF YEAR	23.028	1822323.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.051	3999.851	0.13
ANNUAL WATER BUDGET BALANCE	0.0095	754.214	0.02

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ANNUAL TOTALS FOR YEAR 18

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	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.91	1971228.500	100.00
RUNOFF	3.950	312579.250	15.86
EVAPOTRANSPIRATION	17.933	1419079.120	71.99
DRAINAGE COLLECTED FROM LAYER 3	3.0094	238148.578	12.08
PERC./LEAKAGE THROUGH LAYER 4	0.474202	37525.473	1.90
AVG. HEAD ON TOP OF LAYER 4	0.0004		
CHANGE IN WATER STORAGE	-0.456	-36104.867	-1.83
SOIL WATER AT START OF YEAR	23.028	1822323.000	
SOIL WATER AT END OF YEAR	22.623	1790218.000	
SNOW WATER AT START OF YEAR	0.051	3999.851	0.20
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.781	0.00

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.41	3118669.500	100.00
RUNOFF	7.365	582845.125	18.69
EVAPOTRANSPIRATION	21.041	1665052.250	53.39
DRAINAGE COLLECTED FROM LAYER 3	9.8141	776630.625	24.90
PERC./LEAKAGE THROUGH LAYER 4	0.694524	54960.473	1.76
AVG. HEAD ON TOP OF LAYER 4	0.0012		
CHANGE IN WATER STORAGE	0.489	38678.473	1.24
SOIL WATER AT START OF YEAR	22.623	1790218.000	
SOIL WATER AT END OF YEAR	23.039	1823144.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.073	5751.760	0.18

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ANNUAL WATER BUDGET BALANCE	0.0064	502.627	0.02

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.99	2768898.000	100.00
RUNOFF	6.077	480860.844	17.37
EVAPOTRANSPIRATION	21.036	1664655.870	60.12
DRAINAGE COLLECTED FROM LAYER 3	7.1513	565912.812	20.44
PERC./LEAKAGE THROUGH LAYER 4	0.745671	59007.926	2.13
AVG. HEAD ON TOP OF LAYER 4	0.0009		
CHANGE IN WATER STORAGE	-0.022	-1752.557	-0.06
SOIL WATER AT START OF YEAR	23.039	1823144.750	
SOIL WATER AT END OF YEAR	23.089	1827143.870	
SNOW WATER AT START OF YEAR	0.073	5751.760	0.21
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0027	213.145	0.01

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.56 3.78	1.42 2.92	2.51 3.50	3.11 2.24	3.62 2.23	3.94 2.08
STD. DEVIATIONS	0.64 1.75	0.65 1.72	1.40 1.68	1.67 1.27	1.86 1.02	2.09 1.00
RUNOFF						

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TOTALS	0.537	0.818	1.797	0.199	0.005	0.042
	0.034	0.008	0.003	0.000	0.000	0.209
STD. DEVIATIONS	0.790	0.651	1.326	0.498	0.022	0.184
	0.124	0.033	0.012	0.001	0.000	0.325

EVAPOTRANSPIRATION

TOTALS	0.457	0.417	0.812	2.701	2.968	3.137
	3.218	2.254	2.345	1.700	1.109	0.609
STD. DEVIATIONS	0.099	0.070	0.523	0.842	1.173	1.102
	1.203	1.212	0.895	0.632	0.304	0.183

LATERAL DRAINAGE COLLECTED FROM LAYER 3

TOTALS	0.2038	0.0003	0.2194	1.2295	0.8475	0.413
	0.6959	0.5379	0.7314	0.7746	0.5921	0.578
STD. DEVIATIONS	0.2190	0.0013	0.2786	0.7011	0.9592	0.483
	1.0362	0.6594	0.7516	0.5950	0.7585	0.399

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0472	0.0001	0.0138	0.0834	0.0815	0.062
	0.0665	0.0562	0.0643	0.0780	0.0583	0.070
STD. DEVIATIONS	0.0400	0.0006	0.0170	0.0242	0.0300	0.033
	0.0345	0.0382	0.0317	0.0289	0.0385	0.041

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0003	0.0000	0.0003	0.0019	0.0013	0.000
	0.0010	0.0008	0.0011	0.0011	0.0009	0.000
STD. DEVIATIONS	0.0003	0.0000	0.0004	0.0011	0.0014	0.000
	0.0015	0.0010	0.0011	0.0009	0.0012	0.000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	32.89	(5.107)	2602954.7	100.00
RUNOFF	3.653	(2.0624)	289042.94	11.104
EVAPOTRANSPIRATION	21.727	(2.6667)	1719378.25	66.055

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LATERAL DRAINAGE COLLECTED FROM LAYER 3	6.82433 (2.24682)	540036.187	20.74704
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.68203 (0.10373)	53971.937	2.07345
AVERAGE HEAD ON TOP OF LAYER 4	0.001 (0.000)		
CHANGE IN WATER STORAGE	-0.003 (1.1963)	-232.03	-0.009

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A15-106

PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	4.09	323658.062
RUNOFF	1.801	142522.5940
DRAINAGE COLLECTED FROM LAYER 3	0.82016	64902.23830
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.003407	269.59775
AVERAGE HEAD ON TOP OF LAYER 4	0.038	
MAXIMUM HEAD ON TOP OF LAYER 4	4.669	
SNOW WATER	4.36	345196.6250

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4575
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1162

*** MAXIMUM HEADS ARE COMPUTED USING THE MOUND EQUATION. ***

A15-107

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	1.5875	0.2646
2	11.2511	0.3750
3	0.0027	0.0136
4	10.2480	0.4270
SNOW WATER	0.000	

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A15-108

CURRENTLY PERMITTED DESIGN WITHOUT FML

Average annual leachate generated - 75,627cf or 565,690 gallons

HELP MODEL INPUT DATA SUMMARY
Version 3.04

Site Name: BFI Zion Prepared by: DPW Date: _____

Landfilled Area: 21.8 Acres SCS Runoff CN: _____
State: IL City: Chicago
Vegetative Cover Description: Good Vegetative Cover (
Vegetative Cover Number: _____ SIDESLOPES COLD Design
Evaporative Zone Depth: _____ w/o FML)

Layer Number	Layer Type	Thickness (inches)	Texture	Compaction	Layer Desription
1	1	6"	6	No	Topsoil
2	2	6"	1	No	Sand Drainage
3	3	36"	16	No	Compacted Clay

Type of Vegetative Cover.

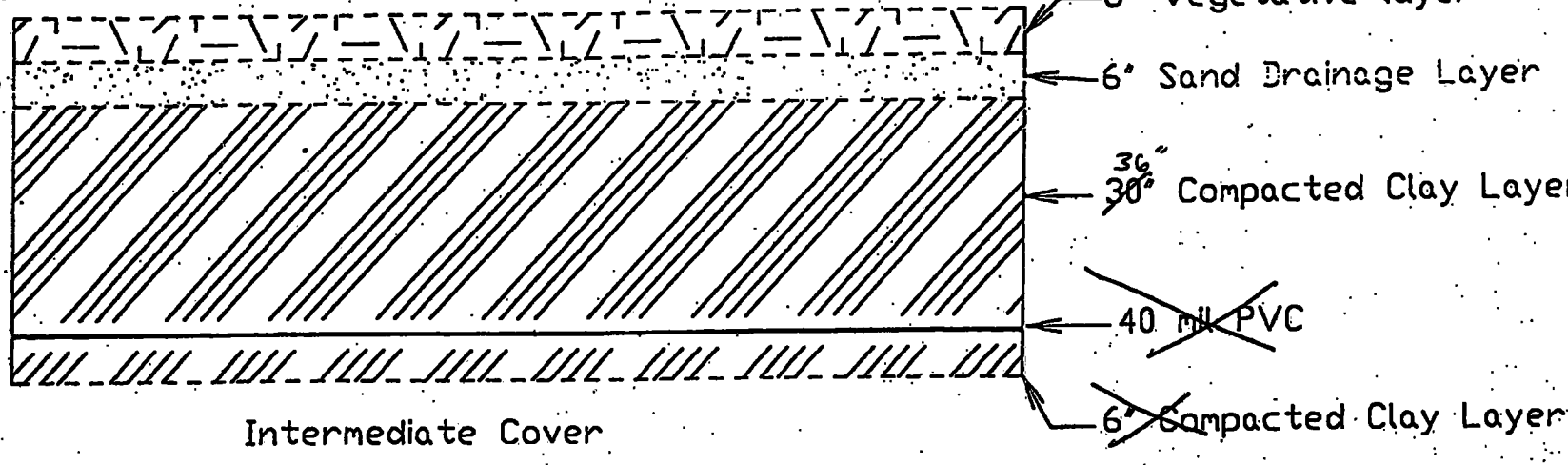
Enter 1 for Bare Ground
Enter 2 for Poor Grass
Enter 3 for Fair Grass
4 for Good Grass, and
5 for Excellent Grass

Layer Types

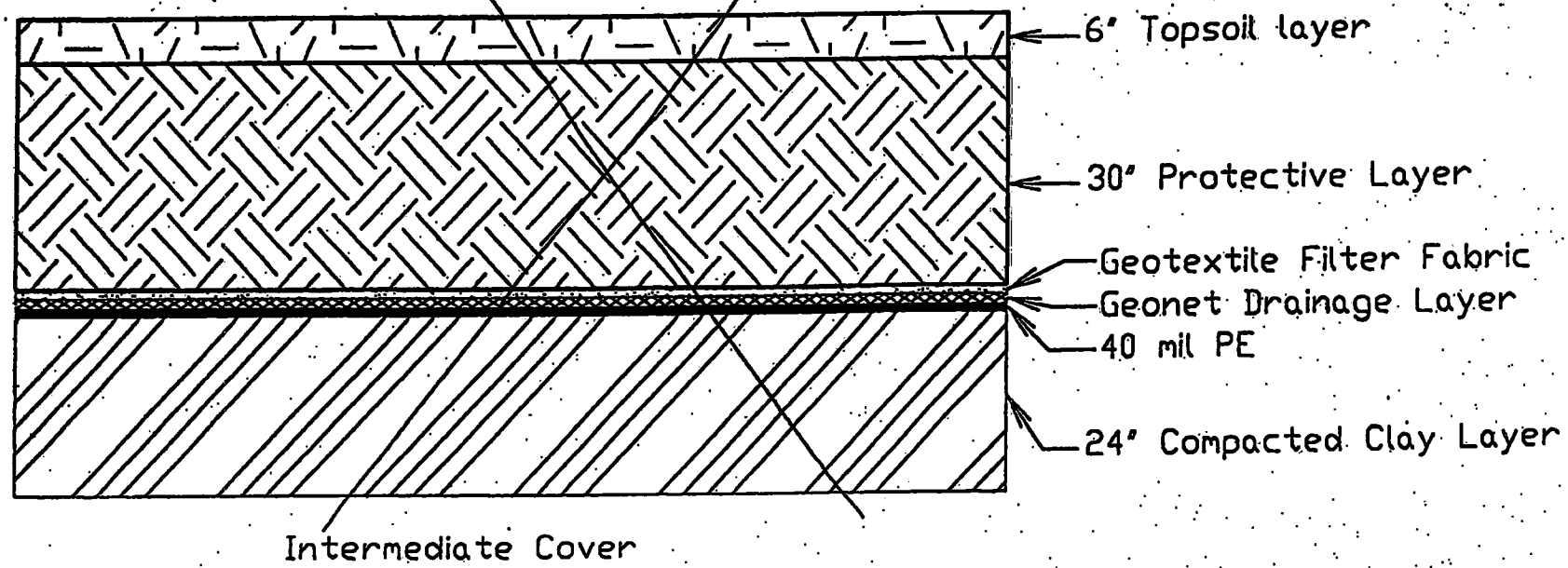
Enter 1 for a Vertical Percolation Layer
2 for a Lateral Drainage Layer
3 for a Barrier Soil Liner, or
4 for a geomembrane liner.

A15-110

Permitted Final Cover



Proposed Final Cover



R 001656

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**                                                                  **
**                                                                  **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE       **
**                HELP MODEL VERSION 3.04   (13 MARCH 1995)         **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY            **
**                   USAE WATERWAYS EXPERIMENT STATION              **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY      **
**                                                                  **
**                                                                  **
**********************************************************************
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PRECIPITATION DATA FILE:     E:\HELP3\data\bfizion\PREC.D4
TEMPERATURE DATA FILE:       E:\HELP3\data\bfizion\TEMP.D7
SOLAR RADIATION DATA FILE:   E:\HELP3\data\bfizion\SOLAR.D13
EVAPOTRANSPIRATION DATA:     e:\help3\data\bfizion\EVAP.D11
SOIL AND DESIGN DATA FILE:   e:\help3\data\bfizion\oldclay.D10
OUTPUT DATA FILE:            E:\HELP3\data\bfizion\oldclay.OUT

TIME:   9:13     DATE:   7/19/1996

**********************************************************************

     TITLE:  BFI Zion Site, Area 1A/Existing Permitted Design

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

                                LAYER  1
                                --------

                  TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER   6
          THICKNESS                      =      6.00   INCHES
          POROSITY                       =      0.4530 VOL/VOL
          FIELD CAPACITY                 =      0.1900 VOL/VOL
          WILTING POINT                  =      0.0850 VOL/VOL
          INITIAL SOIL WATER CONTENT     =      0.2974 VOL/VOL
          EFFECTIVE SAT. HYD. COND.      = 0.720000011000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  1.80
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.
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LAYER 2

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 1

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4170	VOL/VOL
FIELD CAPACITY	=	0.0450	VOL/VOL
WILTING POINT	=	0.0180	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1615	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999978000E-02	CM/SEC
SLOPE	=	20.00	PERCENT
DRAINAGE LENGTH	=	500.0	FEET

LAYER 3

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 16

THICKNESS	=	36.00	INCHES
POROSITY	=	0.4270	VOL/VOL
FIELD CAPACITY	=	0.4180	VOL/VOL
WILTING POINT	=	0.3670	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4270	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.100000001000E-06	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 6 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 20.% AND A SLOPE LENGTH OF 500. FEET.

SCS RUNOFF CURVE NUMBER	=	70.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	21.800	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	2.057	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.552	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.546	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	18.126	INCHES
TOTAL INITIAL WATER	=	18.126	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

A 15-113

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
CHICAGO ILLINOIS

STATION LATITUDE	=	41.78 DEGREES
MAXIMUM LEAF AREA INDEX	=	1.00
START OF GROWING SEASON (JULIAN DATE)	=	117
END OF GROWING SEASON (JULIAN DATE)	=	290
EVAPORATIVE ZONE DEPTH	=	8.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	10.30 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	65.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	72.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	1.31	2.59	3.66	3.15	4.08
3.63	3.53	3.35	2.28	2.06	2.10

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
21.40	26.00	36.00	48.80	59.10	68.60
73.00	71.90	64.70	53.50	39.80	27.70

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR CHICAGO ILLINOIS
AND STATION LATITUDE = 41.78 DEGREES

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCEN
PRECIPITATION	30.45	2409631.000	100.00
RUNOFF	1.051	83146.742	3.45
EVAPOTRANSPIRATION	21.519	1702889.500	70.67
DRAINAGE COLLECTED FROM LAYER 2	6.7997	538089.000	22.33

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PERC./LEAKAGE THROUGH LAYER 3	1.080662	85517.133	3.55
AVG. HEAD ON TOP OF LAYER 3	0.8502		
CHANGE IN WATER STORAGE	0.000	-12.075	0.00
SOIL WATER AT START OF YEAR	18.126	1434361.620	
SOIL WATER AT END OF YEAR	18.126	1434349.620	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.557	0.00

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.90	2840911.000	100.00
RUNOFF	3.155	249651.937	8.79
EVAPOTRANSPIRATION	20.797	1645777.500	57.93
DRAINAGE COLLECTED FROM LAYER 2	9.3403	739134.125	26.02
PERC./LEAKAGE THROUGH LAYER 3	0.915183	72422.055	2.55
AVG. HEAD ON TOP OF LAYER 3	1.2280		
CHANGE IN WATER STORAGE	1.691	133853.281	4.71
SOIL WATER AT START OF YEAR	18.126	1434349.620	
SOIL WATER AT END OF YEAR	16.908	1337979.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	2.909	230223.734	8.10
ANNUAL WATER BUDGET BALANCE	0.0009	71.940	0.00

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ANNUAL TOTALS FOR YEAR 3

A15-115

	INCHES	CU. FEET	PERCENT
PRECIPITATION	44.40	3513548.500	100.00
RUNOFF	7.850	621185.187	17.68
EVAPOTRANSPIRATION	27.270	2157962.750	61.42
DRAINAGE COLLECTED FROM LAYER 2	10.2595	811875.750	23.11
PERC./LEAKAGE THROUGH LAYER 3	0.774768	61310.480	1.74
AVG. HEAD ON TOP OF LAYER 3	1.4354		
CHANGE IN WATER STORAGE	-1.826	-144536.781	-4.11
SOIL WATER AT START OF YEAR	16.908	1337979.120	
SOIL WATER AT END OF YEAR	17.736	1403550.120	
SNOW WATER AT START OF YEAR	2.909	230223.734	6.55
SNOW WATER AT END OF YEAR	0.254	20115.924	0.57
ANNUAL WATER BUDGET BALANCE	0.0727	5751.015	0.16

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.12	2383516.000	100.00
RUNOFF	5.159	408282.031	17.13
EVAPOTRANSPIRATION	20.537	1625181.250	68.18
DRAINAGE COLLECTED FROM LAYER 2	4.2340	335056.219	14.06
PERC./LEAKAGE THROUGH LAYER 3	0.742010	58718.250	2.46
AVG. HEAD ON TOP OF LAYER 3	0.5284		
CHANGE IN WATER STORAGE	-0.553	-43721.730	-1.83
SOIL WATER AT START OF YEAR	17.736	1403550.120	
SOIL WATER AT END OF YEAR	17.438	1379944.370	
SNOW WATER AT START OF YEAR	0.254	20115.924	0.84
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

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ANNUAL WATER BUDGET BALANCE	0.0000	-0.033	0.00

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.29	2555236.750	100.00
RUNOFF	3.928	310802.906	12.16
EVAPOTRANSPIRATION	21.271	1683264.500	65.88
DRAINAGE COLLECTED FROM LAYER 2	6.4937	513874.750	20.11
PERC./LEAKAGE THROUGH LAYER 3	0.900112	71229.469	2.79
AVG. HEAD ON TOP OF LAYER 3	0.8142		
CHANGE IN WATER STORAGE	-0.304	-24033.559	-0.94
SOIL WATER AT START OF YEAR	17.438	1379944.370	
SOIL WATER AT END OF YEAR	17.134	1355910.750	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0012	98.750	0.00

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCEN
PRECIPITATION	34.58	2736454.250	100.00
RUNOFF	1.736	137364.562	5.02
EVAPOTRANSPIRATION	23.871	1888971.500	69.03
DRAINAGE COLLECTED FROM LAYER 2	8.1969	648657.125	23.70
PERC./LEAKAGE THROUGH LAYER 3	1.048133	82942.977	3.03
AVG. HEAD ON TOP OF LAYER 3	1.0267		

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CHANGE IN WATER STORAGE	-0.275	-21756.502	-0.80
SOIL WATER AT START OF YEAR	17.134	1355910.750	
SOIL WATER AT END OF YEAR	16.826	1331510.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.033	2643.980	0.10
ANNUAL WATER BUDGET BALANCE	0.0035	274.628	0.01

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.24	2788682.250	100.00
RUNOFF	1.902	150496.797	5.40
EVAPOTRANSPIRATION	21.590	1708538.620	61.27
DRAINAGE COLLECTED FROM LAYER 2	10.5312	833378.500	29.88
PERC./LEAKAGE THROUGH LAYER 3	1.034558	81868.703	2.94
AVG. HEAD ON TOP OF LAYER 3	1.3271		
CHANGE IN WATER STORAGE	0.154	12199.681	0.44
SOIL WATER AT START OF YEAR	16.826	1331510.370	
SOIL WATER AT END OF YEAR	17.014	1346354.000	
SNOW WATER AT START OF YEAR	0.033	2643.980	0.09
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0278	2199.894	0.08

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.13	2779978.000	100.00

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RUNOFF	3.892	307950.625	11.08
EVAPOTRANSPIRATION	19.968	1580184.870	56.84
DRAINAGE COLLECTED FROM LAYER 2	9.3510	739979.500	26.62
PERC./LEAKAGE THROUGH LAYER 3	1.069281	84616.469	3.04
AVG. HEAD ON TOP OF LAYER 3	1.1665		
CHANGE IN WATER STORAGE	0.850	67245.859	2.42
SOIL WATER AT START OF YEAR	17.014	1346354.000	
SOIL WATER AT END OF YEAR	17.450	1380893.250	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.413	32706.545	1.18
ANNUAL WATER BUDGET BALANCE	0.0000	0.557	0.00

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.61	3055363.750	100.00
RUNOFF	6.465	511575.406	16.74
EVAPOTRANSPIRATION	21.077	1667933.000	54.59
DRAINAGE COLLECTED FROM LAYER 2	10.5842	837567.937	27.41
PERC./LEAKAGE THROUGH LAYER 3	0.972872	76987.234	2.52
AVG. HEAD ON TOP OF LAYER 3	1.3292		
CHANGE IN WATER STORAGE	-0.489	-38701.426	-1.27
SOIL WATER AT START OF YEAR	17.450	1380893.250	
SOIL WATER AT END OF YEAR	17.374	1374898.370	
SNOW WATER AT START OF YEAR	0.413	32706.545	1.07
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	1.476	0.00

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A15-119

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.75	2433370.750	100.00
RUNOFF	2.174	172065.812	7.07
EVAPOTRANSPIRATION	19.454	1539451.250	63.26
DRAINAGE COLLECTED FROM LAYER 2	8.3488	660677.437	27.15
PERC./LEAKAGE THROUGH LAYER 3	0.974211	77093.234	3.17
AVG. HEAD ON TOP OF LAYER 3	1.0522		
CHANGE IN WATER STORAGE	-0.201	-15918.931	-0.65
SOIL WATER AT START OF YEAR	17.374	1374898.370	
SOIL WATER AT END OF YEAR	17.173	1358979.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	2.066	0.00

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	25.85	2045613.870	100.00
RUNOFF	2.880	227899.625	11.14
EVAPOTRANSPIRATION	17.219	1362645.250	66.61
DRAINAGE COLLECTED FROM LAYER 2	4.8472	383582.094	18.75
PERC./LEAKAGE THROUGH LAYER 3	0.956349	75679.758	3.70
AVG. HEAD ON TOP OF LAYER 3	0.6049		
CHANGE IN WATER STORAGE	-0.053	-4193.182	-0.20
SOIL WATER AT START OF YEAR	17.173	1358979.500	
SOIL WATER AT END OF YEAR	16.699	1321427.750	

A/S-120

SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.422	33358.516	1.63
ANNUAL WATER BUDGET BALANCE	0.0000	0.302	0.00

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	28.81	2279850.500	100.00
RUNOFF	1.523	120539.609	5.29
EVAPOTRANSPIRATION	20.504	1622543.000	71.17
DRAINAGE COLLECTED FROM LAYER 2	6.4136	507529.969	22.26
PERC./LEAKAGE THROUGH LAYER 3	0.937811	74212.703	3.26
AVG. HEAD ON TOP OF LAYER 3	0.8039		
CHANGE IN WATER STORAGE	-0.568	-44975.012	-1.97
SOIL WATER AT START OF YEAR	16.699	1321427.750	
SOIL WATER AT END OF YEAR	16.552	1309811.250	
SNOW WATER AT START OF YEAR	0.422	33358.516	1.46
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.075	0.00

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCEN
PRECIPITATION	31.56	2497469.250	100.00
RUNOFF	2.696	213329.969	8.54
EVAPOTRANSPIRATION	20.171	1596247.750	63.91
DRAINAGE COLLECTED FROM LAYER 2	6.9221	547774.187	21.93

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PERC./LEAKAGE THROUGH LAYER 3	0.907874	71843.711	2.88
AVG. HEAD ON TOP OF LAYER 3	0.8686		
CHANGE IN WATER STORAGE	0.856	67720.656	2.71
SOIL WATER AT START OF YEAR	16.552	1309811.250	
SOIL WATER AT END OF YEAR	17.408	1377532.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0070	552.954	0.02

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.36	2481643.000	100.00
RUNOFF	1.404	111071.891	4.48
EVAPOTRANSPIRATION	17.944	1419964.750	57.22
DRAINAGE COLLECTED FROM LAYER 2	8.1309	643427.562	25.93
PERC./LEAKAGE THROUGH LAYER 3	0.969634	76731.031	3.09
AVG. HEAD ON TOP OF LAYER 3	1.0829		
CHANGE IN WATER STORAGE	2.912	230446.766	9.29
SOIL WATER AT START OF YEAR	17.408	1377532.000	
SOIL WATER AT END OF YEAR	16.694	1321044.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	3.626	286934.750	11.56
ANNUAL WATER BUDGET BALANCE	0.0000	0.934	0.00

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ANNUAL TOTALS FOR YEAR 15

A15-122

	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.36	1927704.870	100.00
RUNOFF	4.283	338954.187	17.58
EVAPOTRANSPIRATION	16.501	1305767.370	67.74
DRAINAGE COLLECTED FROM LAYER 2	5.5902	442375.344	22.95
PERC./LEAKAGE THROUGH LAYER 3	0.863780	68354.391	3.55
AVG. HEAD ON TOP OF LAYER 3	0.7012		
CHANGE IN WATER STORAGE	-2.938	-232472.484	-12.06
SOIL WATER AT START OF YEAR	16.694	1321044.000	
SOIL WATER AT END OF YEAR	17.382	1375506.250	
SNOW WATER AT START OF YEAR	3.626	286934.750	14.88
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0597	4725.975	0.25

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCEN
PRECIPITATION	30.70	2429413.500	100.00
RUNOFF	0.709	56072.145	2.31
EVAPOTRANSPIRATION	20.710	1638878.250	67.46
DRAINAGE COLLECTED FROM LAYER 2	8.0249	635043.187	26.14
PERC./LEAKAGE THROUGH LAYER 3	1.072203	84847.719	3.49
AVG. HEAD ON TOP OF LAYER 3	1.0303		
CHANGE IN WATER STORAGE	0.184	14572.127	0.60
SOIL WATER AT START OF YEAR	17.382	1375506.250	
SOIL WATER AT END OF YEAR	17.566	1390078.370	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

A15-123

ANNUAL WATER BUDGET BALANCE	0.0000	0.132	0.00

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.44	3041910.750	100.00
RUNOFF	2.862	226513.000	7.45
EVAPOTRANSPIRATION	24.447	1934565.250	63.60
DRAINAGE COLLECTED FROM LAYER 2	9.3510	739984.812	24.33
PERC./LEAKAGE THROUGH LAYER 3	1.111406	87949.969	2.89
AVG. HEAD ON TOP OF LAYER 3	1.1815		
CHANGE IN WATER STORAGE	0.659	52142.586	1.71
SOIL WATER AT START OF YEAR	17.566	1390078.370	
SOIL WATER AT END OF YEAR	18.175	1438221.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.051	3999.851	0.13
ANNUAL WATER BUDGET BALANCE	0.0095	755.067	0.02

****

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	24.91	1971228.500	100.00
RUNOFF	3.764	297844.937	15.11
EVAPOTRANSPIRATION	16.912	1338302.750	67.89
DRAINAGE COLLECTED FROM LAYER 2	3.8762	306735.562	15.56
PERC./LEAKAGE THROUGH LAYER 3	0.874947	69238.070	3.51
AVG. HEAD ON TOP OF LAYER 3	0.4866		

A15-124

CHANGE IN WATER STORAGE	-0.517	-40894.070	-2.07
SOIL WATER AT START OF YEAR	18.175	1438221.120	
SOIL WATER AT END OF YEAR	17.708	1401326.870	
SNOW WATER AT START OF YEAR	0.051	3999.851	0.20
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	1.198	0.00

****

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.41	3118669.500	100.00
RUNOFF	7.048	557740.750	17.88
EVAPOTRANSPIRATION	20.486	1621163.750	51.98
DRAINAGE COLLECTED FROM LAYER 2	10.2994	815029.562	26.13
PERC./LEAKAGE THROUGH LAYER 3	0.913967	72325.867	2.32
AVG. HEAD ON TOP OF LAYER 3	1.3238		
CHANGE IN WATER STORAGE	0.656	51905.008	1.66
SOIL WATER AT START OF YEAR	17.708	1401326.870	
SOIL WATER AT END OF YEAR	18.292	1447480.120	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.073	5751.760	0.18
ANNUAL WATER BUDGET BALANCE	0.0064	504.584	0.02

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCEN
PRECIPITATION	34.99	2768898.000	100.00

A15-125

RUNOFF	5.902	467069.437	16.87
EVAPOTRANSPIRATION	19.831	1569334.750	56.68
DRAINAGE COLLECTED FROM LAYER 2	8.7433	691890.250	24.99
PERC./LEAKAGE THROUGH LAYER 3	0.993940	78654.430	2.84
AVG. HEAD ON TOP OF LAYER 3	1.0949		
CHANGE IN WATER STORAGE	-0.484	-38264.605	-1.38
SOIL WATER AT START OF YEAR	18.292	1447480.120	
SOIL WATER AT END OF YEAR	17.881	1414967.250	
SNOW WATER AT START OF YEAR	0.073	5751.760	0.21
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0027	213.768	0.01

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.56	1.42	2.51	3.11	3.62	3.94
	3.78	2.92	3.50	2.24	2.23	2.08
STD. DEVIATIONS	0.64	0.65	1.40	1.67	1.86	2.09
	1.75	1.72	1.68	1.27	1.02	1.00
RUNOFF						
TOTALS	0.521	0.792	1.723	0.185	0.004	0.04
	0.035	0.008	0.002	0.000	0.000	0.20
STD. DEVIATIONS	0.758	0.634	1.283	0.478	0.017	0.21
	0.100	0.031	0.011	0.000	0.000	0.31
EVAPOTRANSPIRATION						
TOTALS	0.457	0.417	0.774	2.485	2.827	2.90
	3.092	2.105	2.208	1.570	1.153	0.60
STD. DEVIATIONS	0.099	0.070	0.481	0.907	1.129	1.07
	1.218	1.084	0.840	0.642	0.277	0.17

A15-126

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS	0.0858	0.0007	0.4351	1.3283	0.8905	0.598
	0.7634	0.6969	0.9182	0.8595	0.6974	0.542
STD. DEVIATIONS	0.1207	0.0022	0.4112	0.6711	0.8501	0.419
	0.8472	0.6862	0.6858	0.5379	0.6492	0.416

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS	0.0515	0.0028	0.0244	0.0984	0.1036	0.100
	0.1003	0.0942	0.0943	0.1051	0.0917	0.088
STD. DEVIATIONS	0.0404	0.0081	0.0244	0.0223	0.0206	0.014
	0.0232	0.0285	0.0266	0.0100	0.0240	0.039

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.1260	0.0012	0.6437	2.0465	1.3646	0.951
	1.2043	1.0447	1.4380	1.2719	1.0671	0.802
STD. DEVIATIONS	0.1779	0.0037	0.6084	1.0690	1.3896	0.742
	1.4829	1.0451	1.1181	0.7962	0.9942	0.616

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	32.89	(5.107)	2602954.7	100.00
RUNOFF	3.519	(2.0636)	278477.87	10.699
EVAPOTRANSPIRATION	20.604	(2.5540)	1630478.75	62.640
LATERAL DRAINAGE COLLECTED FROM LAYER 2	7.81691	(2.09395)	618583.125	23.7646
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.95569	(0.09890)	75627.187	2.905
AVERAGE HEAD ON TOP OF LAYER 3	0.997	(0.280)		
CHANGE IN WATER STORAGE	-0.012	(1.1978)	-969.72	-0.037

A15-127

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	4.09	323658.062
RUNOFF	1.788	141454.3590
DRAINAGE COLLECTED FROM LAYER 2	0.14398	11393.79590
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.004493	355.52512
AVERAGE HEAD ON TOP OF LAYER 3	11.548	
MAXIMUM HEAD ON TOP OF LAYER 3	81.999	
SNOW WATER	4.36	345196.6250

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4440
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0683

*** MAXIMUM HEADS ARE COMPUTED USING THE MOUND EQUATION. ***

****

A15-128

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	1.3965	0.2327
2	1.1122	0.1854
3	15.3720	0.4270
SNOW WATER	0.000	

****
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A15-129

APPENDIX 4
PROOF OF NOTIFICATION

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

CERTIFIED MAIL - RETURN REQUESTED

July 31, 1996

City of Zion - Clerk
2828 Sheridan Road
Zion, IL 60099

Dear Sir/Madam:

Browning-Ferris Industries of Illinois, Inc. (BFIIL) has, today, submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap.

Attached to this letter are drawings showing the currently permitted cap and the proposed cap. While the currently permitted cap is outdated and the proposed cap is an improvement and more protective of the environment, IEPA cannot approve the change unless BFIIL obtains a Permit Modification. This notice to you is required under the Permit Modification regulations (35 IAC 703.283).

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office from 7 a.m. to 4 p.m. Monday through Friday. BFIIL will hold a public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period begins today. Comments should be directed to the Illinois Environmental Protection Agency's (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's James Lewis or Michael Williams at 708/746-5777.

Sincerely,

Rebecca Ries, CHMM

A15-131

Ries Environmental, Inc.
2717 Miller Rd. • Marengo, IL 60152 • 815/568-3100 • 815/568-3138 (FAX)

CERTIFIED MAIL - RETURN REQUESTED

July 31, 1996

Mr. Robert Depke
Lake County Courthouse
18 N. County Street
Waukegan, IL 60085

Dear Mr. Dopke:

Browning-Ferris Industries of Illinois, Inc. (BFIIL) has, today, submitted a request for a Class 3 Modification to its RCRA Part B Permit to allow BFIIL's Zion Landfill to modify the final cap design for the hazardous waste landfill (Site 1 Phase A). The Class 3 Modification request contains drawings and a written description of the proposed cap.

Attached to this letter are drawings showing the currently permitted cap and the proposed cap. While the currently permitted cap is outdated and the proposed cap is an improvement and more protective of the environment, IEPA cannot approve the change unless BFIIL obtains a Permit Modification. This notice to you is required under the Permit Modification regulations (35 IAC 703.283).

A copy of the Class 3 Modification application can be reviewed at the BFI-Zion Landfill office from 7 a.m. to 4 p.m. Monday through Friday. BFIIL will hold a public meeting to discuss the change will be held at the BFIIL Zion Landfill office, 701 Green Bay Road, Zion, Illinois on Wednesday September 4, 1996 at 10 a.m.

The public may comment on this Class 3 Modification request. The 60-day comment period begins today. Comments should be directed to the Illinois Environmental Protection Agency"s (IEPA) contact person listed below. The permittee's compliance history during the life of the permit being modified is also available from the EPA contact person .

Kevin Lesko
2200 Churchill Road
P.O. Box 19276
Springfield, IL 62794-9276
217/524-3271

If there are any questions regarding the Class 3 Modification request, please contact BFIIL's James Lewis or Michael Williams at 708/746-5777.

Sincerely,

Rebecca Ries, CHMM

A-15-132

Appendix E-5

Construction Acceptance Report for Site 1 – Phase A Final Closure, February 1998 (TOC and Narrative only)

0120 - 37

Waste Systems™

CONSTRUCTION ACCEPTANCE REPORT FOR THE SITE 1 - PHASE A FINAL CLOSURE PERMIT NO. B-23-M-16

Zion Sanitary Landfill
Zion, Illinois

Volume I

February 1998

Prepared For:
BFI Waste Systems of North America, Inc.
Zion Sanitary Landfill
701 North Green Bay Road
Zion, Illinois 60099
(847) 746-5777

Prepared By:
CQM, Inc.
2778 Manitowoc Road - Suite A
Green Bay, Wisconsin 54311
(920) 465-3911

CQM, INC.

Construction Quality Management

2778 Manitowoc Road - Suite A Green Bay, Wisconsin 54311

Phone: (920) 465-3911 Fax: (920) 465-3913

February 10, 1998

Mr. Kevin D. Lesko, E.I.T.
Illinois Environmental Protection Agency
Division of Land
Permit Section - Hazardous Waste
2200 Churchill Road
Springfield, IL 62794-9276

RE: Construction Acceptance Report and Drawings for the Site 1 - Phase A Final Closure, Zion Sanitary Landfill, 0978020001 - Lake County

Dear Mr. Lesko:

On behalf of BFI Waste Systems of North America, Inc., we are submitting one original and two copies of the report titled: "*Construction Acceptance Report for the Site 1 - Phase A Final Closure at the Zion Sanitary Landfill*," dated February 1998, with the accompanying Drawing Nos. A-1 through A-12.

Based upon our observations, surveys, field and soil test results, it is our professional opinion, that the project has been constructed in accordance with IEPA permit requirements.

Should you have any questions or if additional information is required, feel free to contact me at (920) 465-3911.

Sincerely,

CQM, INC.

Timothy J. Ambrosius, P.E.
President

TJA/lv

Enclosures

CONSTRUCTION ACCEPTANCE REPORT
FOR THE
SITE 1 - PHASE A FINAL CLOSURE
PERMIT NO. B-23-M-16

ZION SANITARY LANDFILL
ZION, ILLINOIS

DISTRIBUTION LIST

No. of Copies	Sent To
3	Mr. Kevin D. Lesko, E.I.T. Illinois Environmental Protection Agency Division of Land Permit Section - Hazardous Waste 2200 Churchill Road Springfield, IL 62794-9276
2	Mr. James A. Lewis, Site Engineer Zion Sanitary Landfill 701 N. Green Bay Road Zion, IL 60099
1	Mr. Clarke M. Lundell, P.E., Area Manager BFI Waste Systems of North America, Inc. 9813 Flying Cloud Drive Eden Prairie, MN 55347

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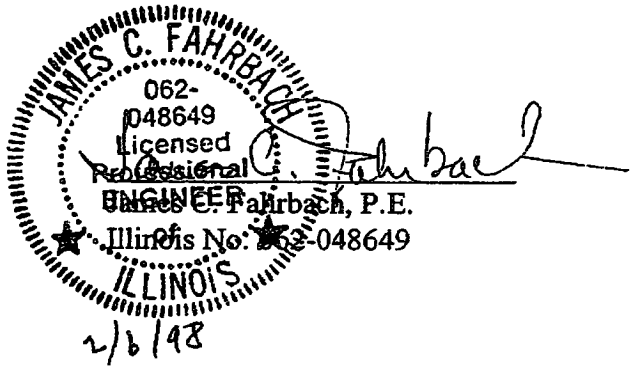
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1. CERTIFICATIONS

1.1 Document and Construction Certification

"I, James C. Fahrbach, P.E. hereby certify that I am a registered professional engineer in the State of Illinois, that this document has been prepared in accordance with Subpart E of Part 811, Subtitle G of Title 35, Illinois Administrative Code and that construction has been prepared and constructed in accordance with the engineering design.



James C. Fahrbach, P.E.
Illinois No. 062-048649

1.2 Clay Cap Certification

I, James C. Fahrbach, P.E. certify that each of the items listed below were constructed in accordance with the permit drawings and Construction Quality Assurance Plan for this waste facility, as well as all applicable solid waste administrative code requirements. This certification is based on my personal observations of construction of Site 1 - Phase A Final Closure, review and interpretation of collected data for Site 1 - Phase A Final Closure, and supervision and discussion with quality assurance staff directly under my supervision of Site 1 - Phase A Final Closure. This certification in no way implies a guarantee or warranty regarding the performance of the construction documented in this report.

1. The quality of the clay material used and the methods utilized in its placement;
2. Connections with previously placed clay layers;
3. Preparation of the upper portions of the clay component of a composite-capped waste facility for installation of the geomembrane, including smoothness of the surface, removal of rocks and other foreign objects, and repair of the clay surface due to rain, rutting or other damage;
4. Placement of soil or other materials placed over the composite cap.

James C. Fahrbach 2/6/98

James C. Fahrbach, P.E.
Illinois No. 062-048649

1.3 Geomembrane Certification

I, James C. Fahrbach, P.E. certify that each of the items listed below were constructed in accordance with the permit drawings and Construction Quality Assurance Plan for this waste facility, as well as all applicable solid waste administrative code requirements. This certification is based on my personal observations of construction of Site 1 - Phase A Final Closure, review and interpretation of collected data for Site 1 - Phase A Final Closure, and supervision and discussion with quality assurance staff directly under my supervision of Site 1 - Phase A Final Closure. This certification in no way implies a guarantee or warranty regarding the performance of the construction documented in this report.

1. Placement of geomembrane on prepared clay surfaces and other irregularly shaped areas;
2. Connections of geomembrane around gas extraction wells and any other penetration of the composite cap;
3. Removal of geomembrane wrinkles, which were higher than they were wide.

James C. Fahrbach 2/6/98

James C. Fahrbach, P.E.
Illinois No. 062-048649

2. INTRODUCTION

2.1 General Project Information

Zion Sanitary Landfill is located in the NW ¼ of Section 7, Township 46N, Range 12E, Lake County, Illinois. The entire facility property encompasses about 250 acres, located in Benton and Newport Townships.

Zion Sanitary Landfill consists of 2 existing sites, identified as Site No. 1 (IEPA I.D. No. 09802000), and Site No. 2 (IEPA I.D. No. 098020002). Both sites are presently full, therefore, BFI is not accepting any municipal solid waste at this time.

In 1993 and 1996 auger borings were performed on a 100-foot grid pattern to verify the depth of existing clay cap material placed over Site 1 - Phase A. The depth of the select clay capping material varied from 1.5 feet to 10 feet. On May 3, 1996 a letter report was submitted to the Illinois Environmental Protection Agency (IEPA) for the actual clay depths and soil laboratory test results for cover material over Site 1 - Phase A. On March 6, 1997 an approval letter was issued by the agency to modify the final closure requirements for Site 1 - Phase A. All pertinent correspondence with IEPA are provided in Appendix "A".

2.2 Purpose and Scope

This Construction Acceptance Report and accompanying Drawing Nos. A-1 through A-12 present the results of construction observations and surveys during the Site 1 - Phase A Final Closure. The construction observation was performed in 1997 by CQM, Inc., Green Bay, Wisconsin. The report and accompanying drawings document the findings of CQM, Inc. The scope of this report includes documentation of the construction activities as outlined in Sections 3 through 10.

In order to document that construction was completed in accordance with Illinois Administrative Codes, Construction Quality Assurance Plan, and Permit Approval, this report contains soil test data, in-place moisture density testing results, soil thicknesses, geomembrane test data, photograph documentation, summary tables, and appendices. To further the verification, drawings were prepared to depict site conditions after construction.

3. QUALITY ASSURANCE (QA)

3.1 Laboratory Testing

Laboratory tests performed for this project were completed in accordance with American Society for Testing and Materials (ASTM). The list of laboratory tests and the standard methods used are as follows:

Fine Grain Soils

• Soil Classification	ASTM D2487
• Grain Size Analysis	ASTM D422
• Atterberg Limits	ASTM D4318
• Modified Proctor Density	ASTM D1557
• Moisture Content	ASTM D2216
• Flex Wall Permeability	ASTM D5084

Coarse Grain Soil and Aggregate

• Soil Classification	ASTM D2487
• Grain Size Analysis	ASTM D422

Geomembrane

1. Conformance Tests:

• Thickness	ASTM D751
• Carbon Black Content	ASTM D1603
• Carbon Black Dispersion	ASTM D3015
• Density	ASTM D1505
• Tensile Properties	ASTM D638
• Puncture	FTMS 101C
• Tear Resistance	ASTM D1004
• Melt Flow Index	ASTM D1238
• Dimensional Stability	ASTM D1204
• Low Temperature Brittleness	ASTM D746
• Environmental Stress Crack Resistance	ASTM D1693

2. Quality Assurance Tests:

• Peel Adhesion	ASTM D4437
• Bonded Seam Strength (Shear)	ASTM D4437

Geotextile

• Grab Strength	ASTM D4632
• Puncture Resistance	ASTM D4833
• Mass/Unit Area	ASTM D5261
• Mullen Burst Strength	ASTM D3786
• Tear Resistance	ASTM D4533

All soil laboratory testing was performed in CQM, Inc.'s soils laboratory, Green Bay, Wisconsin. Geomembrane and geotextile testing was performed by TRI/Environmental, Inc., Austin, Texas.

3.2 Field Testing and Sampling

All field testing and sampling was performed by the field technician, in accordance with ASTM standards. The following is a list of the field sampling and testing methods used:

Fine Grain Soils

• Moisture Testing (Nuclear Method)	ASTM D3017
• Density Testing (Nuclear Method)	ASTM D2922
• Shelby Tube Sampling	ASTM D1587
• Preserving/Transporting Soil Samples	ASTM D4220

Field density testing was performed using a Troxler 3440 Nuclear Density Meter.

4. SELECT CLAY CAPPING MATERIAL

4.1 General

Prior to placing select clay capping material, topsoil was removed from the sideslope areas that were previously topsoiled, and vegetation removed from all areas.

Prior to installing geomembrane, the top area was built up with select clay capping material. Additional clay capping material was placed and compacted to thicknesses ranging from 0.1 feet to 7.1 feet. Slopes ranged from 2 percent to 5 percent. In areas where the existing clay capping layer material was less than 2.5 feet, additional clay capping material was added.

4.2 Select Clay Capping Borrow Source

Source samples of the select clay capping material were randomly obtained at a rate of 1 sample per 5,000 cubic yards. A total of 16 samples were obtained and analyzed for modified Proctor, grain size, hydrometer, Atterberg limits, moisture content, and classified according to the United Soil Classification System (USCS). The modified Proctor value selected for the construction of the select clay cap was (sample No. ZL-CC-7) 129.6 pcf at an optimum moisture content of 9.5 percent. This sample was determined to be the best representative value of all 16 randomly selected clay capping borrow source samples. This Proctor value exceeds the average of all 16 randomly selected clay capping borrow source samples.

The percent by weight passing the No. 200 sieve ranged from a high of 90.0 percent (ZL-CS-13) to a low of 73.6 percent (ZL-CS-1). The average percent by weight passing the No. 200 sieve was 81.2 percent. The clay size fraction ranged from a high of 45.0 percent (ZL-CS-2) to a low of 33.5 percent (ZL-CS-9), having an average of 39.5 percent.

Atterberg limits were conducted on each of the 16 samples. The liquid limit ranged from a high of 29.6 (ZL-CS-10) to a low of 22.5 (ZL-CS-16), with an average of 26.8. The plastic limit ranged from a high of 14.9 (ZL-CS-5) to a low of 12.3 (ZL-CS-13), with an average of 13.6. The plasticity index ranged from a high of 16.0 (ZL-CS-11) to a low of 10.1 (ZL-CS-16), with an average of 13.2.

Table 1 summarizes the laboratory soil test results of the soil samples obtained from the select clay capping source. Appendices "B" and "C" contain all the laboratory data sheets.

4.3 Discussion of Construction Methods

The general contractor, Ryan Incorporated Central, Janesville, Wisconsin began Site 1 - Phase A Final Closure activities on May 22, 1997. As the select clay capping material was being transported and placed by scrapers and off-road trucks, Caterpillar dozers bladed the clay material to a uniform 8 to 9-inch thick loose lift. In addition to keeping the select clay capping material to a uniform thickness, the dozer also broke down any clumps of clay that occurred during placement.

The select clay capping material was normally several percentage points above the optimum moisture content. This allowed for direct placement of the select clay capping material.

A Caterpillar 825 sheepsfoot compactor provided the primary means of compacting the select clay capping material. The Caterpillar 825 has a static weight of 71,000 pounds and pad lengths of 7.5 inches. Deliberate staggered travel of loaded and unloaded scrapers and off-road trucks also aided in the compaction effort.

In areas where large heavy construction equipment were unable to be used, mechanical hand compactors were used to compact the select clay capping material. Areas such as gas extraction wells required compaction with hand compactors.

Various individual lifts of select clay capping material were required to achieve the minimum cap thickness of 2 feet. The top surface of each compacted lift was scarified, prior to placing select clay material for subsequent lifts. This method promoted effective bonding of lifts. Select clay capping material was compacted at or wet of the optimum moisture content in lifts that were not more than 6 inches thick after compaction. Photographs depicting typical construction methods used for the placement and compaction of the select clay capping material are included in Appendix "D". Daily inspection reports are provided in Appendix "E".

4.4 Select Clay Cap Thickness

The thickness of the select clay cap material was determined by two separate surveys. The first survey was conducted on the existing conditions prior to clay placement using a 100-foot grid pattern. This 100-foot grid pattern was the identical 100-foot grid pattern used for the 1993 and 1996 auger boring program. The second survey was conducted after clay placement and was performed on the identical 100-foot grid pattern used to document existing conditions. The grades are summarized in Table 2 and are shown on Drawing No. A-3.

4.5 Discussion and Summary of Soil Testing

The select clay capping material was analyzed at CQM, Inc.'s soils laboratory. The laboratory test results of the in-place samples are summarized in Table 3. The laboratory data sheets are contained in Appendix "F". The results of the in-place moisture density testing for the select clay capping material are summarized in Table 4.

During the placement of the select clay capping material, in-place moisture density tests were performed. A Troxler 3440 nuclear density gauge was used on a 100-foot grid pattern to provide in-place testing. Subsequent grid patterns were then offset 50 feet from the previous grid pattern. This in-place testing pattern was maintained while the select clay capping material was being placed on Site 1 - Phase A.

As stated in the previous section, all compacted lifts of the select clay capping material were maintained at 6 inches in depth. The in-place moisture density tests were performed on the specific grid pattern after a total of 6 inches of the select clay capping material was placed. In-place moisture density test locations are shown on Drawing Nos. A-4 through A-6.

The select clay capping material was compacted in the range of 90 percent to 99 percent of modified Proctor maximum dry density, and at a moisture equal to or greater than optimum moisture.

Seventeen undisturbed samples were collected from the in-place select clay capping material as construction progressed. Each sample, consisting of 2 shelby tube samples and a 10-pound bulk sample, was obtained at a rate of 1 sample for each 5,000 cubic yards of clay placed. Sample locations are shown on Drawing No. A-7.

Each of the 17 samples were analyzed for grain size, hydrometer, Atterberg limits, moisture content, dry density, and hydraulic conductivity (ASTM D5048). The percent by weight passing the No. 200 sieve ranged from 84.3 percent to 70.7 percent, having an average of 77.2 percent. The clay size fraction ranged from 42.5 percent to 27.0 percent, having an average of 35.4 percent.

Liquid limit ranged from 28.4 to 20.3, with an average value of 24.4. The liquid limit values comply with the project requirements of 20 or greater. The plastic limit ranged from 14.2 to 10.1, with an average value of 12.4. The plasticity index ranged from 15.0 to 10.2, with an average value of 12.1. The plasticity index values comply with the project requirements of 10 or greater.

The moisture contents from the shelby tube samples ranged from a high of 16.3 percent to a low of 12.1 percent, with an average value of 13.9 percent.

The dry density values ranged from a high of 130.2 pcf, to a low of 119.1 pcf, with an average value of 123.6 pcf.

The coefficient of permeability ranged from 9.2×10^{-8} cm/sec to 2.7×10^{-8} cm/sec. The average permeability rate was 5.4×10^{-8} cm/sec. The test results indicate that the rate of permeability of the in-place clay layer material is slower than the permit requirement of 1.0×10^{-7} cm/sec.

5. GEOMEMBRANE

The installation of the geomembrane cap commenced June 10, 1997. The geomembrane was manufactured and installed by GSE Lining Technology, Inc. (GSE), Houston, Texas. The on-site construction quality assurance was provided by CQM, Inc., Green Bay, Wisconsin. Appendix "D" contains photographic documentation of all major aspects of construction. The independent geomembrane testing laboratory was TRI/Environmental, Inc., Austin, Texas.

5.1 Transportation, Delivery and Storage

Semi-trucks transported 59 rolls of 40-mil linear low density polyethylene (LLDPE) smooth geomembrane to the site to deploy on Site 1 - Phase A. A total of 807,454 square feet of smooth geomembrane was installed.

All smooth rolls were 22.5 feet wide, with an average length of 620 feet. The rolls were single sheets containing no factory seams. GSE's personnel were responsible for unloading the geomembrane rolls. As each roll was removed from the truck, the roll was logged, and all roll certifications were obtained. Each roll certification was reviewed by CQM, Inc.'s designated construction quality assurance officer. Appendix "G" contains all roll certifications for the geomembrane material used in the cap construction.

5.2 Conformance Testing

BFI requested that a representative of the independent geomembrane testing laboratory (TRI/Environmental, Inc.) be present at the geomembrane manufacturer's plant and observe the material manufacturing and quality control testing. Therefore, a representative of TRI/Environmental, Inc. provided full time inspection for the periods between June 2 through June 5, 1997 and June, 8, 1997. The quality control test results observed by TRI/Environmental, Inc.'s representative, and performed by GSE are summarized in Table 5.

TRI/Environmental, Inc. also obtained additional samples from the manufactured rolls for conformance testing. Tests for tensile properties (break strength and break elongation) were performed at a frequency of 1 test for every 50,000 square feet of manufactured geomembrane. Melt flow index and low temperature brittleness tests were performed at a frequency of 1 test for every 100,000 square feet of manufacturer geomembrane and 2 rolls were tested for carbon black content and dispersion and density. A total of 18 tensile properties, 9 melt flow index, 9 low temperature brittleness, 2 carbon black content and dispersion, and 2 density were conducted on the geomembrane. In all cases, the geomembrane material test results exceeded the project requirements. Table 6 provides a summary of the test results from the conformance samples. Appendix "H" contains the laboratory data sheets from TRI/Environmental, Inc.

5.3 Earthwork and Soil Preparation

The earthwork contractor (Ryan Incorporated Central) fine graded the top of the select clay capping material with a Caterpillar D6H dozer. The dozer used a laser detector that was controlled by the operator. All stones were hand picked, and all stone holes were backfilled with dry bentonite. The select clay capping material was then rolled with a smooth drum vibratory roller, prior to deployment of the geomembrane. Construction inspection reports are provided in Appendix "E".

GSE's site supervisor and CQM, Inc.'s designated construction quality assurance officer inspected the surface of the select clay cap, prior to geomembrane deployment. A soil surface acceptance form for each prepared section was provided and signed by GSE's site supervisor and CQM, Inc.'s representative, prior to deploying the geomembrane. The soil surface acceptance forms are provided in Appendix "I".

5.4 Anchor Trenching

The geomembrane anchor trench was constructed using a Caterpillar D6H dozer. The geomembrane anchor trench totaled approximately 4,438 lineal feet. The geomembrane anchor trench consisted of a "V" ditch, approximately 1 foot deep. After the geomembrane was seamed and tested, the geomembrane was placed in the geomembrane anchor trench and backfilled with select clay capping material. Drawing No. A-12, Detail No. 3 provides a detail of the geomembrane anchor trench.

5.5 Geomembrane Placement and Seaming

A sheet of geomembrane bounded by either 4 seams or a combination of seams and anchor trenches is referred to as a panel. A panel can be of any size or shape.

A total of 108 panels were placed during the deployment of the geomembrane. The panel layout of the geomembrane material is shown on Drawing No. A-8. The panel numbers shown on the drawing correspond to the order in which the panels were deployed. Table 12 summarizes the placement of each geomembrane panel.

Panel deployment commenced along the south end and continued northward. Each smooth panel on the east sideslope was deployed from top to bottom, extending a minimum of 5 feet or greater past the toe of slope. Panels on the sideslope were installed with seams running perpendicular to the contour lines of the sideslope. Panels on the top area were deployed in a north/south direction. The north end was the final area to be covered with geomembrane.

During the deployment of the geomembrane, each panel overlapped the previous panel by a minimum of 4 inches, and was positioned forming a "shingle effect". The 4-inch

overlap was the standard used for all geomembrane seaming (i.e. double wedge fusion or extrusion). Photographic documentation of the geomembrane placement is provided in Appendix "D".

The majority of geomembrane seaming was performed using a double wedge fusion seaming machine. This seaming machine consisted of electrically heated elements which were passed between 2 sheets of geomembrane. Immediately following melting, rollers apply pressure to form a homogenous bond between the 2 geomembrane panels. This method of welding creates a continuous air channel between the 2 geomembrane panels, which was used to low pressure air test the welded seams. Table 8 summarizes the geomembrane seaming.

The extrusion seaming consisted of extruding (welding) the edge of 1 geomembrane panel to another. This extrusion welding method was used for all repairs, corners, patches, and any double wedge seam that failed the low pressure air test procedure.

The extrusion seaming machine extrudes the same polymer mix the geomembrane is manufactured from. The extrusion seaming machine extrudes the molten extrudate against and into each of the geomembrane panel sheets being welded and forms a homogenous mass of geomembrane material.

The temperature of the double wedge seaming machines and the extrusion seaming machines were maintained at approximately 400 and 240 degrees Celsius, respectively. The seaming machines operated at approximately 5 feet per minute. During the seaming of all geomembrane panels, the seaming rate and seaming machine temperature were continually monitored by the designated construction quality assurance officer.

5.6 Geomembrane Seam Testing

All seams of the geomembrane material were made by either the double wedge fusion or the extrusion seaming machines. All seaming machines were tested daily by preweld tests, which is discussed in Section 5.6.1. All seams were tested utilizing a nondestructive method. In addition to the nondestructive testing, destructive seam tests were also conducted. Sections 5.6.2 and 5.6.3 describe the testing methods used to ensure seam integrity.

5.6.1 Preweld Testing

All seaming machines were required to perform prewelds, prior to performing any production welds. Seaming machine performance was field verified by collecting 1 preweld sample at the beginning of the day for each machine, by each seaming technician who performed geomembrane seaming. Additional preweld samples were tested at intervals not exceeding 5 hours and significant changes in weather. Each of the preweld samples were tested by GSE's personnel for peel and shear in the field using GSE's tensiometer. The calibration record for the tensiometer is included in Appendix "J".

A total of 89 preweld samples were obtained and tested in the field by GSE's personnel. Forty-six samples were obtained from double wedge fusion seaming machines and 43 samples were obtained from the extrusion seaming machines. In each case, the preweld sample field test results exceeded the project requirements. Table 9 summarizes the preweld sample field test results.

5.6.2 Nondestructive Seam Testing

All geomembrane seams were nondestructively tested for continuity and integrity. All double wedge fusion seams were low pressure air tested, while all extrusion seams were vacuum box tested.

The low pressure air testing method can be conducted only on double wedge fusion seaming machine welds. The double wedge fusion seaming machine leaves an air channel between each respective wedge. The air channel was sealed at each seam end prior to testing. A pressure gauge needle was then inserted into the air channel. Ambient air was pumped into the channel until the pressure gauge registered 30 psig or greater. The pressure was allowed to stabilize for approximately 2 minutes, and then was held for a minimum of 5 minutes. If the pressure dropped more than 2 psig or would not stabilize, the seam was shortened and retested. Repairs were then performed on the failed areas using the extrusion seaming machine and retested by the vacuum box method. The air testing results are summarized in Table 10.

The vacuum box testing method was used on all extruded seams. The vacuum box is a rigid box, measuring 18 inches in length and approximately 8-inches wide, with a transparent viewing window and a soft neoprene gasket attached to the bottom. A vacuum line from a vacuum pump was connected to the box by a flexible hose, through an on/off valve and a vacuum gauge. A soap and water solution was applied to the area to be tested. The vacuum box was then placed over the soaped area. The control valve was energized, allowing 5 inches of gauge vacuum to be read. For approximately 15 seconds, the area was viewed for air bubbling. If bubbling occurred, the area was marked, repaired, and retested. If the area showed no bubbling through the viewing window, the box was moved to the adjacent location. This procedure continued until the

entire length of seam was tested. The designated construction quality assurance officer verified each vacuum box test.

5.6.3 Destructive Seam Testing

The project required destructive seam testing to verify the performance of each seaming machine and to determine the strength of the seam in both shear and peel. The minimum specified frequency for destructive seam sampling, determined as an average for the entire installation area, was 1 sample per 500 lineal feet of seam length. Approximately 36,413 linear feet of geomembrane seaming was completed, with a total of 77 destructive seam samples obtained by CQM, Inc. Drawing No. A-8 depicts the locations of each destructive sample.

Each of the destructive seam samples were tested by GSE's personnel for peel and shear in the field using GSE's tensiometer. Each sample was also tested in the laboratory by TRI/Environmental, Inc. Table 11 provides a summary of the destructive seam sample test results. Appendix "K" contains the laboratory reports on the destructive seam samples.

Samples for destructive testing were cut under the direction of the designated construction quality assurance officer as the production seaming progressed. Samples for qualitative field testing were taken prior to cutting the seam sample for laboratory testing. Two samples for field tensiometer testing were cut from the seam a distance of 42 inches apart. All samples passed the field tensiometer test, therefore, the remaining panel was cut into 3 pieces. The first piece (12 by 12 inches) was given to the installer. The second piece (12 by 12 inches) was archived by CQM, Inc. The third piece (12 by 18 inches) was sent to TRI/Environmental, Inc. for analysis.

A total of 77 destructive seam samples were obtained and tested to determine the strength of the geomembrane production seams. In cases where the initial destructive sample failed the strength tests, the designated construction quality assurance officer obtained 2 additional samples, 1 on each side of the initial destructive sample location. The 2 additional samples were then tested by the independent geomembrane testing laboratory. These samples passed the required strength tests. Any portion of the geomembrane or geomembrane seam showing a flaw, or having a destructive or nondestructive test failure was repaired. Larger areas of failed seams were capped with additional geomembrane and vacuum box tested. Seams with little overlap, pinholes, wedge entries and exits, small holes, and destructive sample locations were patched. Geomembrane repairs are summarized in Table 12. Seams that were capped are shown on Drawing No. A-8.

6. DRAINAGE LAYER

The drainage layer consists of 2 geocomposite materials. The single sided geocomposite was placed directly over the geomembrane and the double sided geocomposite was placed on the select clay capping material on the sideslopes.

6.1 Single Sided Geocomposite

The single sided geocomposite was manufactured by Fluid Systems, Aurora, Illinois. The roll width was 14.5 feet with a length of approximately 300 feet. A total of 807,454 square feet of single sided geocomposite was installed on top of the geomembrane. Appendix "L" contains the single sided geocomposite roll certifications. Quality assurance (QA) testing was conducted on 5 rolls of single sided geocomposite. Table 13 provides a summary of test results and Appendix "M" contains the laboratory data sheets from TRI/Environmental, Inc.

Panel deployment commenced along the south end and continued northward concurrently with the geomembrane deployment. On the east side, the single sided geocomposite was anchored utilizing the geomembrane anchor trench as described in Section 5.4. After deployment, each panel was positioned such that it could be tied to the previously placed panel. The ties used to connect each panel were polypropylene interlocking ties, spaced approximately 5 feet on center. The nonwoven geotextile flaps from each single sided geocomposite panel were sewn together to protect the single sided geocomposite panel from wind uplifts.

6.2 Double Sided Geocomposite

The double sided geocomposite was manufactured by Fluid Systems, Aurora, Illinois. The roll width was 14.5 feet with a length of approximately 300 feet. A total of 915,600 square feet of double sided geocomposite was placed on the south, west, and north sideslopes of Site 1 - Phase A. Appendix "N" contains the double sided geocomposite roll certifications. Quality assurance (QA) testing was conducted on 6 rolls of double sided geocomposite. Table 13 provides a summary of test results and Appendix "O" contains the laboratory data sheets from TRI/Environmental, Inc.

Panel deployment commenced along the south sideslope and continued westward. Each double sided geocomposite panel was deployed with seams running perpendicular to the contour lines of the sideslope. After deployment, each panel was positioned such that it could be tied to the previously placed panel. In areas where double sided geocompiste was deployed over the geomembrane anchor trench, panels were positioned to allow for a 2 feet overlap onto the single sided geocomposite. The ties used to connect each panel were polypropylene interlocking ties, spaced approximately 5 feet on center. Butt seams were fastened with 2 staggered rolls of ties at 1 foot intervals. The nonwoven geotextile

flaps from each double sided geocomposite panel were sewn together to protect the double sided geocomposite from wind uplifts.

6.3 Anchor Trench

An anchor trench was excavated using a Case 580 backhoe and totals approximately 3,800 lineal feet along the south, west, and north sideslopes. The anchor trench was 2 feet wide by 1 foot deep. Drawing No. A-12, Detail No. 2 depicts the typical detail of the anchor trench. The purpose of the anchor trench was to secure the double sided geocomposite, as well as to drain the drainage layer.

The trench was lined with 6 oz/sq yd nonwoven geotextile fabric, manufactured by TNS Advanced Technologies. Appendix "P" contains the manufacturer's data for the nonwoven geotextile fabric. Approximately 2 inches of drain pipe bedding material was then placed at the anchor trench bottom. The 4-inch diameter, perforated corrugated polyethylene pipe was placed on the bedding material. Forty-two factory tees were placed at approximate 100 foot intervals on the perforated pipe. Solid-wall corrugated polyethylene pipe was attached to each tee and sloped toward the perimeter drainage ditch. The trench was then backfilled with drain pipe bedding material to the shoulders of the anchor trench.

In-place sampling was conducted during the placement of the drain pipe bedding material. Three in-place samples were collected and analyzed for grain size and classification in CQM, Inc.'s soils laboratory. Table 14 summarizes all the laboratory analysis of the drain pipe bedding material. Appendix "Q" provides the laboratory data.

7. PROTECTIVE LAYER

The protective layer consists of 30 inches of soil material that is capable of supporting vegetation. Six inches of topsoil was placed on top of the protective layer material. The topsoil material is described in Section 8.

The depth of the protective layer material was verified on a 100-foot grid pattern. This 100-foot grid pattern was the identical grid pattern used for documenting the select clay capping material.

8. TOPSOIL, SEED, FERTILIZER, AND MULCHING

The topsoil material was transported to the construction area from on-site and off-site stockpiles by semi-trucks. At first the topsoil material was dumped at the outer edge and pushed out over the silty clay material by a Caterpillar D6H LGP dozer to a minimum thickness of 6 inches. Semi-trucks were allowed on the protective cover material when 3 feet or more of material separated the semi-trucks and the drainage layer geocomposite. Topsoil material was continually graded outward covering the silty clay material.

In-place sampling was conducted during the placement of the topsoil material. Thirteen in-place topsoil samples were collected and analyzed for pH, nitrogen, phosphorus, potassium and classification. Table 15 summarizes all the laboratory analysis of the topsoil material. Appendix "S" provides the laboratory data.

The thickness of the topsoil was documented on a 100-foot grid pattern. The same 100-foot grid pattern was used to document the silty clay material thickness. After the topsoil material was fine graded, the topsoil thickness was determined by hand shoveling to the top of the silty clay material. In all cases, the topsoil thickness was greater than the 6 inches specified. The topsoil grades (top of protective cover) are shown on Drawing No. A-9 and are summarized in Table 2.

The seeding, fertilizing, and mulching was performed by Martin's Landscaping, Charlestown, Indiana. The seed and fertilizer were incorporated into the topsoil by conventional equipment. Photograph No. 23 depicts the method and equipment used for seeding and fertilizing.

The seed mixture for the cover area was selected because of the shallow roots of the grasses. The seed was applied at a rate of 260 pounds per acre. The seed mixture is as follows:

Seed Type	Pounds Per Acre
Kentucky Bluegrass	60
Perennial Ryegrass	25
Creeping Red Fescue	15
White Dutch Clover	10
Winter Rye	50
Fescue 31	100

The fertilizer was applied at a rate of 250 pounds per acre. The fertilizer was mixed with the consistency of 19 percent nitrogen, 19 percent phosphorous and 19 percent potash.

The straw mulch was blown into place at a rate of 1 ½ tons per acre. The mulch was crimped into the topsoil using an agricultural disc. Crimping of the mulch kept the mulch from blowing off the seeded area.

9. MISCELLANEOUS CONSTRUCTION

9.1 Surface Water Diversion Berms

The surface water diversion berms were constructed on the south, west and north sideslopes of Site 1 - Phase A. The surface water diversion berms were constructed with a minimum 6 inches of topsoil material placed over the silty clay material and seeded, fertilized and mulched per methods described in Section 8. Riprap was then placed in the drainage ditch where the surface water diversion berms terminate. Drawing No. A-12, Detail No. 6 provides a detail of the surface water diversion berms constructed on Site 1 - Phase A.

9.2 Surface Runoff Water

Surface runoff water for Site 1 - Phase A was controlled by the surface water diversion berms, drainage ditches and detention basins. The drainage ditches received a minimum 6 inches of topsoil and were seeded, fertilized and mulched per methods described in Section 8. Drawing No. 12, Detail No. 1 provides a detail of the drainage ditch. Basin Nos. 1, 2, 3 and 7 collect the discharge surface runoff water from Site 1 - Phase A.

9.3 Drainage Layer Trench

A drainage layer trench was installed between Site 1 - Phase A and Cell Nos. 1 and 2 of Phase B. The water collected in the drainage layer is discharged to the drainage layer trench. The drainage layer trench discharges into the south perimeter ditch of Cell Nos. 1 and 2. Drawing No. A-3 provides the location of the drainage layer trench. Drawing No. A-12, Detail No. 7 provides a detail of the drainage layer trench.

10. CONCLUSIONS

Based on our observations, field surveys, photograph documentation, record drawings and laboratory test results, it is our professional opinion, that the Site 1 - Phase A Final Closure at the Zion Sanitary Landfill is constructed in accordance with the Illinois Environmental Protection Agency's applicable Permit No. B-23-M-16 approvals.

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Table 1

Summary of Laboratory Testing Results
for
Select Clay Capping Material
Sampled from the Borrow Source

TABLE 1

SUMMARY OF LABORATORY TESTING RESULTS
FOR
SELECT CLAY CAPPING MATERIAL SAMPLED FROM THE BORROW SOURCE

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Sampled	Sample Number	Sample Location	Grain Size Analysis %Fines <#200	Grain Size Analysis %Clay <.005	Atterberg Limits Liquid Limit	Atterberg Limits Plastic Limit	Atterberg Limits Plasticity Index	Sampled Moisture Contents (%)	Modified Proctor Density Max. Dry Density	Modified Proctor Density Optimum Moisture	U.S.C.S.
7/2/96	ZL-CS-1	Borrow Source	73.6	41.5	27.5	13.3	14.2	13.2	128.3	10.3	CL
7/2/96	ZL-CS-2	Borrow Source	81.3	45.0	27.5	13.5	14.0	14.4	124.7	10.9	CL
7/10/96	ZL-CS-3	Borrow Source	77.7	40.0	26.8	13.7	13.1	12.8	128.7	10.2	CL
7/10/96	ZL-CS-4	Borrow Source	83.6	43.5	27.4	14.0	13.4	1.4*	126.9	10.4	CL
7/24/96	ZL-CS-5	Borrow Source	82.9	40.5	27.7	14.9	12.8	14.9	128.8	9.7	CL
7/24/96	ZL-CS-6	Borrow Source	83.4	44.0	26.5	14.3	12.2	9.9	127.8	10.3	CL
7/31/96	ZL-CS-7	Borrow Source	83.3	41.0	26.0	13.8	12.2	16.3	129.6	9.5	CL
7/31/96	ZL-CS-8	Borrow Source	77.8	35.5	25.0	13.0	12.0	14.1	128.8	9.8	CL
8/13/96	ZL-CS-9	Borrow Source	77.6	33.5	29.1	13.8	15.3	12.5	130.2	9.1	CL
8/13/96	ZL-CS-10	Borrow Source	84.2	44.0	29.6	14.7	14.9	13.5	127.3	10.2	CL

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TABLE 1

SUMMARY OF LABORATORY TESTING RESULTS
FOR
SELECT CLAY CAPPING MATERIAL SAMPLED FROM THE BORROW SOURCE

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Sampled	Sample Number	Sample Location	Grain Size Analysis %Fines <#200	Grain Size Analysis %Clay <.005	Atterberg Limits Liquid Limit	Atterberg Limits Plastic Limit	Atterberg Limits Plasticity Index	Sampled Moisture Contents (%)	Modified Proctor Density Max. Dry Density	Modified Proctor Density Optimum Moisture	U.S.C.S.
8/16/96	ZL-CS-11	Borrow Source	80.7	39.0	29.5	13.5	16.0	15.8	125.6	10.6	CL
5/23/97	ZL-CS-12	Borrow Source	77.3	35.5	25.3	12.9	12.4	13.7	132.1	9.2	CL
5/23/97	ZL-CS-13	Borrow Source	90.0	33.5	25.9	12.3	13.6	16.3	131.0	9.4	CL
5/31/97	ZL-CS-14	Borrow Source	81.4	38.5	26.4	13.7	12.7	14.2	129.5	9.8	CL
5/31/97	ZL-CS-15	Borrow Source	85.8	43.5	26.1	14.0	12.1	16.6	129.5	10.0	CL
6/6/97	ZL-CS-16	Borrow Source	79.2	34.5	22.5	12.4	10.1	12.7	130.3	10.0	CL
Average:			**81.2**	**39.6**	**26.8**	**13.6**	**13.2**	**14.1****	**128.7**	**10.0**	**CL**
Project Requirements:					**≥20**		**≥10.0**				

* Moisture content was low on sample because the seal on sample bag broke, prior to lab analysis.

** Average of 15 samples.

R 001711

Table 2

Summary of Grades

TABLE 2

SUMMARY OF GRADES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Coordinates		Clay Capping Layer				Protective Layer	
North	East	Previous Certified Thickness (Ft)	Added Thickness (Ft)	Total Thickness (Ft)	Elevation (Ft)	Thickness (Ft)	Elevation (Ft)
10100	8700	5.5	2.3	7.8	741.9	3.2	745.1
10100	8800	5.5	2.0	7.5	744.5	3.1	747.6
10100	8900	5.5	2.0	7.5	746.0	3.0	749.0
10100	9000	5.5	2.1	7.6	746.1	3.8	749.9
10100	9100	4.0	2.1	6.1	747.1	5.8	752.9
10100	9200	4.0	2.1	6.1	747.6	4.1	751.7
10100	9300	3.7	2.0	5.7	747.9	3.3	751.2
10200	8700	3.6	2.0	5.6	753.5	3.2	756.7
10200	8800	3.3	2.0	5.3	755.6	3.0	758.6
10200	8900	2.3	2.0	4.3	756.3	3.1	759.4
10200	9000	2.9	2.0	4.9	757.5	3.2	760.7
10200	9100	5.2	2.0	7.2	757.7	3.0	760.7
10200	9200	3.7	2.1	5.8	757.5	3.2	760.7
10200	9300	3.3	2.2	5.5	752.7	3.9	756.6
10300	8700	3.8	2.0	5.8	756.3	3.4	759.7
10300	8800	3.2	2.1	5.3	759.2	3.4	762.6
10300	8900	3.4	2.4	5.8	762.3	3.1	765.4
10300	9000	4.2	2.0	6.2	765.4	3.1	768.5
10300	9100	3.8	2.1	5.9	765.9	3.1	769.0
10300	9200	4.2	2.0	6.2	764.5	3.1	767.6
10300	9300	2.4	2.1	4.5	755.7	4.3	760.0
10400	8700	1.7	2.2	3.9	757.5	3.5	761.0
10400	8800	3.0	2.2	5.2	762.3	3.1	765.4
10400	8900	2.5	2.0	4.5	771.4	3.0	774.4
10400	9000	4.2	2.2	6.4	773.9	3.0	776.9
10400	9100	5.3	2.1	7.4	773.1	3.0	776.1
10400	9200	8.0	2.0	10.0	769.8	3.1	772.9
10400	9300	4.5	2.0	6.5	760.2	4.5	764.7

TABLE 2

SUMMARY OF GRADES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Coordinates		Clay Capping Layer				Protective Layer	
		Previous Certified	Added	Total			
North	East	Thickness (Ft)	Thickness (Ft)	Thickness (Ft)	Elevation (Ft)	Thickness (Ft)	Elevation (Ft)
10500	8700	2.5	2.0	4.5	757.5	3.1	760.6
10500	8800	4.5	0.0	4.5	766.0	3.1	769.1
10500	8900	0.8	1.7	2.5	776.6	3.0	779.6
10500	9000	2.8	0.0	2.8	779.2	3.0	782.2
10500	9100	4.7	0.0	4.7	779.1	3.1	782.2
10500	9200	6.3	0.0	6.3	777.0	3.0	780.0
10500	9300	10.0	0.0	10.0	768.0	4.7	772.7
10600	8700	3.6	0.0	3.6	755.8	3.1	758.9
10600	8800	5.0	0.0	5.0	767.3	3.0	770.3
10600	8900	4.0	0.0	4.0	780.1	3.0	783.1
10600	9000	4.3	0.0	4.3	783.8	3.0	786.8
10600	9100	5.5	0.0	5.5	785.3	3.0	788.3
10600	9200	5.0	0.0	5.0	786.4	3.0	789.4
10600	9300	6.0	0.0	6.0	783.1	3.0	786.1
10700	8700	3.5	0.0	3.5	752.8	4.0	756.8
10700	8800	5.2	0.0	5.2	771.7	3.2	774.9
10700	8900	3.4	0.0	3.4	784.2	3.1	787.3
10700	9000	1.9	1.4	3.3	790.1	3.0	793.1
10700	9100	5.0	1.5	6.5	793.1	3.0	796.1
10700	9200	4.0	0.2	4.2	793.2	3.0	796.2
10700	9300	1.5	1.2	2.7	793.0	3.0	796.0
10800	8700	2.5	0.0	2.5	753.8	6.3	760.1
10800	8800	5.3	0.0	5.3	775.2	3.2	778.4
10800	8900	4.2	0.0	4.2	787.9	3.1	791.0
10800	9000	3.5	0.3	3.8	794.1	3.3	797.4
10800	9100	5.5	1.4	6.9	797.0	3.2	800.2
10800	9200	5.1	0.3	5.4	797.4	3.3	800.7
10800	9300	3.0	0.7	3.7	797.1	3.6	800.7

TABLE 2

SUMMARY OF GRADES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Coordinates		Clay Capping Layer				Protective Layer	
		Previous Certified	Added	Total			
North	East	Thickness (Ft)	Thickness (Ft)	Thickness (Ft)	Elevation (Ft)	Thickness (Ft)	Elevation (Ft)
10900	8700	3.2	0.0	3.2	762.6	4.4	767.0
10900	8800	5.5	0.0	5.5	780.7	4.4	785.1
10900	8900	3.3	0.0	3.3	790.9	3.4	794.3
10900	9000	3.4	2.9	6.3	800.4	3.1	803.5
10900	9100	3.2	1.1	4.3	800.3	3.0	803.3
10900	9200	7.0	0.1	7.1	800.6	3.3	803.9
10900	9300	4.5	1.0	5.5	800.2	3.1	803.3
11000	8700	2.5	0.0	2.5	766.4	6.9	773.3
11000	8800	2.3	0.3	2.6	784.8	3.0	787.8
11000	8900	3.2	0.0	3.2	794.0	4.3	798.3
11000	9000	2.3	2.8	5.1	801.7	3.0	804.7
11000	9100	3.3	0.8	4.1	802.2	3.0	805.2
11000	9200	5.1	0.1	5.2	802.2	3.1	805.3
11000	9300	4.0	0.8	4.8	802.2	3.1	805.3
11100	8700	3.8	0.0	3.8	767.0	5.6	772.6
11100	8800	4.5	0.0	4.5	787.4	3.0	790.4
11100	8900	1.3	1.9	3.2	797.3	3.3	800.6
11100	9000	1.8	3.0	4.8	804.1	3.1	807.2
11100	9100	1.4	1.8	3.2	804.0	3.1	807.1
11100	9200	7.0	0.4	7.4	804.2	3.1	807.3
11100	9300	3.8	0.9	4.7	804.3	3.1	807.4
11200	8700	4.8	0.0	4.8	766.4	4.8	771.2
11200	8800	4.5	0.0	4.5	788.3	3.0	791.3
11200	8900	3.0	0.0	3.0	796.7	3.4	800.1
11200	9000	3.4	2.4	5.8	804.1	3.2	807.3
11200	9100	3.2	2.9	6.1	805.9	3.2	809.1
11200	9200	4.0	1.5	5.5	806.0	3.0	809.0
11200	9300	3.5	0.9	4.4	806.1	3.1	809.2

TABLE 2

SUMMARY OF GRADES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Coordinates		Clay Capping Layer				Protective Layer	
		Previous Certified	Added	Total		Thickness	Elevation
North	East	Thickness (Ft)	Thickness (Ft)	Thickness (Ft)	Elevation (Ft)	(Ft)	(Ft)
11300	8700	4.5	0.0	4.5	766.2	3.2	769.4
11300	8800	5.5	0.0	5.5	787.1	3.2	790.3
11300	8900	3.3	0.0	3.3	797.9	3.4	801.3
11300	9000	3.5	2.4	5.9	804.2	3.1	807.3
11300	9100	3.5	2.0	5.5	806.1	3.3	809.4
11300	9200	6.0	2.7	8.7	807.9	3.0	810.9
11300	9300	5.5	1.5	7.0	808.0	3.0	811.0
11400	8700	5.3	0.0	5.3	764.3	4.6	768.9
11400	8800	5.0	0.0	5.0	787.1	3.0	790.1
11400	8900	3.0	0.0	3.0	797.9	3.7	801.6
11400	9000	3.0	1.3	4.3	804.2	3.4	807.6
11400	9100	5.0	0.8	5.8	806.1	3.9	810.0
11400	9200	7.0	1.2	8.2	808.1	3.5	811.6
11400	9300	6.0	3.5	9.5	809.2	3.2	812.4
11500	8800	2.5	0.0	2.5	788.4	3.0	791.4
11500	8900	3.0	0.0	3.0	799.2	3.2	802.4
11500	9000	2.5	0.0	2.5	804.1	3.4	807.5
11500	9100	2.0	0.6	2.6	806.2	3.0	809.2
11500	9200	6.5	0.8	7.3	808.1	3.2	811.3
11500	9300	5.0	3.0	8.0	810.0	3.0	813.0
11600	8800				784.7	3.0	787.7
11600	8900	4.0	0.0	4.0	798.3	3.0	801.3
11600	9000	2.5	0.4	2.9	804.1	3.2	807.3
11600	9100	4.5	0.8	5.3	806.2	3.1	809.3
11600	9200	5.3	1.5	6.8	808.1	3.0	811.1
11600	9300	4.5	3.8	8.3	809.5	3.2	812.7

TABLE 2

SUMMARY OF GRADES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Coordinates		Clay Capping Layer				Protective Layer	
		Previous Certified	Added	Total			
North	East	Thickness (Ft)	Thickness (Ft)	Thickness (Ft)	Elevation (Ft)	Thickness (Ft)	Elevation (Ft)
11700	8800	3.1	0.0	3.1	781.3	3.1	784.4
11700	8900	4.0	0.0	4.0	796.5	3.8	800.3
11700	9000	3.0	2.1	5.1	804.1	3.0	807.1
11700	9100	2.0	1.5	3.5	806.0	3.0	809.0
11700	9200	5.0	1.4	6.4	808.1	3.0	811.1
11700	9300	4.5	4.4	8.9	809.9	3.0	812.9
11800	8800	5.7	0.0	5.7	781.2	3.0	784.2
11800	8900	2.5	0.0	2.5	795.5	4.0	799.5
11800	9000	5.0	2.4	7.4	803.6	3.0	806.6
11800	9100	1.5	2.0	3.5	805.9	3.0	808.9
11800	9200	5.0	2.0	7.0	807.8	3.1	810.9
11800	9300	6.0	5.7	11.7	809.6	3.0	812.6
11900	8800	5.5	0.0	5.5	781.1	3.0	784.1
11900	8900	10.0	0.0	10.0	797.1	3.1	800.2
11900	9000	2.0	2.8	4.8	804.1	3.0	807.1
11900	9100	2.0	1.9	3.9	806.2	3.6	809.8
11900	9200	6.0	-2.9	3.1	808.2	3.0	811.2
11900	9300	3.5	7.0	10.5	809.2	3.1	812.3
12000	8800	5.8	0.0	5.8	779.7	3.0	782.7
12000	8900	6.2	0.0	6.2	797.2	3.0	800.2
12000	9000	3.0	3.9	6.9	802.9	3.5	806.4
12000	9100	2.0	5.2	7.2	806.0	3.0	809.0
12000	9200	8.0	3.6	11.6	808.3	3.2	811.5
12000	9300	3.5	5.5	9.0	809.2	3.0	812.2

TABLE 2

SUMMARY OF GRADES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Coordinates		Clay Capping Layer				Protective Layer	
North	East	Previous Certified Thickness (Ft)	Added Thickness (Ft)	Total Thickness (Ft)	Elevation (Ft)	Thickness (Ft)	Elevation (Ft)
12100	8800	4.0	0.0	4.0	778.9	3.0	781.9
12100	8900	6.2	0.0	6.2	797.0	3.0	800.0
12100	9000	2.0	5.2	7.2	803.7	3.0	806.7
12100	9100	2.5	7.1	9.6	805.4	3.2	808.6
12100	9200	4.0	4.4	8.4	804.2	3.1	807.3
12100	9300	5.1	5.7	10.8	804.3	3.1	807.4
12200	8800	5.3	0.0	5.3	776.8	3.5	780.3
12200	8900	4.2	0.0	4.2	796.3	3.0	799.3
12200	9000	4.5	3.1	7.6	800.0	3.4	803.4
12200	9100	4.0	2.4	6.4	799.3	3.0	802.3
12200	9200	2.5	6.1	8.6	798.6	3.1	801.7
12200	9300	6.5	6.8	13.3	799.3	3.3	802.6
12300	8800	4.2	0.0	4.2	777.3	3.0	780.3
12300	8900	1.7	2.6	4.3	792.1	3.0	795.1
12300	9000	3.5	0.5	4.0	795.2	3.2	798.4
12300	9100	1.5	2.1	3.6	794.6	3.1	797.7
12300	9200	2.0	3.2	5.2	793.7	3.4	797.1
12300	9300	4.5	4.1	8.6	794.5	3.4	797.9
12400	8800	3.1	0.0	3.1	776.1	3.1	779.2
12400	8900	2.1	1.3	3.4	786.9	3.0	789.9
12400	9000	5.0	1.7	6.7	788.5	3.1	791.6
12400	9100	1.5	2.6	4.1	789.1	3.0	792.1
12400	9200	1.0	3.2	4.2	789.3	3.0	792.3
12400	9300	2.8	0.8	3.6	788.0	3.0	791.0

TABLE 2

SUMMARY OF GRADES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Coordinates		Clay Capping Layer				Protective Layer	
		Previous Certified Thickness	Added Thickness	Total Thickness	Elevation	Thickness	Elevation
North	East	(Ft)	(Ft)	(Ft)	(Ft)	(Ft)	(Ft)
12500	8800	4.0	0.0	4.0	769.8	4.3	774.1
12500	8900	3.4	0.0	3.4	772.7	3.5	776.2
12500	9000	4.9	0.0	4.9	774.0	3.6	777.6
12500	9100	6.0	0.0	6.0	774.7	3.2	777.9
12500	9200	4.2	0.0	4.2	774.6	5.1	779.7
12500	9300	9.0	0.0	9.0	773.2	4.3	777.5

Table 3

Summary of Laboratory Testing Results
for
Select Clay Capping Material Sampled In-Place

TABLE 3

SUMMARY OF LABORATORY TESTING RESULTS
FOR
SELECT CLAY CAPPING MATERIAL SAMPLED IN-PLACE

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Sampled	Sample Number	Lift No.	Coordinates North	Coordinates East	Grain Size Analysis %Fines <#200	Grain Size Analysis %Clay <.005	Atterberg Limits Liquid Limit	Atterberg Limits Plastic Limit	Atterberg Limits Plasticity Index	Dry Density (PCF)	Moisture Contents (%)	Coefficient Permeability (cm/sec)	U.S.C.S.
6/05/97	ZL-CC-1	2	12200	9200	72.9	33.0	21.7	11.7	10.2	123.2	14.0	4.6 x 10-8	CL
6/05/97	ZL-CC-2	2	12000	9200	70.7	32.5	21.8	10.5	11.3	130.2	12.1	6.4 x 10-8	CL
6/02/97	ZL-CC-3	2	11600	9300	78.4	36.0	23.2	13.0	10.2	119.2	14.3	9.2 x 10-8	CL
5/30/97	ZL-CC-4	2	11200	9000	79.7	42.5	28.4	13.4	15.0	123.9	13.3	4.8 x 10-8	CL
6/03/97	ZL-CC-5	2	11800	9000	79.0	33.5	27.0	12.7	14.3	124.6	12.4	4.1 x 10-8	CL
6/05/97	ZL-CC-6	2	12200	9000	76.4	35.5	22.0	11.8	10.2	127.6	12.9	4.8 x 10-8	CL
6/10/97	ZL-CC-7	2	12400	9200	72.4	28.5	25.1	12.3	12.8	126.0	12.3	6.2 x 10-8	CL
6/10/97	ZL-CC-8	4	12200	9300	77.3	34.0	25.1	11.5	13.6	124.7	13.8	5.3 x 10-8	CL
6/10/97	ZL-CC-9	4	11800	9300	71.2	34.0	25.0	12.3	12.7	123.5	13.3	3.5 x 10-8	CL
6/13/97	ZL-CC-10	4	11300	9200	77.6	32.0	20.3	10.1	10.2	120.5	15.7	7.7 x 10-8	CL

R 001721

TABLE 3

SUMMARY OF LABORATORY TESTING RESULTS
FOR
SELECT CLAY CAPPING MATERIAL SAMPLED IN-PLACE

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Sampled	Sample Number	Lift No.	Coordinates North	Coordinates East	Grain Size Analysis %Fines <#200	Grain Size Analysis %Clay <.005	Atterberg Limits Liquid Limit	Atterberg Limits Plastic Limit	Atterberg Limits Plasticity Index	Dry Density (PCF)	Moisture Contents (%)	Coefficient Permeability (cm/sec)	U.S.C.S.
6/05/97	ZL-CC-11	4	12400	9000	76.0	29.0	21.9	11.7	10.2	128.1	12.6	4.9 x 10-8	CL
6/04/97	ZL-CC-12	4	11900	9000	82.3	41.0	24.7	12.6	12.1	123.2	14.7	6.8 x 10-8	CL
5/31/97	ZL-CC-13	4	12300	9100	71.9	27.0	23.7	13.0	10.7	123.1	13.1	7.1 x 10-8	CL
6/12/97	ZL-CC-14	2	10100	9200	78.3	33.0	22.7	12.4	10.3	123.7	13.4	5.1 x 10-8	CL
6/17/97	ZL-CC-15	2	10300	8800	81.7	42.5	28.1	14.2	13.9	121.1	15.6	2.7 x 10-8	CL
6/18/97	ZL-CC-16	4	10200	8900	84.3	44.5	28.0	13.5	14.5	119.1	16.3	4.4 x 10-8	CL
6/18/97	ZL-CC-17	4	10400	9300	82.1	44.0	26.9	14.2	12.7	119.1	16.3	3.6 x 10-8	CL
Average:					**77.2**	**35.4**	**24.4**	**12.4**	**12.1**	**123.6**	**13.9**	**5.4 x 10-8**	**CL**
Project Requirements:							**≥20.0**		**≥10.0**			**≤1.0 x 10-7**	**CL**

R 001722

Table 4

Summary of In-Place Moisture Density Testing of Select Clay Capping Material

TABLE 4

CLIENT:	**ZION SANITARY LANDFILL**
PROJECT NAME:	**SITE 1 - PHASE A FINAL CLOSURE**
LOCATION AND SOIL TYPE:	**CLAY CAPPING MATERIAL**
	IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER:	**TROXLER 3440 - S/N 25869**
PROBE DEPTH:	**6 INCHES**
MAXIMUM PROCTOR DENSITY:	**129.6 PCF @ 9.5% MOISTURE**
COMPACTION REQUIREMENTS:	**90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE**

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
1	6/18/97	10075	8700	1	12.3	120.1	93
2	6/13/97	10075	8750	1	10.2	119.6	92
3	6/13/97	10075	8850	1	10.7	118.9	92
4	6/13/97	10075	8950	1	10.5	118.0	91
5	6/12/97	10075	9050	1	9.8	118.3	91
6	6/12/97	10075	9150	1	12.1	120.0	93
7	6/14/97	10075	9250	1	12.6	116.9	90
8	6/18/97	10150	8700	1	11.2	120.6	93
9	6/13/97	10150	8750	1	11.4	118.5	91
10	6/13/97	10150	8850	1	13.9	117.6	91
11	6/13/97	10150	8950	1	9.8	123.0	95
12	6/12/97	10150	9050	1	10.4	124.1	96
13	6/12/97	10150	9150	1	12.1	120.5	93
14	6/12/97	10150	9250	1	12.1	117.7	91
15	6/18/97	10250	8700	1	11.6	121.2	94
16	6/13/97	10250	8750	1	11.6	117.7	91
17	6/13/97	10250	8850	1	14.8	116.8	90
18	6/13/97	10250	8950	1	9.7	117.0	90
19	6/12/97	10250	9050	1	11.9	120.4	93
20	6/12/97	10250	9150	1	13.1	123.4	95
21	6/14/97	10250	9250	1	13.0	117.5	91
22	6/18/97	10350	8700	1	12.6	122.5	95
23	6/13/97	10350	8750	1	10.2	117.4	91
24	6/13/97	10350	8850	1	13.8	117.2	90
25	6/13/97	10350	8950	1	10.8	120.1	93

TABLE 4

CLIENT:	**ZION SANITARY LANDFILL**
PROJECT NAME:	**SITE 1 - PHASE A FINAL CLOSURE**
LOCATION AND SOIL TYPE:	**CLAY CAPPING MATERIAL**
	IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER:	**TROXLER 3440 - S/N 25869**
PROBE DEPTH:	**6 INCHES**
MAXIMUM PROCTOR DENSITY:	**129.6 PCF @ 9.5% MOISTURE**
COMPACTION REQUIREMENTS:	**90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE**

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
26	6/12/97	10350	9050	1	11.1	121.1	93
27	6/12/97	10350	9150	1	12.1	122.7	95
28	6/14/97	10350	9250	1	13.4	118.1	91
29	6/18/97	10450	8700	1	11.8	120.5	93
30	6/30/97	10500	8900	1	9.9	122.0	94
31	5/27/97	10650	8950	1	9.7	121.8	94
32	5/27/97	10700	9100	1	9.5	124.0	96
33	5/22/97	10650	9250	1	10.4	122.3	94
34	5/27/97	10750	9050	1	11.0	119.4	92
35	5/27/97	10800	9300	1	9.6	125.3	97
36	5/27/97	10900	9000	1	11.1	121.6	94
37	5/27/97	10850	9050	1	11.1	123.5	95
38	5/31/97	10850	9250	1	14.1	119.5	92
39	5/29/97	11000	9000	1	14.0	120.5	93
40	5/22/97	11000	9100	1	14.7	118.3	91
41	5/31/97	11000	9300	1	12.9	118.5	91
42	6/2/97	11100	8900	1	10.5	122.2	94
43	5/22/97	11050	8950	1	11.9	122.3	94
44	5/27/97	11100	9100	1	11.2	120.6	93
45	5/31/97	11100	9300	1	12.7	121.8	94
46	5/22/97	11150	8950	1	12.6	118.2	91
47	5/22/97	11200	9100	1	13.0	119.5	92
48	5/23/97	11200	9200	1	12.7	118.8	92
49	6/2/97	11200	9300	1	10.6	117.9	91
50	5/29/97	11250	8950	1	13.6	116.6	90

TABLE 4

CLIENT:	**ZION SANITARY LANDFILL**
PROJECT NAME:	**SITE 1 - PHASE A FINAL CLOSURE**
LOCATION AND SOIL TYPE:	**CLAY CAPPING MATERIAL**
	IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER:	**TROXLER 3440 - S/N 25869**
PROBE DEPTH:	**6 INCHES**
MAXIMUM PROCTOR DENSITY:	**129.6 PCF @ 9.5% MOISTURE**
COMPACTION REQUIREMENTS:	**90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE**

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
51	5/22/97	11250	9050	1	12.3	121.0	93
52	5/27/97	11300	9200	1	14.9	117.6	91
53	6/3/97	11300	9300	1	12.1	120.5	93
54	6/2/97	11350	8950	1	9.8	127.0	98
55	5/22/97	11400	9100	1	13.6	117.9	91
56	5/22/97	11350	9150	1	14.1	117.2	90
57	5/29/97	11400	9300	1	11.4	120.5	93
58	5/27/97	11500	9100	1	9.5	125.1	97
59	5/27/97	11500	9200	1	11.3	121.5	94
60	5/27/97	11450	9250	1	11.5	120.4	93
61	5/27/97	11600	9100	1	10.8	123.9	96
62	5/30/97	11600	9200	1	9.8	124.5	96
63	6/2/97	11600	9300	1	11.7	117.7	91
64	5/31/97	11650	8950	1	11.7	122.3	94
65	5/28/97	11700	9100	1	10.2	118.0	91
66	5/27/97	11650	9150	1	15.3	117.3	91
67	5/30/97	11650	9250	1	10.2	121.8	94
68	5/31/97	11750	8950	1	13.9	119.9	93
69	5/30/97	11750	9050	1	11.2	118.7	92
70	6/3/97	11750	9150	1	10.1	122.9	95
71	5/28/97	11800	9300	1	13.4	116.7	90
72	6/4/97	11900	9000	1	12.8	124.6	96
73	5/27/97	11900	9100	1	13.6	116.9	90
74	6/2/97	11850	9250	1	13.8	120.3	93
75	6/3/97	12000	9000	1	15.2	119.7	92

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
76	5/30/97	11950	9050	1	12.1	116.7	90
77	6/4/97	12000	9200	1	13.4	119.9	93
78	6/3/97	12000	9300	1	15.8	117.7	91
79	5/29/97	12050	8950	1	14.1	117.5	91
80	5/27/97	12050	9050	1	13.1	116.7	90
81	6/5/97	12050	9150	1	13.5	119.4	92
82	6/4/97	12100	9300	1	13.4	118.5	91
83	6/4/97	12150	8950	1	9.7	118.1	91
84	5/29/97	12150	9050	1	12.1	121.0	93
85	5/29/97	12150	9150	1	11.5	120.4	93
86	6/3/97	12200	9300	1	11.6	121.2	94
87	6/30/97	12300	8900	1	12.0	120.2	93
88	6/10/97	12300	9000	1	11.1	118.7	92
89	5/27/97	12250	9050	1	12.7	121.2	94
90	5/27/97	12250	9150	1	13.6	119.2	92
91	5/29/97	12250	9250	1	15.7	116.9	90
92	6/30/97	12350	8850	1	9.6	127.9	99
93	6/10/97	12400	9000	1	13.0	119.4	92
94	5/27/97	12400	9100	1	11.2	124.3	96
95	5/29/97	12350	9150	1	15.1	118.6	92
96	5/29/97	12400	9300	1	12.6	121.1	93
97	6/19/97	10100	8700	2	12.4	119.2	92
98	6/13/97	10100	8800	2	10.5	119.0	92
99	6/13/97	10100	8900	2	14.6	117.2	90
100	6/13/97	10100	9000	2	11.7	120.8	93

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
101	6/12/97	10100	9100	2	12.0	118.1	91
102	6/12/97	10100	9200	2	9.6	117.8	91
103	6/14/97	10100	9300	2	12.6	118.2	91
104	6/19/97	10200	8700	2	10.3	120.5	93
105	6/13/97	10200	8800	2	11.9	121.3	94
106	6/13/97	10200	8900	2	12.7	119.4	92
107	6/13/97	10200	9000	2	9.5	123.0	95
108	6/12/97	10200	9100	2	11.3	117.8	91
109	6/12/97	10200	9200	2	13.8	118.4	91
110	6/14/97	10200	9300	2	12.1	119.0	92
111	6/19/97	10300	8700	2	12.2	121.6	94
112	6/13/97	10300	8800	2	11.1	120.1	93
113	6/13/97	10300	8900	2	9.7	117.3	91
114	6/13/97	10300	9000	2	9.6	126.8	98
115	6/12/97	10300	9100	2	11.3	126.2	97
116	6/12/97	10300	9200	2	13.3	120.6	93
117	6/14/97	10300	9300	2	13.0	116.7	90
118	6/19/97	10400	8700	2	14.1	120.6	93
119	6/17/97	10400	8800	2	10.6	125.3	97
120	6/13/97	10400	8900	2	11.8	117.5	91
121	6/13/97	10400	9000	2	11.8	117.2	90
122	6/12/97	10400	9100	2	12.6	117.9	91
123	6/12/97	10400	9200	2	10.8	118.6	92
124	6/14/97	10400	9300	2	13.4	118.7	92
125	6/19/97	10500	8700	2	10.2	121.1	93

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
126	6/19/97	10450	8850	2	13.1	122.2	94
127	5/27/97	10700	9000	2	10.4	121.4	94
128	5/27/97	10650	9050	2	11.4	122.7	95
129	5/27/97	10700	9300	2	11.4	122.6	95
130	5/29/97	10800	9100	2	12.9	122.2	94
131	5/29/97	10850	8950	2	14.6	119.0	92
132	5/27/97	10900	9100	2	10.1	119.8	92
133	5/31/97	10900	9300	2	10.9	126.2	97
134	5/29/97	10950	8950	2	12.5	123.2	95
135	6/9/97	11050	8850	2	9.8	123.5	95
136	5/29/97	11100	9000	2	14.5	118.9	92
137	5/29/97	11050	9050	2	15.4	118.3	91
138	5/29/97	11200	9000	2	14.9	117.1	90
139	5/29/97	11150	9050	2	14.2	119.6	92
140	5/29/97	11150	9150	2	15.2	118.0	91
141	5/29/97	11300	9000	2	14.9	116.8	90
142	5/29/97	11300	9100	2	12.9	116.8	90
143	5/29/97	11250	9150	2	14.7	118.4	91
144	6/3/97	11250	9250	2	13.0	117.7	91
145	6/2/97	11400	9000	2	10.2	123.3	95
146	5/27/97	11400	9200	2	14.1	117.8	91
147	5/23/97	11350	9250	2	14.3	117.2	90
148	6/2/97	11500	9300	2	15.0	117.2	90
149	6/2/97	11550	9150	2	12.6	119.0	92
150	5/30/97	11550	9250	2	13.4	120.8	93

TABLE 4

CLIENT:	**ZION SANITARY LANDFILL**
PROJECT NAME:	**SITE 1 - PHASE A FINAL CLOSURE**
LOCATION AND SOIL TYPE:	**CLAY CAPPING MATERIAL**
	IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER:	**TROXLER 3440 - S/N 25869**
PROBE DEPTH:	**6 INCHES**
MAXIMUM PROCTOR DENSITY:	**129.6 PCF @ 9.5% MOISTURE**
COMPACTION REQUIREMENTS:	**90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE**

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
151	5/31/97	11700	9000	2	14.1	120.4	93
152	5/31/97	11650	9050	2	13.6	122.4	94
153	6/2/97	11700	9200	2	12.5	121.1	93
154	6/2/97	11700	9300	2	13.2	117.6	91
155	6/3/97	11800	9000	2	12.5	124.3	96
156	6/4/97	11800	9100	2	11.5	121.2	94
157	5/28/97	11800	9200	2	11.2	122.1	94
158	6/2/97	11750	9250	2	14.2	119.6	92
159	6/4/97	11850	8950	2	12.2	120.9	93
160	6/2/97	11850	9050	2	10.5	124.1	96
161	6/4/97	11900	9300	2	13.6	119.1	92
162	6/3/97	11950	8950	2	14.0	120.3	93
163	6/2/97	12000	9100	2	9.5	120.0	93
164	6/3/97	11950	9150	2	12.7	118.1	91
165	6/4/97	11950	9250	2	12.4	119.1	92
166	5/30/97	12100	9000	2	16.1	120.2	93
167	6/4/97	12100	9100	2	12.8	122.8	95
168	6/4/97	12100	9200	2	15.4	119.1	92
169	6/4/97	12050	9250	2	13.6	118.0	91
170	6/4/97	12200	9000	2	10.3	116.7	90
171	5/29/97	12200	9100	2	13.6	119.9	93
172	5/29/97	12200	9200	2	14.2	117.1	90
173	6/3/97	12150	9250	2	11.2	119.2	92
174	6/30/97	12250	8850	2	10.9	119.9	93
175	5/27/97	12300	9100	2	12.4	121.8	94

TABLE 4

CLIENT:	**ZION SANITARY LANDFILL**
PROJECT NAME:	**SITE 1 - PHASE A FINAL CLOSURE**
LOCATION AND SOIL TYPE:	**CLAY CAPPING MATERIAL**
	IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER:	**TROXLER 3440 - S/N 25869**
PROBE DEPTH:	**6 INCHES**
MAXIMUM PROCTOR DENSITY:	**129.6 PCF @ 9.5% MOISTURE**
COMPACTION REQUIREMENTS:	**90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE**

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
176	5/27/97	12300	9200	2	13.3	120.1	93
177	5/29/97	12300	9300	2	14.7	117.6	91
178	6/30/97	12400	8900	2	13.1	122.2	94
179	6/10/97	12350	8950	2	13.0	119.4	92
180	5/29/97	12350	9050	2	12.2	121.8	94
181	5/29/97	12400	9200	2	13.0	119.7	92
182	6/19/97	10075	8700	3	11.4	118.7	92
183	6/19/97	10075	8750	3	10.2	119.6	92
184	6/14/97	10075	8850	3	10.8	122.6	95
185	6/14/97	10075	8950	3	13.3	121.2	94
186	6/13/97	10075	9050	3	13.3	118.8	92
187	6/13/97	10075	9150	3	11.0	122.6	95
188	6/18/97	10075	9250	3	12.4	120.9	93
189	6/19/97	10150	8700	3	11.7	118.0	91
190	6/19/97	10150	8750	3	10.7	118.5	91
191	6/14/97	10150	8850	3	10.3	122.3	94
192	6/14/97	10150	8950	3	10.2	125.1	97
193	6/13/97	10150	9050	3	14.0	116.7	90
194	6/13/97	10150	9150	3	14.6	119.5	92
195	6/18/97	10150	9250	3	10.2	120.3	93
196	6/19/97	10250	8700	3	14.0	116.8	90
197	6/19/97	10250	8750	3	14.7	117.3	91
198	6/14/97	10250	8850	3	12.5	122.4	94
199	6/14/97	10250	8950	3	11.0	120.9	93
200	6/13/97	10250	9050	3	14.8	117.5	91

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
201	6/13/97	10250	9150	3	13.2	119.7	92
202	6/18/97	10250	9250	3	13.0	118.2	91
203	6/19/97	10350	8700	3	13.5	118.1	91
204	6/19/97	10350	8750	3	10.5	117.1	90
205	6/18/97	10350	8850	3	11.5	118.4	91
206	6/14/97	10350	8950	3	10.7	118.5	91
207	6/13/97	10350	9050	3	13.5	118.4	91
208	6/13/97	10350	9150	3	13.6	117.6	91
209	6/18/97	10350	9250	3	15.0	117.1	90
210	6/19/97	10450	8700	3	13.5	119.6	92
211	6/19/97	10500	8900	3	10.9	127.0	98
212	5/27/97	10700	9100	3	13.0	123.8	96
213	6/2/97	10900	9000	3	12.5	120.7	93
214	5/30/97	11000	9000	3	15.4	117.0	90
215	6/4/97	11100	8900	3	11.1	121.0	93
216	6/2/47	11050	8950	3	10.1	122.1	94
217	5/30/97	11100	9100	3	14.0	116.6	90
218	6/4/97	11150	8950	3	10.2	123.3	95
219	6/2/97	11200	9100	3	11.0	125.4	97
220	6/3/97	11200	9200	3	11.2	118.8	92
221	6/4/97	11250	8950	3	10.3	125.3	97
222	6/4/97	11250	9050	3	11.5	121.9	94
223	6/2/97	11300	9200	3	14.9	117.2	90
224	6/3/97	11300	9300	3	12.8	120.3	93
225	5/23/97	11400	9300	3	9.7	118.1	91

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
226	6/3/97	11450	9250	3	12.2	116.6	90
227	6/5/97	11600	9200	3	11.2	117.5	91
228	6/2/97	11600	9300	3	13.9	119.3	92
229	6/4/97	11650	8950	3	10.8	127.5	98
230	6/2/97	11700	9100	3	10.0	126.1	97
231	6/4/97	11650	9250	3	9.9	122.8	95
232	6/4/97	11750	8950	3	10.8	123.8	96
233	6/3/97	11750	9050	3	10.9	124.0	96
234	6/3/97	11750	9150	3	10.5	124.0	96
235	6/4/97	11800	9300	3	12.8	117.7	91
236	6/4/97	11900	9000	3	13.6	121.8	94
237	6/4/97	11900	9100	3	11.6	121.6	94
238	6/4/97	11850	9250	3	14.8	117.5	91
239	6/3/97	12000	9000	3	14.1	120.3	93
240	6/3/97	11950	9050	3	13.5	119.6	92
241	6/4/97	12000	9200	3	10.6	116.6	90
242	6/4/97	12000	9300	3	12.9	123.6	95
243	6/3/97	12050	8950	3	13.3	118.4	91
244	6/4/97	12050	9050	3	12.2	119.2	92
245	6/4/97	12050	9150	3	15.6	117.5	91
246	6/5/97	12100	9300	3	9.8	119.3	92
247	6/5/97	12150	8950	3	13.8	119.2	92
248	6/4/97	12150	9050	3	10.1	120.8	93
249	5/29/97	12150	9150	3	14.1	121.4	94
250	6/3/97	12200	9300	3	12.5	117.1	90

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
251	6/30/97	12300	8900	3	10.4	122.1	94
252	5/29/97	12250	9050	3	11.5	122.3	94
253	5/29/97	12250	9150	3	14.0	117.2	90
254	6/10/97	12250	9250	3	11.0	120.1	93
255	6/10/97	12400	9000	3	10.1	123.8	96
256	5/29/97	12400	9100	3	13.6	120.5	93
257	5/29/97	12350	9150	3	12.0	122.8	95
258	6/20/97	10100	8700	4	11.8	116.7	90
259	6/18/97	10100	8800	4	12.1	116.7	90
260	6/18/97	10100	8900	4	10.0	118.4	91
261	6/18/97	10100	9000	4	10.5	124.6	96
262	6/18/97	10100	9100	4	12.0	117.8	91
263	6/13/97	10100	9200	4	11.9	117.5	91
264	6/18/97	10100	9300	4	12.2	119.1	92
265	6/20/97	10200	8700	4	11.9	119.4	92
266	6/18/97	10200	8800	4	10.8	117.6	91
267	6/18/97	10200	8900	4	10.1	119.2	92
268	6/18/97	10200	9000	4	12.8	117.6	91
269	6/18/97	10200	9100	4	11.6	116.8	90
270	6/13/97	10200	9200	4	13.1	122.0	94
271	6/18/97	10200	9300	4	12.4	117.6	91
272	6/20/97	10300	8700	4	13.7	118.8	92
273	6/18/97	10300	8800	4	11.3	117.4	91
274	6/18/97	10300	8900	4	11.9	116.8	90
275	6/18/97	10300	9000	4	10.7	120.5	93

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
276	6/18/97	10300	9100	4	11.7	118.3	91
277	6/13/97	10300	9200	4	9.8	120.3	93
278	6/18/97	10300	9300	4	13.2	121.4	94
279	6/20/97	10400	8700	4	14.2	119.6	92
280	6/18/97	10400	8800	4	12.1	118.7	92
281	6/18/97	10400	8900	4	10.2	119.0	92
282	6/18/97	10400	9000	4	10.9	122.1	94
283	6/18/97	10400	9100	4	10.8	124.8	96
284	6/18/97	10400	9200	4	10.4	126.4	98
285	6/18/97	10400	9300	4	13.5	119.0	92
286	6/20/97	10500	8700	4	13.5	121.3	94
287	6/4/97	10850	8950	4	15.1	117.2	90
288	6/3/97	10950	8950	4	9.8	126.5	98
289	6/2/97	11100	9000	4	12.4	118.1	91
290	6/4/97	11200	9000	4	10.8	123.7	95
291	6/4/97	11150	9050	4	9.7	122.7	95
292	6/4/97	11300	9000	4	10.0	124.2	96
293	6/5/97	11300	9100	4	12.0	121.1	93
294	6/3/97	11250	9150	4	12.5	121.4	94
295	5/23/97	11350	9250	4	10.8	126.0	97
296	6/3/97	11500	9300	4	12.6	124.2	96
297	6/2/97	11550	9250	4	13.4	120.1	93
298	6/4/97	11700	9000	4	12.1	125.6	97
299	6/5/97	11700	9300	4	14.3	119.8	92
300	6/4/97	11800	9000	4	12.3	120.1	93

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
301	6/5/97	11800	9100	4	10.5	124.1	96
302	6/5/97	11800	9200	4	10.4	122.6	95
303	6/10/97	11750	9250	4	10.4	124.8	96
304	6/4/97	11850	8950	4	13.1	120.4	93
305	6/10/97	11900	9300	4	12.2	122.8	95
306	6/4/97	11950	8950	4	11.9	121.0	93
307	6/3/97	12000	9100	4	12.4	122.4	94
308	6/5/97	11950	9150	4	13.4	120.5	93
309	6/11/97	11950	9250	4	12.8	119.3	92
310	6/4/97	12100	9000	4	11.6	120.8	93
311	6/5/97	12100	9100	4	15.1	117.3	91
312	6/4/97	12100	9200	4	13.6	116.7	90
313	6/5/97	12050	9250	4	13.0	121.5	94
314	6/5/97	12200	9000	4	13.4	121.0	93
315	6/10/97	12200	9100	4	12.7	119.2	92
316	5/29/97	12200	9200	4	11.7	117.1	90
317	6/3/97	12150	9250	4	11.9	117.8	91
318	6/30/97	12350	8850	4	9.8	121.9	94
319	5/31/97	12300	9100	4	10.0	126.4	98
320	5/29/97	12300	9200	4	12.8	123.7	95
321	6/10/97	12300	9300	4	13.6	118.4	91
322	5/29/97	12350	9050	4	9.5	127.1	98
323	5/29/97	12400	9200	4	14.2	118.7	92
324	6/2/97	10900	9000	5	13.6	117.8	91
325	6/3/97	11000	9000	5	10.7	120.8	93

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
326	6/4/97	11050	8950	5	12.7	118.2	91
327	6/4/97	11200	9100	5	9.5	123.9	96
328	6/3/97	11300	9200	5	13.4	119.5	92
329	5/23/97	11400	9300	5	10.7	120.8	93
330	5/23/97	11450	9250	5	11.3	119.5	92
331	6/4/97	11600	9300	5	10.7	123.9	96
332	6/5/97	11650	9250	5	10.8	118.8	92
333	6/10/97	11800	9300	5	12.3	121.1	93
334	6/4/97	11900	9000	5	14.2	119.6	92
335	6/10/97	11850	9250	5	14.2	116.8	90
336	6/4/97	12000	9000	5	14.0	119.7	92
337	6/3/97	11950	9050	5	11.2	124.1	96
338	6/11/97	12000	9200	5	11.8	118.5	91
339	6/11/97	12000	9300	5	15.3	118.8	92
340	6/5/97	12050	8950	5	14.4	117.5	91
341	6/5/97	12050	9050	5	15.6	117.2	90
342	6/4/97	12050	9150	5	13.7	119.5	92
343	6/5/97	12100	9300	5	12.4	123.3	95
344	6/10/97	12150	8950	5	11.0	121.2	94
345	5/29/97	12150	9150	5	13.4	120.1	93
346	6/4/97	12200	9300	5	13.6	116.8	90
347	6/30/97	12300	8900	5	11.1	125.1	97
348	5/31/97	12250	9150	5	10.0	119.5	92
349	6/10/97	12250	9250	5	12.6	118.9	92
350	5/31/97	12400	9100	5	10.7	127.3	98

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING

DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
351	6/10/97	12350	9150	5	11.2	125.7	97
352	6/4/97	11100	9000	6	12.7	116.9	90
353	6/3/97	11350	9250	6	9.8	121.9	94
354	6/3/97	11500	9300	6	10.1	116.8	90
355	6/5/97	11550	9250	6	10.8	121.9	94
356	6/5/97	11700	9300	6	11.3	123.8	96
357	6/5/97	11750	9250	6	9.8	121.9	94
358	6/11/97	11900	9300	6	13.1	118.9	92
359	6/5/97	11950	8950	6	15.1	119.2	92
360	6/4/97	12000	9100	6	14.2	120.8	93
361	6/11/97	11950	9150	6	9.7	124.0	96
362	6/13/97	11950	9250	6	12.3	121.7	94
363	6/15/97	12100	9000	6	14.5	121.0	93
364	6/5/97	12100	9100	6	12.8	118.3	91
365	6/4/97	12100	9200	6	15.1	116.8	90
366	6/2/97	12050	9250	6	11.7	120.8	93
367	6/10/97	12200	9000	6	10.1	116.8	90
368	6/3/97	12200	9200	6	11.1	125.0	96
369	6/4/97	12150	9250	6	12.9	120.4	93
370	5/31/97	12300	9200	6	11.9	117.6	91
371	6/10/97	12300	9300	6	13.0	119.9	93
372	6/10/97	12400	9200	6	11.1	124.2	96
373	6/3/97	11400	9300	7	11.8	121.4	94
374	6/5/97	11600	9300	7	10.7	125.6	97
375	6/5/97	11650	9250	7	13.0	117.4	91

TABLE 4

CLIENT: ZION SANITARY LANDFILL
PROJECT NAME: SITE 1 - PHASE A FINAL CLOSURE
LOCATION AND SOIL TYPE: CLAY CAPPING MATERIAL
IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER: TROXLER 3440 - S/N 25869
PROBE DEPTH: 6 INCHES
MAXIMUM PROCTOR DENSITY: 129.6 PCF @ 9.5% MOISTURE
COMPACTION REQUIREMENTS: 90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
376	6/5/97	11800	9300	7	10.8	121.4	94
377	6/10/97	11850	9250	7	10.4	119.3	92
378	6/9/97	12000	9000	7	10.7	123.1	95
379	6/4/97	11950	9050	7	13.0	124.4	96
380	6/11/97	12000	9200	7	9.6	122.9	95
381	6/13/97	12000	9300	7	10.1	123.8	96
382	6/5/97	12050	8950	7	14.8	120.5	93
383	6/5/97	12050	9050	7	14.4	118.8	92
384	6/10/97	12050	9150	7	10.5	122.6	95
385	6/10/97	12100	9300	7	9.6	121.3	94
386	6/4/97	12150	9150	7	10.5	120.1	93
387	6/4/97	12200	9300	7	11.4	121.8	94
388	6/10/97	12250	9250	7	11.7	121.2	94
389	6/5/97	11700	9300	8	10.2	117.7	91
390	6/5/97	11750	9250	8	12.3	120.8	93
391	6/11/97	11900	9300	8	14.6	117.6	91
392	6/4/97	12000	9100	8	13.0	124.4	96
393	6/13/97	11950	9250	8	14.2	119.6	92
394	6/5/97	12100	9000	8	13.5	120.0	93
395	6/5/97	12100	9100	8	13.5	118.7	92
396	6/10/97	12100	9200	8	10.1	120.9	93
397	6/10/97	12050	9250	8	10.7	120.3	93
398	6/4/97	12200	9200	8	10.1	117.0	90
399	6/4/97	12150	9250	8	12.4	121.2	94
400	6/10/97	12300	9300	8	12.7	121.2	94

TABLE 4

CLIENT:	**ZION SANITARY LANDFILL**
PROJECT NAME:	**SITE 1 - PHASE A FINAL CLOSURE**
LOCATION AND SOIL TYPE:	**CLAY CAPPING MATERIAL**
	IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER:	**TROXLER 3440 - S/N 25869**
PROBE DEPTH:	**6 INCHES**
MAXIMUM PROCTOR DENSITY:	**129.6 PCF @ 9.5% MOISTURE**
COMPACTION REQUIREMENTS:	**90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE**

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
401	6/5/97	11800	9300	9	11.5	122.3	94
402	6/11/97	11850	9250	9	11.2	119.1	92
403	6/14/97	11950	9050	9	14.0	116.7	90
404	6/13/97	12000	9300	9	11.9	120.6	93
405	6/5/97	12050	8950	9	13.0	119.1	92
406	6/5/97	12050	9050	9	11.2	120.2	93
407	6/11/97	12100	9300	9	12.7	118.2	91
408	6/5/97	12150	9150	9	11.2	122.9	95
409	6/4/97	12200	9300	9	10.0	120.7	93
410	6/5/97	11750	9250	10	11.7	120.8	93
411	6/11/97	11900	9300	10	12.7	118.2	91
412	6/9/97	12000	9100	10	12.0	121.2	94
413	6/13/97	11950	9250	10	11.0	121.1	93
414	6/11/97	12100	9000	10	10.7	118.1	91
415	6/5/97	12100	9100	10	14.8	116.9	90
416	6/11/97	12050	9250	10	11.4	118.4	91
417	6/5/97	12200	9200	10	10.9	125.4	97
418	6/10/97	12150	9250	10	9.5	122.2	94
419	6/5/97	11800	9300	11	10.1	120.7	93
420	6/11/97	11850	9250	11	12.6	119.3	92
421	6/13/97	12000	9300	11	11.3	120.2	93
422	6/5/97	12050	9050	11	11.1	120.0	93
423	6/13/97	12100	9300	11	11.5	118.7	92
424	6/9/97	12150	9150	11	9.5	118.8	92
425	6/10/97	12200	9300	11	11.2	119.1	92

TABLE 4

CLIENT:	**ZION SANITARY LANDFILL**
PROJECT NAME:	**SITE 1 - PHASE A FINAL CLOSURE**
LOCATION AND SOIL TYPE:	**CLAY CAPPING MATERIAL**
	IN-PLACE MOISTURE DENSITY TESTING
DENSITY METER:	**TROXLER 3440 - S/N 25869**
PROBE DEPTH:	**6 INCHES**
MAXIMUM PROCTOR DENSITY:	**129.6 PCF @ 9.5% MOISTURE**
COMPACTION REQUIREMENTS:	**90.0% OF MODIFIED PROCTOR DENSITY @ ≥ OPTIMUM MOISTURE**

Test Number	Date Tested	Coordinates North	Coordinates East	Lift No.	Moisture (%)	Dry Density (PCF)	Compaction (%)
426	6/11/97	11900	9300	12	10.4	120.0	93
427	6/10/97	12100	9100	12	10.7	119.7	92
428	6/10/97	12200	9200	12	9.8	118.2	91
429	6/11/97	12150	9250	12	12.8	120.5	93
430	6/11/97	11850	9250	13	10.7	123.0	95
431	6/11/97	12050	9050	13	11.2	124.0	96
432	6/11/97	12200	9300	13	9.7	123.5	95
433	6/11/97	11900	9300	14	13.0	124.3	96
434	6/11/97	12100	9100	14	11.7	118.6	92

Table 5

Summary of Pre-shipping Testing Results for Geomembrane Conformance Samples

TABLE 5

SUMMARY OF PRE-SHIPPING TESTING RESULTS
FOR
GEOMEMBRANE CONFORMANCE SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Roll Number	Sample Number*	Density (g/cc)	Tensile @ Break (lb./in.)	Elongation @ Break (%)	Carbon Black Content (%)	Carbon Black Disp.	Thickness Minimum (mil)	Thickness Average (mil)	Puncture Resistance (lbs)	Tear Resistance (lbs)	Dimen-sional Stability (%)	Environ. Stress Cracking (Hrs.)
SMOOTH												
01043506	1	.925	229	900	2.6	A-2	38.0	40.0	75	28	-.28	Pass
01043507	2	.925	231	900	2.6	A-2	39.0	40.0	74	31	-.18	Pass
01043508	3	.925	224	925	2.6	A-2	39.0	41.0	75	29	-.20	Pass
01043509	4	.925	224	938	2.6	A-2	39.0	41.0	76	31	-.02	Pass
01043510	5	.925	226	925	2.6	A-2	38.0	41.0	75	29	-.60	Pass
01043511	6	.924	219	950	2.5	A-2	38.0	41.0	80	29	-.42	Pass
01043512	7	.924	238	903	2.5	A-2	38.0	40.0	91	32	-.45	Pass
01043513	8	.925	236	911	2.5	A-2	38.0	40.0	85	31	-.38	Pass
01043514	9	.925	220	945	2.5	A-2	38.0	40.0	97	31	-.40	Pass
01043515	10	.925	239	924	2.3	A-2	38.0	40.0	84	30	-.40	Pass

R 001743

TABLE 5

SUMMARY OF PRE-SHIPPING TESTING RESULTS
FOR
GEOMEMBRANE CONFORMANCE SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Roll Number	Sample Number*	Density (g/cc)	Tensile @ Break (lb./in.)	Elongation @ Break (%)	Carbon Black Content (%)	Carbon Black Disp.	Thickness Minimum (mil)	Thickness Average (mil)	Puncture Resistance (lbs)	Tear Resistance (lbs)	Dimen-sional Stability (%)	Environ. Stress Cracking (Hrs.)
01043516	11	.925	230	877	2.3	A-2	38.0	40.0	80	31	-.48	Pass
01043517	12	.925	218	904	2.5	A-2	37.0	40.0	130	30	-.38	Pass
01043518	13	.925	224	892	2.5	A-2	38.0	40.0	77	31	-.12	Pass
01043519	14	.925	223	916	2.5	A-2	38.0	40.0	102	32	-.05	Pass
01043520	15	.925	223	872	2.5	A-2	39.0	40.0	71	30	-.18	Pass
01043521	16	.925	226	895	2.5	A-2	39.0	40.0	74	30	-.18	Pass
01043522	17	.925	231	913	2.5	A-2	39.0	40.0	66	29	-.15	Pass
01043523	18	.925	230	909	2.5	A-2	38.0	40.0	71	31	-.12	Pass
01043524	19	.925	228	938	2.5	A-2	39.0	40.0	75	30	-.05	Pass
01043525	20	.926	229	939	2.4	A-2	38.0	40.0	73	31	-.40	Pass
01043526	21	.926	240	915	2.4	A-2	39.0	41.0	87	32	-.30	Pass
01043527	22	.925	226	908	2.5	A-2	38.0	40.0	85	28	-.35	Pass
01043528	23	.925	234	899	2.5	A-2	38.0	40.0	90	32	-.48	Pass
01043529	24	.925	233	878	2.3	A-2	38.0	40.0	89	32	-.38	Pass
01043530	25	.925	236	942	2.3	A-2	38.0	40.0	82	32	-.52	Pass

R 001744

TABLE 5

SUMMARY OF PRE-SHIPPING TESTING RESULTS
FOR
GEOMEMBRANE CONFORMANCE SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Roll Number	Sample Number*	Density (g/cc)	Tensile @ Break (lb./in.)	Elongation @ Break (%)	Carbon Black Content (%)	Carbon Black Disp.	Thickness Minimum (mil)	Thickness Average (mil)	Puncture Resistance (lbs)	Tear Resistance (lbs)	Dimen-sional Stability (%)	Environ. Stress Cracking (Hrs.)
01043531	26	.924	214	892	2.6	A-2	38.0	40.0	85	31	-.35	Pass
01043532	27	.924	217	870	2.6	A-2	38.0	40.0	80	32	-.35	Pass
01043533	28	.926	216	871	2.7	A-2	38.0	40.0	89	33	-.12	Pass
01043534	29	.926	229	928	2.7	A-2	39.0	40.0	75	30	-.15	Pass
01043535	30	.926	215	860	2.7	A-2	39.0	40.0	77	30	-.12	Pass
01043536	31	.926	220	875	2.7	A-2	38.0	40.0	85	30	-.08	Pass
01043537	32	.926	214	872	2.7	A-2	38.0	40.0	78	30	-.05	Pass
01043538	33	.926	226	937	2.7	A-2	38.0	40.0	71	30	-.10	Pass
01043539	34	.926	230	940	2.7	A-2	38.0	40.0	82	30	-.10	Pass
01043540	35	.926	224	943	2.7	A-2	39.0	40.0	67	30	-.58	Pass
01043541	36	.925	229	926	2.8	A-2	38.0	40.0	75	31	-.58	Pass
01043542	37	.925	213	883	2.8	A-2	39.0	40.0	78	30	-.58	Pass
01043544	38	.925	210	882	2.7	A-2	38.0	40.0	75	30	-.38	Pass
01043545	39	.925	240	892	2.8	A-2	38.0	40.0	72	30	-.45	Pass
01043546	40	.925	265	922	2.8	A-2	38.0	40.0	74	34	-.40	Pass

R 001745

TABLE 5

SUMMARY OF PRE-SHIPPING TESTING RESULTS
FOR
GEOMEMBRANE CONFORMANCE SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Roll Number	Sample Number*	Density (g/cc)	Tensile @ Break (lb./in.)	Elongation @ Break (%)	Carbon Black Content (%)	Carbon Black Disp.	Thickness Minimum (mil)	Thickness Average (mil)	Puncture Resistance (lbs)	Tear Resistance (lbs)	Dimen-sional Stability (%)	Environ. Stress Cracking (Hrs.)
01043547	41	.925	243	909	2.8	A-2	38.0	40.0	66	34	-.40	Pass
01043549	42	.928	230	950	2.8	A-2	38.0	40.0	73	30	-.68	Pass
01043551	43	.928	229	932	2.8	A-2	39.0	41.0	76	32	-.52	Pass
01043552	44	.928	234	922	2.8	A-2	38.0	40.0	74	34	-.35	Pass
01043553	45	.928	243	934	2.7	A-2	38.0	40.0	71	35	-.58	Pass
01043554	46	.928	232	902	2.7	A-2	39.0	40.0	75	33	-.45	Pass
01043555	47	.928	221	922	2.7	A-2	38.0	40.0	78	33	-.52	Pass
01043589	48	.925	201	882	2.5	A-2	38.0	41.0	65	29	-.48	Pass
01043590	49	.925	217	888	2.5	A-2	39.0	40.0	72	31	-.45	Pass
01043591	50	.925	225	901	2.4	A-2	39.0	40.0	69	31	-.42	Pass
01043594	51	.925	225	872	2.3	A-2	39.0	40.0	75	31	-.50	Pass
01043595	52	.925	197	873	2.4	A-2	38.0	40.0	70	31	-.40	Pass
01043596	53	.925	214	945	2.4	A-2	38.0	40.0	70	29	-.50	Pass
01043597	54	.925	225	943	2.5	A-2	37.0	40.0	71	30	-.60	Pass
01043599	55	.925	214	934	2.4	A-2	39.0	40.0	69	30	-.45	Pass

R 001746

TABLE 5

SUMMARY OF PRE-SHIPPING TESTING RESULTS
FOR
GEOMEMBRANE CONFORMANCE SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Roll Number	Sample Number*	Density (g/cc)	Tensile @ Break (lb./in.)	Elongation @ Break (%)	Carbon Black Content (%)	Carbon Black Disp.	Thickness Minimum (mil)	Thickness Average (mil)	Puncture Resistance (lbs)	Tear Resistance (lbs)	Dimen-sional Stability (%)	Environ. Stress Cracking (Hrs.)
01043601	56	.925	234	926	2.4	A-2	38.0	40.0	77	31	-.48	Pass
01043602	57	.925	226	923	2.4	A-2	39.0	40.0	74	32	-.50	Pass
01043603	58	.925	231	932	2.5	A-2	38.0	40.0	74	32	-.38	Pass
01043604	59	.925	217	931	2.5	A-2	39.0	41.0	77	31	-.48	Pass
Average:		.925	226	911	2.56		38.3	40.1	78	31	-.36	
Project Requirements:		≥.915	≥110	≥625	2-3	A-1, A-2 B-1	≥36.0	≥40.0	≥48	≥24	+/- 2.0	1500

* Samples were tested by GSE Lining Technology, Inc. under the observation of TRI/Environmental, Inc., an independent laboratory testing company retained by BFI.

R 001747

Table 6

Summary of Laboratory Testing Results
for
Geomembrane Conformance Samples
Tested by TRI/Environmental, Inc.

TABLE 6

SUMMARY OF LABORATORY TESTING RESULTS FOR GEOMEMBRANE CONFORMANCE SAMPLES TESTED BY TRI/ENVIRONMENTAL, INC.

ZION SANITARY LANDFILL SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Roll Number	Sample Number	Density (g/cc)	Tensile @ Break (ppi) MD	Tensile @ Break (ppi) TD	Elongation @ Break (%) MD	Elongation @ Break (%) TD	Melt Index (g/10 min.)	Carbon Black Content (%)	Carbon Black Disp.	Low Temp. Brittleness
SMOOTH										
01043508	1	.928	221	223	882	958	.51	2.21	A-1	Pass
01043511	2		210	222	870	1004	.54			Pass
01043514	3		209	225	890	1015	.52			Pass
01043517	4		203	218	855	1021	.55			Pass
01043520	5		214	198	928	970	.49			Pass
01043523	6		214	222	847	907	.51			Pass
01043526	7		204	197	913	823	.49			Pass
01043529	8		199	194	871	815	.50			Pass
01043532	9		227	207	979	949				
01043535	10		214	211	902	926				
01043539	11		206	212	903	945				
01043542	12		223	235	937	945				
01043546	13		173	179	712	768				
01043549	14	.928	172	172	714	749	.50	2.13	A-1	Pass
01043553	15		182	182	722	753				
01043591	16		223	207	869	863				
01043594	17		195	205	760	900				
01043597	18		193	226	729	896				
Average:		.928	205	208	849	900	.51	2.17		
Project Requirements:		≥.915	≥110	≥110	≥625	≥625	≤1.0	2-3	A-1, A-2 B-1	Pass

Table 7

Summary of Geomembrane Panel Placement

TABLE 7

SUMMARY OF GEOMEMBRANE PANEL PLACEMENT

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Deployed	Panel Number	Roll Number	Panel Length (Ft).	Panel Width (Ft.)	Geomembrane Surface
6/10/97	1	C01043534	640	22.5	Smooth
6/10/97	2	A01043510	638	22.5	Smooth
6/11/97	3	D01043555	632	22.5	Smooth
6/11/97	4	C01043536	623	22.5	Smooth
6/11/97	5	C01043524	633	22.5	Smooth
6/11/97	6	D01043545	632	22.5	Smooth
6/11/97	7	C01043535	633	22.5	Smooth
6/12/97	8	C01043540	619	22.5	Smooth
6/13/97	9	A01043526	610	22.5	Smooth
6/13/97	10	C01043533	625	22.5	Smooth
6/13/97	11	A01043527	640	22.5	Smooth
6/13/97	12	A01043594	641	22.5	Smooth
6/13/97	13	A01043595	638	22.5	Smooth
6/13/97	14	C01043603	636	22.5	Smooth
6/13/97	15	A01043591	634	22.5	Smooth
6/13/97	16	C01043602	638	22.5	Smooth
6/13/97	17	C01043601	642	22.5	Smooth
6/17/97	18	C01043599	601	22.5	Smooth
6/17/97	19	A01043511	400	22.5	Smooth
6/17/97	20	A01043511	47	22.5	Smooth
6/17/97	21	A01043511	47	22.5	Smooth
6/17/97	22	A01043511	47	22.5	Smooth
6/17/97	23	A01043511	47	22.5	Smooth
6/17/97	24	A01043511	47	22.5	Smooth
6/17/97	25	C01043539	47	22.5	Smooth

TABLE 7

SUMMARY OF GEOMEMBRANE PANEL PLACEMENT

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Deployed	Panel Number	Roll Number	Panel Length (Ft).	Panel Width (Ft.)	Geomembrane Surface
6/17/97	26	C01043539	47	22.5	Smooth
6/17/97	27	C01043539	47	22.5	Smooth
6/17/97	28	C01043539	47	22.5	Smooth
6/17/97	29	C01043539	400	22.5	Smooth
6/17/97	30	C01043518	608	22.5	Smooth
6/17/97	31	C01043537	643	22.5	Smooth
6/17/97	32	A01043529	642	22.5	Smooth
6/17/97	33	A01043516	643	22.5	Smooth
6/17/97	34	D01043553	645	22.5	Smooth
6/17/97	35	C01043520	643	22.5	Smooth
6/17/97	36	.D01043544	642	22.5	Smooth
6/17/97	37	A01043528	645	22.5	Smooth
6/17/97	38	B01043509	638	22.5	Smooth
6/18/97	39	C01043517	631	22.5	Smooth
6/18/97	40	A01043525	633	22.5	Smooth
6/18/97	41	A01043531	635	22.5	Smooth
6/18/97	42	C01043507	634	22.5	Smooth
6/18/97	43	A01043513	637	22.5	Smooth
6/18/97	44	A01043590	642	22.5	Smooth
6/18/97	45	A01043604	641	22.5	Smooth
6/18/97	46	D01043546	640	22.5	Smooth
6/18/97	47	D01043547	640	22.5	Smooth
6/18/97	48	C01043523	640	22.5	Smooth
6/18/97	49	C01043522	632	22.5	Smooth
6/18/97	50	C01043519	530	22.5	Smooth

TABLE 7

SUMMARY OF GEOMEMBRANE PANEL PLACEMENT

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Deployed	Panel Number	Roll Number	Panel Length (Ft).	Panel Width (Ft.)	Geomembrane Surface
6/18/97	51	C01043519	93	22.5	Smooth
6/18/97	52	C01043554	622	22.5	Smooth
6/19/97	53	B01043508	85	22.5	Smooth
6/19/97	54	B01043508	87	22.5	Smooth
6/19/97	55	B01043508	176	22.5	Smooth
6/19/97	56	B01043508	179	22.5	Smooth
6/19/97	57	C01043538	185	22.5	Smooth
6/19/97	58	C01043538	182	22.5	Smooth
6/19/97	59	C01043538	182	22.5	Smooth
6/23/97	60	C01043538	70	22.5	Smooth
6/23/97	61	C01043521	72	22.5	Smooth
6/23/97	62	C01043521	72	22.5	Smooth
6/23/97	63	C01043521	70	22.5	Smooth
6/23/97	64	C01043521	68	22.5	Smooth
6/23/97	65	C01043521	69	22.5	Smooth
6/23/97	66	C01043521	70	22.5	Smooth
6/23/97	67	C01043521	72	22.5	Smooth
6/23/97	68	C01043521	72	22.5	Smooth
6/23/97	69	D01043541	71	22.5	Smooth
6/23/97	70	D01043541	72	22.5	Smooth
6/23/97	71	D01043541	69	22.5	Smooth
6/23/97	72	D01043541	68	22.5	Smooth
6/23/97	73	D01043541	69	22.5	Smooth
6/23/97	74	D01043541	68	22.5	Smooth
6/23/97	75	D01043541	69	22.5	Smooth

TABLE 7

SUMMARY OF GEOMEMBRANE PANEL PLACEMENT

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Deployed	Panel Number	Roll Number	Panel Length (Ft).	Panel Width (Ft.)	Geomembrane Surface
6/23/97	76	D01043541	72	22.5	Smooth
6/23/97	77	C01043514	380	22.5	Smooth
6/24/97	78	C01043514	256	22.5	Smooth
6/24/97	79	C01043530	127	22.5	Smooth
6/24/97	80	C01043530	386	22.5	Smooth
6/24/97	81	C01043530	119	22.5	Smooth
6/24/97	82	A01043596	269	22.5	Smooth
6/24/97	83	A01043596	370	22.5	Smooth
6/24/97	83A	D01043541	18	22.5	Smooth
6/24/97	84	A01043589	520	22.5	Smooth
6/24/97	85	A01043589	118	22.5	Smooth
6/24/97	86	D01043542	402	22.5	Smooth
6/24/97	87	D01043542	231	22.5	Smooth
6/24/97	88	D01043549	274	22.5	Smooth
6/24/97	89	D01043549	234	22.5	Smooth
6/24/97	90	D01043549	129	22.5	Smooth
6/24/97	91	C01043532	144	22.5	Smooth
6/24/97	92	C01043532	492	22.5	Smooth
6/24/97	92A	C01043521	17	22.5	Smooth
6/24/97	93	D01043551	505	22.5	Smooth
6/26/97	94	D01043551	104	22.5	Smooth
6/27/97	95	D01043550	404	22.5	Smooth
6/27/97	96	D01043550	225	22.5	Smooth
6/27/97	97	A01043512	283	22.5	Smooth
6/27/97	98	A01043512	352	22.5	Smooth

TABLE 7

SUMMARY OF GEOMEMBRANE PANEL PLACEMENT

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Deployed	Panel Number	Roll Number	Panel Length (Ft).	Panel Width (Ft.)	Geomembrane Surface
6/27/97	99	A01043515	161	22.5	Smooth
6/27/97	100	A01043515	473	22.5	Smooth
6/27/97	100A	C01043597	28	22.5	Smooth
6/27/97	101	C01043597	500	22.5	Smooth
6/27/97	102	C01043597	99	22.5	Smooth
6/27/97	103	D01043552	397	22.5	Smooth
6/27/97	104	D01043552	225	22.5	Smooth
6/27/97	105	B01043506	279	22.5	Smooth

Table 8

Summary of Geomembrane Seaming

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop
6/10/97	1-2	315	1241	BN	3:05	4:30
6/10/97	1-2	325	1237	JP	3:05	4:30
6/11/97	2-3	632	1151	CS	8:50	10:24
6/11/97	3-4	623	1237	JP	9:05	11:00
6/11/97	4-5	282	1241	BN	11:10	1:15
6/11/97	4-5	338	1151	CS	10:35	11:26
6/11/97	5-6	381	1237	JP	11:20	12:10
6/11/97	5-6	287	1151	CS	11:35	1:10
6/12/97	6-7	231	1151	CS	9:30	10:00
6/12/97	6-7	406	1241	BN	10:20	11:15
6/12/97	7-8	314	1151	CS	10:25	11:05
6/12/97	7-8	314	1151	CS	11:35	12:20
6/13/97	8-9	314	1219	KEO	7:30	8:07
6/13/97	8-9	296	1237	JP	7:20	8:30
6/13/97	9-10	303	1151	CS	8:00	8:42
6/13/97	9-10	307	1241	BN	8:00	8:45
6/13/97	10-11	315	1291	KEO	8:20	9:00
6/13/97	10-11	298	1237	JP	8:50	9:55
6/13/97	11-12	326	1241	BN	9:00	9:45
6/13/97	11-12	301	1151	CS	9:00	9:45
6/13/97	12-13	314	1291	KEO	9:00	9:45
6/13/97	12-13	323	1241	BN	9:00	10:05
6/13/97	13-14	337	1237	JP	10:30	11:35
6/13/97	13-14	302	1151	CS	10:05	10:45

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop
6/13/97	14-15	319	1241	BN	11:00	11:20
6/13/97	14-15	313	1219	KEO	10:40	11:25
6/13/97	15-16	307	1151	CS	11:00	11:55
6/13/97	15-16	332	1237	JP	11:40	12:08
6/13/97	16-17	122	1219	KEO	12:10	12:27
6/13/97	16-17	85	1151	CS	12:15	12:25
6/13/97	16-17	221	1241	BN	12:10	12:47
6/13/97	16-17	215	1237	JP	12:13	12:38
6/17/97	18-19	245	1151	CS	9:25	9:52
6/17/97	18-19	151	1219	KEO	9:30	9:45
6/17/97	18-20	23	1219	KEO	10:02	10:04
6/17/97	1-18	22	555	KK	Extruded Seam	
6/17/97	2-19	22	555	KK	Extruded Seam	
6/17/97	Note 1	88	555	KK	Extruded Seam	
6/17/97	7-34	12	555	KK	Extruded Seam	
6/17/97	19-20	23	1151	CS	10:02	10:04
6/17/97	20-21	47	1151	CS	10:25	10:32
6/17/97	18-21	23	1219	KEO	10:27	10:29
6/17/97	18-22	23	1219	KEO	10:32	10:35
6/17/97	21-22	47	1151	CS	10:34	10:40
6/17/97	18-23	23	1219	KEO	10:39	10:42
6/17/97	22-23	47	1151	CS	10:42	10:48
6/17/97	18-24	23	1219	KEO	10:33	10:55
6/17/97	23-24	47	1151	CS	11:07	11:13
6/17/97	18-25	23	1219	KEO	11:09	11:11

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time	
					Start	Stop
6/17/97	24-25	47	1219	KEO	11:09	11:12
6/17/97	18-26	23	1219	KEO	11:13	11:18
6/17/97	25-26	47	1511	CS	11:18	11:23
6/17/97	18-27	23	1219	KEO	11:27	11:29
6/17/97	26-27	47	1151	CS	11:33	11:39
6/17/97	18-28	23	1219	KEO	11:32	11:34
6/17/97	27-28	47	1219	KEO	11:36	11:42
6/17/97	20-29	23	1151	CS	11:58	12:00
6/17/97	19-29	400	1241	BN	1:10	2:10
6/17/97	29-30	208	1511	CS	1:55	2:19
6/17/97	Note 2	65	1219	KEO	1:30	1:42
6/17/97	25-30	22	1219	KEO	2:11	2:14
6/17/97	24-30	23	1219	KEO	2:20	2:23
6/17/97	29-30	192	1237	JP	1:30	2:40
6/17/97	30-31	212	1241	BN	2:30	2:59
6/17/97	30-31	389	1151	CS	2:30	3:30
6/17/97	23-30	23	1219	KEO	2:00	2:03
6/17/97	22-30	23	1219	KEO	2:35	2:37
6/17/97	31-32	266	1237	JP	2:50	3:15
6/17/97	21-30	22	1219	KEO	2:42	2:44
6/17/97	20-30	22	1219	KEO	2:48	2:50
6/17/97	31-32	328	1219	KEO	2:59	4:12
6/17/97	32-33	271	1241	BN	3:35	4:15
6/17/97	32-33	273	1151	CS	3:35	4:14
6/17/97	33-34	295	1219	KEO	3:47	4:31

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop
6/17/97	33-34	300	1237	JP	3:50	4:30
6/17/97	34-35	300	1241	BN	4:30	5:07
6/17/97	34-35	317	1151	CS	4:31	5:15
6/17/97	35-36	339	1237	JP	4:50	5:23
6/17/97	35-36	301	1219	KEO	4:50	5:30
6/17/97	36-37	337	1151	CS	5:20	6:15
6/17/97	36-37	307	1241	BN	5:25	5:59
6/17/97	37-38	318	1237	JP	5:50	6:16
6/17/97	37-38	327	1219	KEO	5:50	6:17
6/17/97	7-33	23	223	KK	Extruded Seam	
6/17/97	8-34	23	223	KK	Extruded Seam	
6/17/97	8-35	17	223	KK	Extruded Seam	
6/17/97	9-35	23	223	KK	Extruded Seam	
6/17/97	Note 3	10	223	KK	Extruded Seam	
6/18/97	38-39	404	1237	JP	7:30	8:34
6/18/97	39-40	333	1241	BN	8:02	8:38
6/18/97	39-40	298	1151	CS	8:10	8:39
6/18/97	38-39	226	1219	KEO	8:36	8:54
6/18/97	40-41	345	1237	JP	8:44	9:23
6/18/97	41-42	339	1241	BN	9:04	9:38
6/18/97	40-41	289	1151	CS	8:50	9:20
6/18/97	41-42	297	1219	KEO	9:10	9:39
6/18/97	Note 4	59	555	KK	Extruded Seam	
6/18/97	Note 5	44	555	KK	Extruded Seam	
6/18/97	Note 6	70	555	KK	Extruded Seam	

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop
6/18/97	42-43	336	1237	JP	9:30	10:15
6/18/97	44-45	90	1151	CS	12:00	12:10
6/18/97	42-43	296	1151	CS	9:50	10:35
6/18/97	44-45	181	1151	CS	11:20	12:00
6/18/97	44-45	285	1241	BN	11:10	12:00
6/18/97	44-45	86	1241	BN	1:20	1:35
6/18/97	17-44	341	1237	JP	10:50	12:00
6/18/97	17-44	300	1237	JP	1:00	2:10
6/18/97	46-47	325	1151	CS	2:05	2:30
6/18/97	46-47	315	1237	JP	2:15	3:00
6/18/97	45-46	356	1241	BN	2:05	2:50
6/18/97	45-46	283	1151	CS	1:25	1:55
6/18/97	43-48	187	1237	JP	3:35	3:50
6/18/97	43-48	218	1241	BN	3:35	4:01
6/18/97	43-48	235	1151	CS	3:35	4:03
6/18/97	48-49	179	1237	JP	4:05	4:37
6/18/97	48-49	227	1241	BN	4:15	4:40
6/18/97	48-49	233	1151	CS	4:15	4:40
6/18/97	49-50	99	1237	JP	4:55	5:15
6/18/97	49-50	214	1241	BN	5:05	5:30
6/18/97	49-50	227	1151	CS	4:55	5:16
6/18/97	50-51	23	1237	JP	5:15	5:17
6/18/97	49-51	92	1237	JP	5:22	5:30
6/18/97	51-52	93	1237	JP	5:46	6:07
6/18/97	50-52	221	1151	CS	5:42	6:08

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop
6/18/97	50-52	204	1241	BN	5:47	6:16
6/18/97	50-52	197	1237	JP	6:12	6:31
6/19/97	Note 7	90	555	KK	Extruded Seam	
6/19/97	31-32	49	1237	JP	3:00	3:05
6/19/97	33-34	50	1237	JP	3:45	3:53
6/19/97	32-33	42	1151	CS	3:40	3:45
6/19/97	34-35	25	1237	JP	4:00	4:05
6/19/97	18-53	22	555	KK	Extruded Seam	
6/19/97	Note 8	85	1219	KEO	4:00	4:15
6/19/97	53-54	87	1151	CS	4:00	4:15
6/19/97	Note 9	39	1237	JP	4:15	4:20
6/19/97	54-55	87	1219	KEO	4:20	4:29
6/19/97	55-56	176	1151	CS	4:23	4:40
6/19/97	34-55	22	1237	JP	4:23	4:26
6/19/97	33-55	22	1237	JP	4:26	4:30
6/19/97	32-55	22	1237	JP	4:30	4:35
6/19/97	31-55	22	1237	JP	4:35	4:40
6/19/97	56-57	176	1219	KEO	4:30	4:57
6/19/97	57-58	185	1151	CS	4:48	5:06
6/19/97	58-59	182	1237	JP	5:12	5:30
6/23/97	59-60	70	1151	CS	1:14	1:27
6/23/97	60-61	70	1237	JP	1:15	1:24
6/23/97	61-62	72	1219	KEO	1:15	1:31
6/23/97	62-63	70	1241	BN	1:21	1:36
6/23/97	63-64	68	1237	JP	1:30	1:46

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop
6/23/97	64-65	68	1241	BN	1:34	1:50
6/23/97	65-66	69	1237	JP	1:45	2:06
6/23/97	66-67	70	1151	CS	1:50	2:05
6/23/97	67-68	72	1241	BN	1:55	2:11
6/23/97	68-69	71	1237	JP	2:21	2:32
6/23/97	69-70	71	1241	BN	2:30	2:45
6/23/97	70-71	69	1237	JP	2:38	2:51
6/23/97	71-72	68	1151	CS	2:40	2:51
6/23/97	72-73	68	1219	KEO	2:46	2:57
6/23/97	73-74	68	1241	BN	3:00	3:13
6/23/97	74-75	68	1237	JP	3:30	3:43
6/23/97	75-76	69	1241	BN	3:40	3:53
6/23/97	Note 10	180	1237	JP	4:00	4:39
6/23/97	Note 11	200	1219	KEO	3:00	3:53
6/24/97	59-77	20	146	SV	Extruded Seam	
6/24/97	77-78	180	1237	JP	7:00	7:13
6/24/97	77-78	76	1219	KEO	7:00	7:15
6/24/97	78-79	22	1237	JP	7:13	7:16
6/24/97	77-79	127	1237	JP	7:16	7:35
6/24/97	78-80	175	1219	KEO	7:18	7:30
6/24/97	78-80	82	1241	BN	7:23	7:34
6/24/97	79-80	129	1241	BN	7:34	7:51
6/24/97	80-81	119	1219	KEO	7:32	7:43
6/24/97	81-82	22	1237	JP	7:42	7:46
6/24/97	Note 12	66	1151	CS	7:37	7:45

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time	
					Start	Stop
6/24/97	80-82	269	1237	JP	7:51	8:22
6/24/97	81-83	119	1219	KEO	7:46	7:56
6/24/97	82-83	251	1241	BN	7:59	8:30
6/24/97	83-84	172	1219	KEO	8:32	8:50
6/24/97	59-83	22	1151	CS	8:05	8:10
6/24/97	Note 13	135	1151	CS	8:45	9:55
6/24/97	34-84	20	1151	CS	9:55	10:00
6/24/97	34-84	11	146	SV	Extruded Seam	
6/24/97	83-84	213	1237	JP	8:39	8:58
6/24/97	83-83A	22	1237	JP	9:00	9:10
6/24/97	83A-84	18	1237	JP	9:10	9:18
6/24/97	82-83A	18	1237	JP	9:19	9:23
6/24/97	84-85	118	1151	CS	10:10	10:26
6/24/97	85-86	22	1219	KEO	11:09	11:13
6/24/97	84-86	257	1241	BN	10:02	10:34
6/24/97	85-87	106	1151	CS	10:29	10:42
6/24/97	86-87	125	1219	KEO	10:46	11:01
6/24/97	84-86	27	1219	KEO	10:22	10:41
6/24/97	86-88	274	1237	JP	10:39	11:12
6/24/97	87-89	234	1151	CS	11:00	11:23
6/24/97	87-88	22	1237	JP	11:18	11:23
6/24/97	88-91	144	1241	BN	11:06	11:30
6/24/97	90-91	22	1241	BN	11:31	11:34
6/24/97	88-90	129	1241	BN	11:34	11:46
6/24/97	91-92	128	1237	JP	11:30	11:46

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop
6/24/97	90-92	130	1237	JP	11:46	12:00
6/24/97	89-92	234	1151	CS	11:30	11:54
6/24/97	89-90	22	1219	KEO	11:20	11:25
6/24/97	91-92A	18	1241	BN	1:44	1:49
6/24/97	92-92A	22	1241	BN	1:49	1:53
6/24/97	92A-93	18	1241	BN	1:53	1:56
6/24/97	92-93	240	1219	KEO	1:36	2:06
6/24/97	92-93	248	1241	BN	1:56	2:35
6/24/97	Note 14	68	1151	CS	2:30	2:45
6/24/97	Note 15	51	555	KK	Extruded Seam	
6/24/97	40-93	22	1151	CS	2:46	2:50
6/27/97	93-94	104	1151	CS	7:10	7:23
6/27/97	93-95	229	1237	JP	7:11	7:40
6/27/97	93-95	175	1219	SP	7:18	7:31
6/27/97	94-96	104	1151	CS	7:24	7:38
6/27/97	95-96	121	1219	SP	7:50	8:06
6/27/97	95-97	223	1241	BN	7:26	8:00
6/27/97	96-98	229	1151	CS	7:50	8:15
6/27/97	97-98	123	1237	JP	8:44	9:00
6/27/97	94-95	22	1151	CS	7:40	7:43
6/27/97	96-97	22	1219	SP	7:39	7:45
6/27/97	98-99	22	1237	JP	8:39	8:43
6/27/97	97-99	161	1237	JP	7:50	8:12
6/27/97	98-100	78	1241	BN	8:44	8:56
6/27/97	99-100	133	1241	BN	8:29	8:44

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time	
					Start	Stop
6/27/97	100-100A	22	1241	BN	8:15	8:19
6/27/97	99-100A	28	1241	BN	8:20	8:27
6/27/97	100A-101	27	1237	JP	9:40	9:43
6/27/97	98-100	262	1219	SP	8:15	8:39
6/27/97	100-101	255	1151	CS	8:15	8:55
6/27/97	101-102	99	1219	SP	8:50	9:00
6/27/97	101-103	160	1219	SP	9:00	9:19
6/27/97	102-103	22	1151	CS	9:21	9:25
6/27/97	102-104	106	1151	CS	9:25	9:35
6/27/97	103-104	119	1151	CS	9:00	9:13
6/27/97	100-101	218	1237	JP	9:00	9:40
6/27/97	101-103	237	1241	BN	9:11	9:37
6/27/97	104-105	22	1219	SP	9:26	9:30
6/27/97	103-105	42	1219	SP	9:19	9:24
6/27/97	103-105	237	1237	JP	10:00	10:21
6/27/97	Note 16	76	555	KK	Extruded Seam	
6/27/97	Note 17	86	555	KK	Extruded Seam	
6/27/97	Note 18	21	555	KK	Extruded Seam	

TABLE 8

SUMMARY OF GEOMEMBRANE SEAMING

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

Date Seamed	Seam Number	Seam Length	Machine Number	Welder Initials	Time Start	Time Stop

Notes:

(1) Smooth Panel Nos. 3 thru 6, with Smooth Panel Nos. 29 thru 32
(2) Smooth Panel Nos. 26 thru 28, with Smooth Panel No. 30
(3) Smooth Panel Nos. 10, with Smooth Panel Nos. 35 and 36
(4) Smooth Panel Nos. 11 and 12, with Smooth Panel Nos. 36 thru 38
(5) Smooth Panel Nos. 13 and 14, with Smooth Panel Nos. 39 and 40
(6) Smooth Panel Nos. 15 thru 17, with Smooth Panel Nos. 41 thru 43
(7) Smooth Panel Nos. 44 thru 47, with Smooth Panel Nos. 48, 49, 51 and 52
(8) Smooth Panel No. 53, with Smooth Panel Nos. 28 and 30
(9) Smooth Panel No. 31, with Smooth Panel Nos. 53 and 54
(10) Smooth Panel No. 77, with Smooth Panel Nos. 60 thru 67
(11) Smooth Panel No. 77, with Smooth Panel Nos. 68 thru 76
(12) Smooth Panel No. 59, with Smooth Panel Nos. 78, 80 and 81
(13) Smooth Panel No. 84, with Smooth Panel Nos. 55 thru 59
(14) Smooth Panel Nos. 37 thru 39, with Smooth Panel Nos. 87, 89 and 92
(15) Smooth Panel Nos. 35 and 36, with Smooth Panel Nos. 84 and 85
(16) Smooth Panel Nos. 41 thru 43, with Smooth Panel Nos. 94, 96 and 98
(17) Smooth Panel Nos. 48 thru 50, with Smooth Panel Nos. 98 and 100 thru 102
(18) Smooth Panel No. 52, with Smooth Panel No. 104

Table 9

Summary of Field Testing Results
for
Geomembrane Preweld Seam Samples

TABLE 9

SUMMARY OF FIELD TESTING RESULTS
FOR
GEOMEMBRANE PREWELD SEAM SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE FINAL CLOSURE

FEBRUARY 1998

SINGLE EXTRUSION WELD

Preweld Number*	Date Sampled	Machine Number	Welder Initials	Time AM/PM	Ambient Temp. (°F)	Maximum Tension (ppi)	
						Peel	Shear
PW-1	6/11/97	223	KK	AM	68	61	85
PW-2	6/11/97	146	SV	AM	70	64	73
PW-3	6/12/97	555	JP	AM	70	62	65
PW-4	6/12/97	223	KK	AM	70	63	65
PW-5	6/12/97	146	SV	AM	70	61	62
PW-6	6/12/97	555	JP	PM	75	61	62
PW-7	6/12/97	223	KK	PM	75	61	65
PW-8	6/13/97	146	SV	AM	72	68	77
PW-9	6/13/97	555	KK	AM	72	64	66
PW-10	6/14/97	146	SV	AM	58	70	75
PW-11	6/14/97	555	KK	AM	58	71	73
PW-12	6/17/97	555	KK	AM	60	69	72
PW-13	6/17/97	146	SV	AM	60	71	72
PW-14	6/17/97	555	KK	PM	70	61	64
PW-15	6/18/97	146	SV	AM	60	71	74
PW-16	6/18/97	555	KK	PM	75	67	68
PW-17	6/18/97	146	SV	PM	75	66	66
PW-18	6/19/97	146	SV	AM	74	62	64
PW-19	6/19/97	555	KK	AM	74	61	60
PW-20	6/19/97	294	TAM	AM	74	65	69

TABLE 9

SUMMARY OF FIELD TESTING RESULTS
FOR
GEOMEMBRANE PREWELD SEAM SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE FINAL CLOSURE

FEBRUARY 1998

SINGLE EXTRUSION WELD

Preweld Number*	Date Sampled	Machine Number	Welder Initials	Time AM/PM	Ambient Temp. (°F)	Maximum Tension (ppi)	
						Peel	Shear
PW-21	6/19/97	182	SP	AM	74	60	62
PW-22	6/19/97	223	TS	AM	74	65	66
PW-23	6/19/97	146	SV	PM	93	68	70
PW-24	6/20/97	555	KK	AM	72	63	65
PW-25	6/20/97	146	SV	AM	72	63	66
PW-26	6/24/97	146	SV	AM	80	59	61
PW-27	6/24/97	555	KK	AM	80	65	67
PW-28	6/24/97	146	SV	PM	95	65	65
PW-29	6/24/97	555	KK	PM	95	65	63
PW-30	6/26/97	555	KK	AM	80	67	68
PW-31	6/26/97	146	SV	AM	80	65	66
PW-32	6/26/97	223	SP	AM	84	62	62
PW-33	6/26/97	294	ST	PM	84	60	62
PW-34	6/26/97	146	SV	PM	84	62	63
PW-35	6/26/97	555	KK	PM	84	60	61
PW-36	6/27/97	294	SV	AM	72	64	63
PW-37	6/27/97	555	KK	AM	72	65	65
PW-38	6/27/97	555	KK	PM	80	64	65
PW-39	6/27/97	294	SV	PM	80	65	64
PW-40	6/28/97	555	KK	AM	73	64	65

TABLE 9

SUMMARY OF FIELD TESTING RESULTS
FOR
GEOMEMBRANE PREWELD SEAM SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE FINAL CLOSURE

FEBRUARY 1998

SINGLE EXTRUSION WELD

Preweld Number*	Date Sampled	Machine Number	Welder Initials	Time AM/PM	Ambient Temp. (°F)	Maximum Tension (ppi) Peel	Shear
PW-41	6/28/97	294	SV	AM	73	64	64
PW-42	6/30/97	555	KK	AM	74	66	69
PW-43	7/3/97	555	KK	AM	65	61	65
Average:					**74**	**64**	**67**
Project Requirements:						**≥54**	**≥60**

*Samples were tested in the field with GSE's Tensiometer.

TABLE 9

SUMMARY OF FIELD TESTING RESULTS
FOR
GEOMEMBRANE PREWELD SEAM SAMPLES

ZION SANITARY LANDFILL
SITE 1 - PHASE A FINAL CLOSURE

FEBRUARY 1998

DOUBLE TRACK FUSION WELD

Preweld Number*	Date Sampled	Machine Number	Welder Initials	Time AM/PM	Ambient Temp. (°F)	Maximum Tension (ppi) Peel I	Peel O	Shear
PW-1	6/10/97	1241	BN	PM	79	57	57	70
PW-2	6/10/97	1237	JP	PM	79	63	61	68
PW-3	6/11/97	1237	JP	AM	65	68	70	80
PW-4	6/11/97	1151	CS	AM	65	65	66	70
PW-5	6/11/97	1241	BN	AM	78	60	64	61
PW-6	6/12/97	1151	CS	AM	70	65	66	67
PW-7	6/12/97	1241	BN	AM	70	62	61	61
PW-8	6/13/97	1241	BN	AM	72	66	64	67
PW-9	6/13/97	1237	JP	AM	72	65	63	70
PW-10	6/13/97	1219	KEO	AM	72	69	68	68
PW-11	6/13/97	1151	CS	AM	72	70	72	79
PW-12	6/17/97	1219	KEO	AM	60	72	72	74
PW-13	6/17/97	1237	JP	AM	60	75	74	74
PW-14	6/17/97	1151	CS	AM	60	77	77	79
PW-15	6/17/97	1241	BN	AM	60	77	77	80
PW-16	6/17/97	1219	KEO	PM	70	69	65	65
PW-17	6/17/97	1151	CS	PM	70	63	66	67
PW-18	6/17/97	1241	BN	PM	70	66	64	65
PW-19	6/17/97	1237	JP	PM	70	60	63	65
PW-20	6/17/97	970-211	KEO	PM	70	68	71	72

Appendix E-6

Analytical Results from Recent Leachate Sampling

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

November 18, 2020

Mr. Dan Otzelberger
REPUBLIC SERVICES (Zion)
ADS ZION LANDFILL
701 Green Bay Road
Zion, IL 60099

Project ID: Zion LF 2020 Q4
First Environmental File ID: 20-5965
Date Received: October 22, 2020

Dear Mr. Dan Otzelberger:

The above referenced project was analyzed as directed on the enclosed chain of custody record.

All Quality Control criteria as outlined in the methods and current IL ELAP/NELAP have been met unless otherwise noted. QA/QC documentation and raw data will remain on file for future reference. Our accreditation number is 100292 and our current certificate is number 1002922020-7: effective 06/24/2020 through 02/28/2021.

I thank you for the opportunity to be of service to you and look forward to working with you again in the future. Should you have any questions regarding any of the enclosed analytical data or need additional information, please contact me at (630) 778-1200.

Sincerely,

Neal Cleghorn
Project Manager

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Case Narrative

REPUBLIC SERVICES (Zion)
Project ID: **Zion LF 2020 Q4**

Lab File ID: **20-5965**
Date Received: **October 22, 2020**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The results in this report apply to the samples in the following table:

Laboratory Sample ID	Client Sample Identifier	Date/Time Collected
20-5965-002	1A Tank	10/22/20 9:30
20-5965-005	Trip Blank #2	

Sample Batch Comments:

Sample acceptance criteria were met.

Method Comments

Lab Number	Sample ID	Comments:
20-5965-002	1A Tank	*Total Metals* Chemical preservation pH adjusted in lab.
20-5965-002	1A Tank	*Polychlorinated biphenyls (PCBs)* 1 of 2 surrogate recoveries outside control limits; low bias due to matrix interference.
20-5965-002	1A Tank	*TCLP Pesticides Method 1311* 1 of 2 surrogate recoveries outside control limits; low bias due to matrix interference.
20-5965-002	1A Tank	*Percent Ash* Sample was initially set within HT; Confirming analysis required.
20-5965-002	1A Tank	*TCLP Extraction* Sample is a filterable liquid waste material.
20-5965-002	1A Tank	*TCLP ZHE Preparation* Sample is a filterable liquid waste material.
20-5965-002	1A Tank	*Total Solids* Sample was initially set within HT; Confirming analysis required.

The following analyses have been subcontracted to the indicated laboratory:

Analysis	Subcontractor:
Non-Halogenated Organic	*KEYSTONE LABORATORIES, INC. Newton, IA*
TCLP Herbicides Method 1311	*STAT ANALYSIS CORP. Chicago, IL*

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Case Narrative

REPUBLIC SERVICES (Zion)
Project ID: **Zion LF 2020 Q4**

Lab File ID: **20-5965**
Date Received: **October 22, 2020**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The following is a definition of flags that may be used in this report:

Flag	Description	Flag	Description
A	Method holding time is 15 minutes from collection. Lab analysis was performed as soon as possible.		
B	Analyte was found in the method blank.	L	LCS recovery outside control limits.
<	Analyte not detected at or above the reporting limit.	M	MS recovery outside control limits; LCS acceptable.
C	Sample received in an improper container for this test	P	Chemical preservation pH adjusted in lab.
D	Surrogates diluted out; recovery not available.	Q	Result was determined by a GC/MS database search.
E	Estimated result; concentration exceeds calibration range.	S	Analysis was subcontracted to another laboratory.
G	Surrogate recovery outside control limits.	T	Result is less than three times the MDL value.
H	Analysis or extraction holding time exceeded.	W	Reporting limit elevated due to sample matrix.
J	Estimated result; concentration is less than routine RL but greater than MDL.	N	Analyte is not part of our NELAC accreditation or accreditation may not be available for this parameter.
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF 2020 Q4
Sample ID: 1A Tank
Sample No: 20-5965-002

Date Collected: 10/22/20
Time Collected: 9:30
Date Received: 10/22/20
Date Reported: 11/18/20

Analyte	Result	R.L.	Units	Flags
Ammonia (as N)	**Method: 350.1R2.0**			
Analysis Date: 10/28/20				
Ammonia (as N)	1,390	5	mg/L	
Percent Ash	**Method: 2540G/E**			
Analysis Date: 10/30/20				
Percent Ash	7.41	0.01	mg/L	N
COD	**Method: 5220D 1997**			
Analysis Date: 10/28/20				
COD	1,800	40	mg/L	
Cyanide, Reactive	**Method: 7.3.3.2.**			
Analysis Date: 10/29/20				
Cyanide, Reactive	< 10	10	mg/L	
Flash Point - Closed Cup	**Method: 1010**			
Analysis Date: 10/30/20				
Flash Point - Closed Cup	No flash @		212 °F	
Fluoride	**Method: 4500F,C 1997**			
Analysis Date: 11/03/20				
Fluoride	0.70	0.50	mg/L	
Nitrate (as N)	**Method: 353.2R2.0**			
Analysis Date: 10/23/20				
Nitrate (as N)	< 5.00	5	mg/L	
Oil (Hexane soluble)	**Method: 1664B 2010**			
Analysis Date: 11/05/20				
Oil (Hexane soluble)	< 20	20	mg/L	P
Phenols	**Method: 420.1**			
Analysis Date: 11/04/20				
Phenols	150	100	ug/L	
Sulfide, Reactive	**Method: 7.3.4.2.**			
Analysis Date: 10/26/20				
Sulfide, Reactive	< 10	10	mg/L	
Total Solids	**Method: 2540B 1997**			
Analysis Date: 10/30/20				
Total Solids	8,850	10	mg/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF 2020 Q4
Sample ID: 1A Tank
Sample No: 20-5965-002

Date Collected: 10/22/20
Time Collected: 9:30
Date Received: 10/22/20
Date Reported: 11/18/20

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 10/29/20				
Acetone	731	500	ug/L	
Benzene	< 20.0	20	ug/L	
2-Butanone (MEK)	259	100	ug/L	
Carbon disulfide	< 20.0	20	ug/L	
Carbon tetrachloride	< 20.0	20	ug/L	
Chlorobenzene	< 20.0	20	ug/L	
Cyclohexanone	< 10.0	10.0	ug/L	
Ethyl acetate	< 200	200	ug/L	
Ethylbenzene	< 20.0	20	ug/L	
Ethyl Ether	< 5.0	5.0	ug/L	
4-Methyl-2-pentanone (MIBK)	< 100	100	ug/L	
Methylene chloride	< 40.0	40	ug/L	
Tetrachloroethene	< 20.0	20	ug/L	
Toluene	< 20.0	20	ug/L	
1,1,1-Trichloroethane	< 20.0	20	ug/L	
1,1,2-Trichloroethane	< 20.0	20	ug/L	
Trichloroethene	< 20.0	20	ug/L	
Trichlorofluoromethane	< 20.0	20	ug/L	
Xylene, Total	< 20.0	20	ug/L	
Semi-Volatile Compounds **Method: 8270C**		**Preparation Method 3510C**		
Analysis Date: 10/30/20		Preparation Date: 10/27/20		
1,2-Dichlorobenzene	< 50	50	ug/L	
2-Methylphenol	< 500	500	ug/L	
3 & 4-Methylphenol	< 500	500	ug/L	
Nitrobenzene	< 100	100	ug/L	
Pyridine	< 500	500	ug/L	
Non-Halogenated Organic Compounds **Method: 8015B**				
Analysis Date: 11/06/20				
n-Butanol	< 1,000	1000	ug/L	NS
2-Butoxyethanol	< 1,000	1000	ug/L	NS
Isobutanol	< 1,000	1000	ug/L	NS
Methanol	9,600	1000	ug/L	NS
Total Metals **Method: 6010C**		**Preparation Method 3010A**		
Analysis Date: 10/28/20		Preparation Date: 10/27/20		
Iron	2.13	0.2	mg/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF 2020 Q4
Sample ID: 1A Tank
Sample No: 20-5965-002

Date Collected: 10/22/20
Time Collected: 9:30
Date Received: 10/22/20
Date Reported: 11/18/20

Analyte		Result	R.L.	Units	Flags
Total Metals	**Method: 6010C**		**Preparation Method 3010A**		
Analysis Date: 10/28/20			Preparation Date: 10/27/20		
Nickel		0.896	0.1	mg/L	
Zinc		0.097	0.02	mg/L	
TCLP Metals Method 1311	**Method: 6010C**		**Preparation Method 3010A**		
Analysis Date: 10/29/20			Preparation Date: 10/27/20		
Arsenic		0.026	0.010	mg/L	
Barium		< 1.0	1.0	mg/L	
Cadmium		< 0.005	0.005	mg/L	
Copper		< 0.1	0.1	mg/L	
Chromium		0.059	0.005	mg/L	
Nickel		1.0	0.1	mg/L	
Lead		< 0.005	0.005	mg/L	
Selenium		< 0.010	0.010	mg/L	
Silver		< 0.005	0.005	mg/L	
Zinc		< 0.1	0.1	mg/L	
TCLP Mercury Method 1311	**Method: 7470A**				
Analysis Date: 10/23/20					
Mercury		< 0.0005	0.0005	mg/L	
TCLP Pesticides Method 1311	**Method: 8081A**		**Preparation Method 3510C**		
Analysis Date: 11/12/20			Preparation Date: 10/27/20		
Endrin		< 0.001	0.001	mg/L	
gamma-BHC (Lindane)		< 0.005	0.005	mg/L	
Heptachlor		< 0.004	0.004	mg/L	
Heptachlor epoxide		< 0.004	0.004	mg/L	
Methoxychlor		< 0.005	0.005	mg/L	
Toxaphene		< 0.010	0.01	mg/L	
Chlordane (Total)		< 0.005	0.005	mg/L	
Polychlorinated biphenyls (PCBs)	**Method: 8082**		**Preparation Method 3510C**		
Analysis Date: 11/11/20			Preparation Date: 10/26/20		
Aroclor 1016		< 0.50	0.50	ug/L	
Aroclor 1221		< 0.50	0.50	ug/L	
Aroclor 1232		< 0.50	0.50	ug/L	
Aroclor 1242		< 0.50	0.50	ug/L	
Aroclor 1248		< 0.50	0.50	ug/L	
Aroclor 1254		< 0.50	0.50	ug/L	
Aroclor 1260		< 0.50	0.50	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF 2020 Q4
Sample ID: 1A Tank
Sample No: 20-5965-002

Date Collected: 10/22/20
Time Collected: 9:30
Date Received: 10/22/20
Date Reported: 11/18/20

Analyte		Result	R.L.	Units	Flags
TCLP Herbicides Method 1311	**Method: 8321A**				
Analysis Date: 10/29/20					
2,4-D		< 0.5	0.5	mg/L	S
Silvex (2,4,5-TP)		< 0.5	0.5	mg/L	S
TCLP Semi-Volatiles Method 1311	**Method: 8270C**		**Preparation Method 3510C**		
Analysis Date: 11/04/20			Preparation Date: 10/28/20		
1,4-Dichlorobenzene		< 0.10	0.10	mg/L	
2,4-Dinitrotoluene		< 0.10	0.10	mg/L	
Hexachlorobenzene		< 0.10	0.10	mg/L	
Hexachlorobutadiene		< 0.10	0.10	mg/L	
Hexachloroethane		< 0.10	0.10	mg/L	
2-Methylphenol (o-Cresol)		< 0.10	0.10	mg/L	
3&4-Methylphenol (m&p-Cresol)		< 0.10	0.10	mg/L	
Nitrobenzene		< 0.10	0.10	mg/L	
Pentachlorophenol		< 0.50	0.50	mg/L	
Pyridine		< 0.50	0.50	mg/L	
2,4,5-Trichlorophenol		< 0.10	0.10	mg/L	
2,4,6-Trichlorophenol		< 0.10	0.10	mg/L	
TCLP Volatiles Method 1311	**Method: 5030B/8260B**				
Analysis Date: 11/02/20					
Benzene		< 0.050	0.050	mg/L	
2-Butanone (MEK)		0.241	0.100	mg/L	
Carbon tetrachloride		< 0.050	0.050	mg/L	
Chlorobenzene		< 0.050	0.050	mg/L	
Chloroform		< 0.050	0.050	mg/L	
1,2-Dichloroethane		< 0.050	0.050	mg/L	
1,1-Dichloroethene		< 0.050	0.050	mg/L	
Tetrachloroethene		< 0.050	0.050	mg/L	
Trichloroethene		< 0.050	0.050	mg/L	
Vinyl chloride		< 0.100	0.100	mg/L	
Physical Description	**Method: D4979-12**				
Analysis Date: 11/10/20					
Physical State		liquid			
Color		brown			
Turbidity		cloudy			
Viscosity		low			
Odor		strong			

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF 2020 Q4
Sample ID: 1A Tank
Sample No: 20-5965-002

Date Collected: 10/22/20
Time Collected: 9:30
Date Received: 10/22/20
Date Reported: 11/18/20

Analyte	Result	R.L.	Units	Flags
Physical Description **Method: D4979-12**				
Analysis Date: 11/10/20				
Layers Present	no			
Sulfate **Method: 4500SO4,E 1997**				
Analysis Date: 11/10/20				
Sulfate	410	15	mg/L	
Field Parameters **Method: NPDES**				
Analysis Date: 10/22/20 9:30				
pH, Field	8.95		Units	F

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF 2020 Q4
Sample ID: Trip Blank #2
Sample No: 20-5965-005

Date Collected:
Time Collected:
Date Received: 10/22/20
Date Reported: 11/18/20

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B** Analysis Date: 10/29/20				
Acetone	< 500	500	ug/L	
Benzene	< 20.0	20	ug/L	
Bromobenzene	< 20.0	20	ug/L	
Bromochloromethane	< 20.0	20	ug/L	
Bromodichloromethane	< 20.0	20	ug/L	
Bromoform	< 20.0	20	ug/L	
Bromomethane	< 20.0	20	ug/L	
n-Butanol	< 2,500	2500	ug/L	
2-Butanone (MEK)	< 100	100	ug/L	
n-Butylbenzene	< 20.0	20	ug/L	
sec-Butylbenzene	< 20.0	20	ug/L	
tert-Butylbenzene	< 20.0	20	ug/L	
Carbon disulfide	< 20.0	20	ug/L	
Carbon tetrachloride	< 20.0	20	ug/L	
Chlorobenzene	< 20.0	20	ug/L	
Chlorodibromomethane	< 20.0	20	ug/L	
Chloroethane	< 20.0	20	ug/L	
2-Chloroethyl vinyl ether	< 20.0	20	ug/L	
Chloroform	< 20.0	20	ug/L	
Chloromethane	< 20.0	20	ug/L	
2-Chlorotoluene	< 20.0	20	ug/L	
4-Chlorotoluene	< 20.0	20	ug/L	
1,2-Dibromo-3-chloropropane	< 30.0	30	ug/L	
Dibromomethane	< 20.0	20	ug/L	
1,2-Dichlorobenzene	< 50.0	50	ug/L	
1,3-Dichlorobenzene	< 15.0	15	ug/L	
1,4-Dichlorobenzene	< 75.0	75	ug/L	
trans-1,4-Dichloro-2-butene	< 20.0	20	ug/L	
Dichlorodifluoromethane	< 20.0	20	ug/L	
1,1-Dichloroethane	< 20.0	20	ug/L	
1,2-Dichloroethane	< 10.0	10	ug/L	
1,1-Dichloroethene	< 20.0	20	ug/L	
cis-1,2-Dichloroethene	< 20.0	20	ug/L	
trans-1,2-Dichloroethene	< 20.0	20	ug/L	
1,3-Dichloropropene (total)	< 20.0	20	ug/L	
1,2-Dichloropropane	< 10.0	10	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion LF 2020 Q4
Sample ID: Trip Blank #2
Sample No: 20-5965-005

Date Collected:
Time Collected:
Date Received: 10/22/20
Date Reported: 11/18/20

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 10/29/20				
1,3-Dichloropropane	< 20.0	20	ug/L	
2,2-Dichloropropane	< 50.0	50	ug/L	
1,1-Dichloropropene	< 20.0	20	ug/L	
trans-1,3-Dichloropropene	< 20.0	20	ug/L	
Ethyl acetate	< 200	200	ug/L	
Ethylbenzene	< 20.0	20	ug/L	
Ethylene dibromide (EDB)	< 20.0	20	ug/L	
2-Hexanone	< 100	100	ug/L	
Iodomethane	< 20.0	20	ug/L	
Isopropylbenzene	< 20.0	20	ug/L	
p-Isopropyltoluene	< 20.0	20	ug/L	
4-Methyl-2-pentanone (MIBK)	< 100	100	ug/L	
Methylene chloride	< 40.0	40	ug/L	
2-Propanol	< 1,000	1000	ug/L	
n-Propylbenzene	< 20.0	20	ug/L	
Styrene	< 20.0	20	ug/L	
1,1,1,2-Tetrachloroethane	< 20.0	20	ug/L	
1,1,2,2-Tetrachloroethane	< 20.0	20	ug/L	
Tetrachloroethene	< 20.0	20	ug/L	
Tetrahydrofuran	< 20.0	20	ug/L	
Toluene	< 20.0	20	ug/L	
1,2,3-Trichlorobenzene	< 20.0	20	ug/L	
1,1,1-Trichloroethane	< 20.0	20	ug/L	
1,1,2-Trichloroethane	< 20.0	20	ug/L	
Trichloroethene	< 20.0	20	ug/L	
Trichlorofluoromethane	< 20.0	20	ug/L	
1,2,3-Trichloropropane	< 50.0	50	ug/L	
1,2,4-Trimethylbenzene	< 50.0	50	ug/L	
1,3,5-Trimethylbenzene	< 15.0	15	ug/L	
Vinyl acetate	< 50.0	50	ug/L	
Vinyl chloride	< 20.0	20	ug/L	
Xylene, Total	< 20.0	20	ug/L	
m&p-Xylene	< 20.0	20	ug/L	
o-Xylene	< 20.0	20	ug/L	

CHAIN OF CUSTODY RECORD

Page ___ pgs

First Environmental Laboratories, Inc.

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Naperville, Illinois 60563
Phone: (630) 778-1200 • Fax: (630) 778-1233
E-mail: firstinfo@firstenv.com • www.firstenv.com
IEPA Certification #100292

Company Name: Zion Landfill

Street Address:

City: State: Zip:

Phone: e-mail:

Send Report To: Joe Miller

Sampled By:

Project I.D.: Zion LF 2020 Q4

P.O. #:

20-5965

Date/Time Taken	Sample Description	Matrix	Parameter(s) – Site/A – EW2 – Q4 see 16-0117-001	– Site/B – Leachate	Hold – Do Not Analyze	Comments	Lab I.D.
102220/ 915	EW2		X				001
↓ 930	1A tank			X			002
1000	L302 SSR			X			003
	Trip Blank #1 (VOA) #2						004
							005

FOR LAB USE ONLY:

Cooler Temperature: 0.1-6°C Yes ✓ No. 2.4 °C
Received within 6 hrs. of collection: ✓
Ice Present: Yes ✓ No

LAB COURIER USE ONLY:

Sample Refrigerated: Yes No
Refrigerator Temperature: °C

Program: ☐ TACO/SRP ☐ CCDD ☐ NPDES ☐ LUST ☐ SDWA

*Matrix Code Key: S-Soil SL-Sludge DW-Drinking Water WW-Wastewater GW-Groundwater WIPE-Wipe O-Other

Notes and Special Instructions:

Relinquished By: Date/Time 102220/ 1240 Received By: Date/Time 10/22/20 1340

Relinquished By: Date/Time Received By: Date/Time

Rev. 6/19

R 001784

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November 22, 2019

Mr. Jim Lewis
REPUBLIC SERVICES (Zion)
VEOLIA-ZION LANDFILL
701 Green Bay Road
Zion, IL 60099

Project ID: ZION LF 19Q3
First Environmental File ID: 19-4370
Date Received: July 22, 2019

Dear Mr. Jim Lewis:

The above referenced project was analyzed as directed on the enclosed chain of custody record.

All Quality Control criteria as outlined in the methods and current IL ELAP/NELAP have been met unless otherwise noted. QA/QC documentation and raw data will remain on file for future reference. Our accreditation number is 100292 and our current certificate is number 004324: effective 04/23/2019 through 02/28/2020.

I thank you for the opportunity to be of service to you and look forward to working with you again in the future. Should you have any questions regarding any of the enclosed analytical data or need additional information, please contact me at (630) 778-1200.

Sincerely,

Neal E Cleghorn

Neal Cleghorn
Project Manager

First
Environmental
Laboratories, Inc.

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Case Narrative

REPUBLIC SERVICES (Zion)

Lab File ID: **19-4370**

Project ID: **ZION LF 19Q3**

Date Received: **July 22, 2019**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The results in this report apply to the samples in the following table:

Laboratory Sample ID	Client Sample Identifier	Date/Time Collected
19-4370-001	EW24	07/22/19 9:30
19-4370-004	Trip Blank	

Sample Batch Comments:

Sample acceptance criteria were met.

Method Comments

Lab Number	Sample ID	Comments:
19-4370-001	EW24	*Total Metals* Chemical preservation pH adjusted in lab.
19-4370-001	EW24	*Total Mercury* Chemical preservation pH adjusted in lab.
19-4370-001	EW24	*Dioxin, Low Resolution* Surrogate recovery outside control limits; low bias.

The following analyses have been subcontracted to the indicated laboratory:

Analysis	Subcontractor:
Alcohol Compounds	*KEYSTONE LABORATORIES, INC. Newton, IA*
Carbamate Pesticides	*STAT ANALYSIS CORP. Chicago, IL*
Coliform, Fecal	*ETP LABS, INC. Willowbrook, IL*
Dioxin, Low Resolution	*SUMMIT ENVIRONMENTAL TECHNOLOGY LABS Cuyahoga Falls, OH*
Herbicides Method 8321A	*STAT ANALYSIS CORP. Chicago, IL*

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Case Narrative

REPUBLIC SERVICES (Zion)

Lab File ID: **19-4370**

Project ID: **ZION LF 19Q3**

Date Received: **July 22, 2019**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The following is a definition of flags that may be used in this report:

Flag	Description	Flag	Description
A	Method holding time is 15 minutes from collection. Lab analysis was performed as soon as possible.		
B	Analyte was found in the method blank.	L	LCS recovery outside control limits.
<	Analyte not detected at or above the reporting limit.	M	MS recovery outside control limits; LCS acceptable.
C	Sample received in an improper container for this test.	P	Chemical preservation pH adjusted in lab.
D	Surrogates diluted out; recovery not available.	Q	Result was determined by a GC/MS database search.
E	Estimated result; concentration exceeds calibration range.	S	Analysis was subcontracted to another laboratory.
G	Surrogate recovery outside control limits.	T	Result is less than three times the MDL value.
H	Analysis or extraction holding time exceeded.	W	Reporting limit elevated due to sample matrix.
J	Estimated result; concentration is less than routine RL but greater than MDL.	N	Analyte is not part of our NELAC accreditation or accreditation may not be available for this parameter.
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.

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Analytical Report

Client:	REPUBLIC SERVICES (Zion)	**Date Collected:**	07/22/19
Project ID:	ZION LF 19Q3	**Time Collected:**	9:30
Sample ID:	EW24	**Date Received:**	07/22/19
Sample No:	19-4370-001	**Date Reported:**	08/14/19

Analyte	Result	R.L.	Units	Flags
Alkalinity, Bicarbonate (CaCO3) **Method: 2320B 1997** Analysis Date: 07/25/19 9:00				
Alkalinity, Bicarbonate (CaCO3)	3,300	10	mg/L	
Ammonia (as N) **Method: 350.1R2.0** Analysis Date: 07/26/19				
Ammonia (as N)	1,050	5	mg/L	
BOD, 5 Day **Method: 5210B 2001** Analysis Date: 07/24/19 9:00				
BOD, 5 Day	100	40	mg/L	
Chloride **Method: 4500Cl, E 1997** Analysis Date: 07/23/19				
Chloride	2,700	10	mg/L	
Chromium, Hexavalent **Method: 3500Cr,B 2009** Analysis Date: 07/29/19 11:17				
Chromium, Hexavalent	< 25	25	ug/L	
COD **Method: 5220D 1997** Analysis Date: 08/01/19				
COD	1,010	40	mg/L	
Coliform, Fecal **Method: SM9222D** Analysis Date: 07/22/19				
Fecal Coliform	< 50	50	FU/100mL	S
Cyanide, Total **Method: 9010B/9014** Analysis Date: 07/31/19				
Cyanide, Total	< 0.050	0.050	mg/L	
Fluoride **Method: 4500F,C 1997** Analysis Date: 07/25/19 11:00				
Fluoride	0.53	0.50	mg/L	
Nitrate (as N) **Method: 353.2R2.0** Analysis Date: 07/24/19				
Nitrate (as N)	< 5.00	5	mg/L	
Oil (Hexane soluble) **Method: 1664B 2010** Analysis Date: 08/05/19				
Oil (Hexane soluble)	< 20	20	mg/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: EW24
Sample No: 19-4370-001

Date Collected: 07/22/19
Time Collected: 9:30
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte	Result	R.L.	Units	Flags
Phenols **Method: 420.1**				
Analysis Date: 07/24/19				
Phenols	210	100	ug/L	
Phosphorus (as P) **Method: 4500P,E 1999**				
Analysis Date: 07/24/19				
Phosphorus (as P)	1.24	0.5	mg/L	
Sulfate **Method: 4500SO4,E 1997**				
Analysis Date: 07/24/19				
Sulfate	269	50	mg/L	N
TOC **Method: 5310C 2000**				
Analysis Date: 07/26/19				
TOC	210	10	mg/L	
Total Dissolved Solids **Method: 2540C 1997**				
Analysis Date: 07/25/19				
Total Dissolved Solids	6,160	10	mg/L	
Total Suspended Solids **Method: 2540D 1997**				
Analysis Date: 07/24/19				
Total Suspended Solids	< 40	40	mg/L	
Total Metals **Method: 6010C**		**Preparation Method 3010A**		
Analysis Date: 08/01/19		Preparation Date: 07/30/19		
Aluminum	< 1,000	1000	ug/L	
Antimony	< 60	60	ug/L	
Arsenic	< 20	20	ug/L	
Barium	< 1,000	1000	ug/L	
Beryllium	< 40	40	ug/L	
Boron	5,630	100	ug/L	
Cadmium	< 25	25	ug/L	
Chromium	48	25	ug/L	
Cobalt	< 200	200	ug/L	
Copper	< 50	50	ug/L	
Iron	966	200	ug/L	
Lead	< 25	25	ug/L	
Manganese	221	50	ug/L	
Nickel	601	100	ug/L	
Selenium	< 50	50	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: EW24
Sample No: 19-4370-001

Date Collected: 07/22/19
Time Collected: 9:30
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte		Result	R.L.	Units	Flags
Total Metals	**Method: 6010C**		**Preparation Method 3010A**		
Analysis Date: 08/01/19			Preparation Date: 07/30/19		
Silver		< 50	50	ug/L	
Thallium		< 50	50	ug/L	
Tin		< 100	100	ug/L	
Zinc		88	20	ug/L	
Calcium		147	10	mg/L	
Magnesium		254	10	mg/L	
Potassium		290	10	mg/L	
Sodium		1,160	10	mg/L	
Total Mercury	**Method: 7470A**				
Analysis Date: 07/24/19					
Mercury		< 4.0	4	ug/L	
Volatile Organic Compounds	**Method: 5030B/8260B**				
Analysis Date: 07/29/19					
Acetone		< 500	500	ug/L	
Benzene		20.9	20	ug/L	
Bromobenzene		< 20.0	20	ug/L	
Bromochloromethane		< 20.0	20	ug/L	
Bromodichloromethane		< 20.0	20	ug/L	
Bromoform		< 20.0	20	ug/L	
Bromomethane		< 20.0	20	ug/L	
n-Butanol		< 2,500	2500	ug/L	
2-Butanone (MEK)		< 100	100	ug/L	
n-Butylbenzene		< 20.0	20	ug/L	
sec-Butylbenzene		< 20.0	20	ug/L	
tert-Butylbenzene		< 20.0	20	ug/L	
Carbon disulfide		< 20.0	20	ug/L	
Carbon tetrachloride		< 20.0	20	ug/L	
Chlorobenzene		28.0	20	ug/L	
Chlorodibromomethane		< 20.0	20	ug/L	
Chloroethane		< 20.0	20	ug/L	
2-Chloroethyl vinyl ether		< 20.0	20	ug/L	
Chloroform		< 20.0	20	ug/L	
Chloromethane		< 20.0	20	ug/L	
2-Chlorotoluene		< 20.0	20	ug/L	
4-Chlorotoluene		< 20.0	20	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: EW24
Sample No: 19-4370-001

Date Collected: 07/22/19
Time Collected: 9:30
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 07/29/19				
1,2-Dibromo-3-chloropropane	< 30.0	30	ug/L	
Dibromomethane	< 20.0	20	ug/L	
1,2-Dichlorobenzene	< 50.0	50	ug/L	
1,3-Dichlorobenzene	< 15.0	15	ug/L	
1,4-Dichlorobenzene	< 75.0	75	ug/L	
trans-1,4-Dichloro-2-butene	< 20.0	20	ug/L	
Dichlorodifluoromethane	< 20.0	20	ug/L	
1,1-Dichloroethane	32.5	20	ug/L	
1,2-Dichloroethane	< 10.0	10	ug/L	
1,1-Dichloroethene	< 20.0	20	ug/L	
cis-1,2-Dichloroethene	< 20.0	20	ug/L	
trans-1,2-Dichloroethene	< 20.0	20	ug/L	
1,3-Dichloropropene (total)	< 20.0	20	ug/L	
1,2-Dichloropropane	< 10.0	10	ug/L	
1,3-Dichloropropane	< 20.0	20	ug/L	
2,2-Dichloropropane	< 50.0	50	ug/L	
1,1-Dichloropropene	< 20.0	20	ug/L	
trans-1,3-Dichloropropene	< 20.0	20	ug/L	
Ethyl acetate	< 200	200	ug/L	
Ethylbenzene	22.6	20	ug/L	
Ethylene dibromide (EDB)	< 20.0	20	ug/L	
2-Hexanone	< 100	100	ug/L	
Iodomethane	< 20.0	20	ug/L	
Isopropylbenzene	< 20.0	20	ug/L	
p-Isopropyltoluene	< 20.0	20	ug/L	
4-Methyl-2-pentanone (MIBK)	< 100	100	ug/L	
Methylene chloride	< 40.0	40	ug/L	
2-Propanol	< 1,000	1000	ug/L	
n-Propylbenzene	< 20.0	20	ug/L	
Styrene	< 20.0	20	ug/L	
1,1,1,2-Tetrachloroethane	< 20.0	20	ug/L	
1,1,2,2-Tetrachloroethane	< 20.0	20	ug/L	
Tetrachloroethene	< 20.0	20	ug/L	
Tetrahydrofuran	213	20	ug/L	
Toluene	22.9	20	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: EW24
Sample No: 19-4370-001

Date Collected: 07/22/19
Time Collected: 9:30
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B** Analysis Date: 07/29/19				
1,2,3-Trichlorobenzene	< 20.0	20	ug/L	
1,1,1-Trichloroethane	< 20.0	20	ug/L	
1,1,2-Trichloroethane	< 20.0	20	ug/L	
Trichloroethene	< 20.0	20	ug/L	
Trichlorofluoromethane	< 20.0	20	ug/L	
1,2,3-Trichloropropane	< 50.0	50	ug/L	
1,2,4-Trimethylbenzene	< 50.0	50	ug/L	
1,3,5-Trimethylbenzene	< 15.0	15	ug/L	
Vinyl acetate	< 50.0	50	ug/L	
Vinyl chloride	< 20.0	20	ug/L	
Xylene, Total	47.8	20	ug/L	
m&p-Xylene	30.1	20	ug/L	
o-Xylene	< 20.0	20	ug/L	
Pesticides/PCBs **Method: 8081A/8082** **Preparation Method 3510C** Analysis Date: 07/24/19 Preparation Date: 07/24/19				
Aldrin	< 10.0	10	ug/L	
Polychlorinated biphenyls (Total)	< 1.0	1	ug/L	
alpha-BHC	< 10.0	10	ug/L	
beta-BHC	< 1.0	1	ug/L	
gamma-BHC (Lindane)	< 1.0	1	ug/L	
delta-BHC	< 1.0	1	ug/L	
Chlordane (Technical)	< 10.0	10	ug/L	
4,4'-DDD	< 1.0	1	ug/L	
4,4'-DDE	< 1.0	1	ug/L	
4,4'-DDT	< 10.0	10	ug/L	
Dieldrin	< 10.0	10	ug/L	
Endosulfan I	< 1.0	1	ug/L	
Endosulfan II	< 1.0	1	ug/L	
Endosulfan sulfate	< 1.0	1	ug/L	
Endrin	< 2.0	2	ug/L	
Endrin aldehyde	< 5.0	5	ug/L	
Heptachlor	< 1.0	1	ug/L	
Heptachlor epoxide	< 8.0	8	ug/L	
Methoxychlor	< 10.0	10	ug/L	
Toxaphene	< 10.0	10	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: EW24
Sample No: 19-4370-001

Date Collected: 07/22/19
Time Collected: 9:30
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte	Result	R.L.	Units	Flags
Semi-Volatile Compounds **Method: 8270C** Analysis Date: 07/25/19		**Preparation Method 3510C** Preparation Date: 07/24/19		
Acenaphthene	< 100	100	ug/L	
Anthracene	< 100	100	ug/L	
Benzo(a)anthracene	< 100	100	ug/L	
Benzo(a)pyrene	< 100	100	ug/L	
Benzo(b)fluoranthene	< 100	100	ug/L	
Benzo(k)fluoranthene	< 100	100	ug/L	
Benzo(ghi)perylene	< 100	100	ug/L	
bis(2-Chloroethoxy)methane	< 100	100	ug/L	
bis(2-Chloroethyl)ether	< 100	100	ug/L	
bis(2-Chloroisopropyl)ether	< 100	100	ug/L	
bis(Chloromethyl)ether	ND		ug/L	N Q
bis(2-Ethylhexyl)phthalate	< 100	100	ug/L	
4-Bromophenyl phenyl ether	< 100	100	ug/L	
Butyl benzyl phthalate	< 100	100	ug/L	
2-Chloronaphthalene	< 100	100	ug/L	
2-Chlorophenol	< 500	500	ug/L	
4-Chlorophenyl phenyl ether	< 100	100	ug/L	
Chrysene	< 100	100	ug/L	
Dibenzo(a,h)anthracene	< 100	100	ug/L	
3,3'-Dichlorobenzidine	< 500	500	ug/L	
2,4-Dichlorophenol	< 500	500	ug/L	
Diethyl phthalate	< 100	100	ug/L	
2,4-Dimethylphenol	< 500	500	ug/L	
Dimethyl phthalate	< 100	100	ug/L	
Di-n-butyl phthalate	< 100	100	ug/L	
4,6-Dinitro-2-methylphenol	< 500	500	ug/L	
2,4-Dinitrophenol	< 500	500	ug/L	
2,4-Dinitrotoluene	< 100	100	ug/L	
2,6-Dinitrotoluene	< 500	500	ug/L	
Di-n-octylphthalate	< 100	100	ug/L	
Fluoranthene	< 100	100	ug/L	
Fluorene	< 100	100	ug/L	
Hexachlorobenzene	< 100	100	ug/L	
Hexachlorobutadiene	< 100	100	ug/L	
Hexachlorocyclopentadiene	< 100	100	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: EW24
Sample No: 19-4370-001

Date Collected: 07/22/19
Time Collected: 9:30
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte		Result	R.L.	Units	Flags
Semi-Volatile Compounds Analysis Date: 07/25/19	**Method: 8270C**		**Preparation Method 3510C** Preparation Date: 07/24/19		
Hexachloroethane		< 100	100	ug/L	
Indeno(1,2,3-cd)pyrene		< 100	100	ug/L	
4-Methylphenol		< 500	500	ug/L	
Naphthalene		< 100	100	ug/L	
Nitrobenzene		< 100	100	ug/L	
2-Nitrophenol		< 500	500	ug/L	
4-Nitrophenol		< 500	500	ug/L	
n-Nitrosodimethylamine		< 100	100	ug/L	
n-Nitrosodi-n-propylamine		< 100	100	ug/L	
n-Nitrosodiphenylamine		< 100	100	ug/L	
Pentachlorophenol		< 500	500	ug/L	
Phenanthrene		< 100	100	ug/L	
Pyrene		< 100	100	ug/L	
1,2,4-Trichlorobenzene		< 50	50	ug/L	
2,4,6-Trichlorophenol		< 500	500	ug/L	
Semi-Volatile Pesticides Analysis Date: 07/25/19	**Method: 8270C**		**Preparation Method 3510C** Preparation Date: 07/24/19		
Alachlor		< 20	20	ug/L	N
Atrazine		< 30	30	ug/L	N
Parathion		< 10	10	ug/L	
Carbamate Pesticides Analysis Date: 07/30/19	**Method: 8321A**				
Aldicarb		< 30	30	ug/L	N S
Carbofuran		< 400	400	ug/L	N S
Herbicides Method 8321A Analysis Date: 07/30/19	**Method: 8321A**				
2,4-D		< 20	20	ug/L	S
Silvex (2,4,5-TP)		< 20	20	ug/L	S
Alcohol Compounds Analysis Date: 08/01/19	**Method: 8015B**				
n-Propanol		< 2,500	2500	ug/L	N S

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Analytical Report

Client:	REPUBLIC SERVICES (Zion)	**Date Collected:**	07/22/19
Project ID:	ZION LF 19Q3	**Time Collected:**	9:30
Sample ID:	EW24	**Date Received:**	07/22/19
Sample No:	19-4370-001	**Date Reported:**	08/14/19

Analyte	Result	R.L.	Units	Flags
Dioxin, Low Resolution **Method: 8290**				
Analysis Date: 07/30/19				
2,3,7,8-TCDD	< 5.0	5	ug/L	N S

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: Trip Blank
Sample No: 19-4370-004

Date Collected:
Time Collected:
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 07/25/19				
Acetone	< 500	500	ug/L	
Benzene	< 20.0	20	ug/L	
Bromobenzene	< 20.0	20	ug/L	
Bromochloromethane	< 20.0	20	ug/L	
Bromodichloromethane	< 20.0	20	ug/L	
Bromoform	< 20.0	20	ug/L	
Bromomethane	< 20.0	20	ug/L	
n-Butanol	< 2,500	2500	ug/L	
2-Butanone (MEK)	< 100	100	ug/L	
n-Butylbenzene	< 20.0	20	ug/L	
sec-Butylbenzene	< 20.0	20	ug/L	
tert-Butylbenzene	< 20.0	20	ug/L	
Carbon disulfide	< 20.0	20	ug/L	
Carbon tetrachloride	< 20.0	20	ug/L	
Chlorobenzene	< 20.0	20	ug/L	
Chlorodibromomethane	< 20.0	20	ug/L	
Chloroethane	< 20.0	20	ug/L	
2-Chloroethyl vinyl ether	< 20.0	20	ug/L	
Chloroform	< 20.0	20	ug/L	
Chloromethane	< 20.0	20	ug/L	
2-Chlorotoluene	< 20.0	20	ug/L	
4-Chlorotoluene	< 20.0	20	ug/L	
1,2-Dibromo-3-chloropropane	< 30.0	30	ug/L	
Dibromomethane	< 20.0	20	ug/L	
1,2-Dichlorobenzene	< 50.0	50	ug/L	
1,3-Dichlorobenzene	< 15.0	15	ug/L	
1,4-Dichlorobenzene	< 75.0	75	ug/L	
trans-1,4-Dichloro-2-butene	< 20.0	20	ug/L	
Dichlorodifluoromethane	< 20.0	20	ug/L	
1,1-Dichloroethane	< 20.0	20	ug/L	
1,2-Dichloroethane	< 10.0	10	ug/L	
1,1-Dichloroethene	< 20.0	20	ug/L	
cis-1,2-Dichloroethene	< 20.0	20	ug/L	
trans-1,2-Dichloroethene	< 20.0	20	ug/L	
1,3-Dichloropropene (total)	< 20.0	20	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: ZION LF 19Q3
Sample ID: Trip Blank
Sample No: 19-4370-004

Date Collected:
Time Collected:
Date Received: 07/22/19
Date Reported: 08/14/19

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B** Analysis Date: 07/25/19				
1,2-Dichloropropane	< 10.0	10	ug/L	
1,3-Dichloropropane	< 20.0	20	ug/L	
2,2-Dichloropropane	< 50.0	50	ug/L	
1,1-Dichloropropene	< 20.0	20	ug/L	
trans-1,3-Dichloropropene	< 20.0	20	ug/L	
Ethyl acetate	< 200	200	ug/L	
Ethylbenzene	< 20.0	20	ug/L	
Ethylene dibromide (EDB)	< 20.0	20	ug/L	
2-Hexanone	< 100	100	ug/L	
Iodomethane	< 20.0	20	ug/L	
Isopropylbenzene	< 20.0	20	ug/L	
p-Isopropyltoluene	< 20.0	20	ug/L	
4-Methyl-2-pentanone (MIBK)	< 100	100	ug/L	
Methylene chloride	< 40.0	40	ug/L	
2-Propanol	< 1,000	1000	ug/L	
n-Propylbenzene	< 20.0	20	ug/L	
Styrene	< 20.0	20	ug/L	
1,1,1,2-Tetrachloroethane	< 20.0	20	ug/L	
1,1,2,2-Tetrachloroethane	< 20.0	20	ug/L	
Tetrachloroethene	< 20.0	20	ug/L	
Tetrahydrofuran	< 20.0	20	ug/L	
Toluene	< 20.0	20	ug/L	
1,2,3-Trichlorobenzene	< 20.0	20	ug/L	
1,1,1-Trichloroethane	< 20.0	20	ug/L	
1,1,2-Trichloroethane	< 20.0	20	ug/L	
Trichloroethene	< 20.0	20	ug/L	
Trichlorofluoromethane	< 20.0	20	ug/L	
1,2,3-Trichloropropane	< 50.0	50	ug/L	
1,2,4-Trimethylbenzene	< 50.0	50	ug/L	
1,3,5-Trimethylbenzene	< 15.0	15	ug/L	
Vinyl acetate	< 50.0	50	ug/L	
Vinyl chloride	< 20.0	20	ug/L	
Xylene, Total	< 20.0	20	ug/L	
m&p-Xylene	< 20.0	20	ug/L	
o-Xylene	< 20.0	20	ug/L	

CHAIN OF CUSTODY RECORD

Page____ of ____ pgs

First Environmental Laboratories, Inc.

First Environmental Laboratories
1600 Shore Road, Suite D
Naperville, Illinois 60563
Phone: (630) 778-1200 • Fax: (630) 778-1233
E-mail: firstinfo@firstenv.com • www.firstenv.com
IEPA Certification #100292

Company Name: Zion

Street Address:

City: State: Zip:

Phone: e-mail:

Send Report To: Joe Miller

Sampled By:

Project I.D.: ZION LF 1Q19

P.O. #:

Matrix Codes: S = Soil W = Water O = Other

Analyses

Date/Time Taken	Sample Description	Matrix	-Site 14-EW2-Q4	-Site 18-GT16-Q1	-Site 2-RE25-Q						Hold – Do Not Analyze	Comments	Lab I.D.
7/2/19 / 930	EW24		X										19-4370-001
1145	GT16			X									-002
1105	RE25				X								-003
	Trip Blank B3												-004

FOR LAB USE ONLY:

Cooler Temperature: 0.1-6°C Yes✓ No.__ 4 °C
Received within 6 hrs. of collection:____
Ice Present: Yes✓ No__

Sample Refrigerated: Yes__ No__
Refrigerator Temperature:____°C
5035 Vials Frozen: Yes__ No__
Freezer Temperature:____°C

Program: ☐ TACO/SRP ☐ CCDD ☐ NPDES ☐ LUST ☐ SDWA

Notes and Special Instructions:

Relinquished By: [signature] Date/Time 7-22-19/ 1450 Received By: [signature] Date/Time 7/22/19 1450

Relinquished By: Date/Time Received By: Date/Time

Rev. 5/17

SUBURBAN LABORATORIES, Inc.

1950 S. Batavia Ave., Suite 150 Geneva, Illinois 6013
Tel. (708) 544-3260 • Toll Free (800) 783-LABS
Fax (708) 544-8587
www.suburbanlabs.com

July 29, 2019

Workorder: 1907H98

Joe Miller
Environmental Information Logistics, LLC
534 Duane St
Glen Ellyn, IL 60137

TEL: (630) 942-0652
FAX:
RE: EW 24

Dear Joe Miller:

Suburban Laboratories, Inc. received 1 sample(s) on 7/22/2019 for the analyses presented in the following report.

All data for the associated quality control (QC) met EPA, method, or internal laboratory specifications except where noted in the case narrative. If you are comparing these results to external QC specifications or compliance limits and have any questions, please contact us.

This final report of laboratory analysis consists of this cover letter, case narrative, analytical report, dates report, and any accompanying documentation including, but not limited to, chain of custody records, raw data, and letters of explanation or reliance. This report may not be reproduced, except in full, without the prior written approval of Suburban Laboratories, Inc.

If you have any questions regarding these test results, please call me at (708) 544-3260.

Sincerely,

Keith Sinon
Project Manager
708-544-3260 ext 212
keith@suburbanlabs.com

Suburban Laboratories, Inc.
1950 S. Batavia Ave., Suite 150, Geneva, IL 60134 (708) 544-3260

Case Narrative

Client: Environmental Information Logistics, LLC
Project: EW 24
WorkOrder: 1907H98
Temperature of samples upon receipt at SLI: C

Date: July 29, 2019
PO #:
QC Level:
Chain of Custody #:

General Comments:
- All results reported in wet weight unless otherwise indicated. (dry = Dry Weight)
- Sample results relate only to the analytes of interest tested and to sample as received by the laboratory.
- Environmental compliance sample results meet the requirements of 35 IAC Part 186 unless otherwise indicated.
- Waste water analysis follows the rules set forth in 40 CFR part 136 except where otherwise noted.
- Accreditation by the State of Illinois is not an endorsement or a guarantee of the validity of data generated.
- For more information about the laboratories' scope of accreditation, please contact us at (708) 544-3260 or the Agency at (217) 782-6455.
- All radiological results are reported to the 95% confidence level.

Abbreviations:
- Reporting Limit: The concentration at which an analyte can be routinely detected on a day to day basis, and which also meets regulatory and client needs.
- Quantitation Limit: The lowest concentration at which results can be accurately quantitated.
- J: The analyte was positively identified above our Method Detection Limit and is considered detectable and quantifiable; however, the associated numerical value is the approximate concentration of the analyte in the sample.
- ATC: Automatic Temperature Correction. - TNTC: Too Numerous To Count
- TIC: Tentatively Identified Compound (GCMS library search identification, concentration estimated to nearest internal standard).
- SS (Surrogate Standard): Quality control compound added to the sample by the lab.

Method References:
For a complete list of method references please contact us.
- E: USEPA Reference methods
- SW: USEPA, Test Methods for Evaluating Solid Waste (SW-846)
- M: Standard Methods for the Examination of Water and Wastewater
- USP: Latest version of United States Pharmacopeia

Workorder Specific Comments:

Suburban Laboratories, Inc.
1950 S. Batavia Ave., Suite 150, Geneva, IL 60134 (708) 544-3260

Laboratory Results

Client ID: Environmental Information Logistics, LLC
Project Name: EW 24

Report Date: July 29, 2019
Workorder: 1907H98

Client Sample ID: EW 24
Lab ID: 1907H98-001

Date Received: 07/22/2019 2:47 PM

Matrix: LEACHATE
Collection Date: 07/22/2019 9:30 AM

Parameter	Result	Report Limit	Qual.	Units	Dilution Factor	Date Analyzed	Batch ID
FECAL COLIFORM		Method: Idexx-Colilert-18-Rev 0				Analyst: MMM	
Fecal Coliform	4.1	1.0		MPN/100mL	1	07/22/2019 5:28 PM	R110245

Created: 7/29/2019 7:40:11 PM

Suburban Laboratories, Inc.
1950 S. Batavia Ave., Suite 150, Geneva, IL 60134 (708) 544-3260

Qualifier Definitions

WO#: **1907H98**
Date: **7/29/2019**

Qualifiers:

*/x	Value exceeds Maximum Contaminant Level
B	Analyte detected in the associated Method Blank
C	Value is below Minimum Concentration Limit
c	Analyte not in SLI scope of accreditation
E	Estimated, detected above quantitation range
G	Refer to case narrative page for specific comments
H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limit (QL)
N	Tentatively identified compounds
ND	Not Detected at the Reporting Limit
P	Present
Q	Accreditation is not available from Wisconsin
R	RPD outside accepted recovery limits
S	Spike Recovery outside accepted recovery limits
T	Analyte detected in sample trip blank
V	EPA requires field analysis/filtration. Lab analysis would be considered past hold time.

R 001803

SUBURBAN LABORATORIES, Inc.

1950 S. Batavia Ave. Ste. 150 Geneva, IL 60134 Tel. 708.544.3260 login@suburbanlabs.com www.suburbanlabs.com

CHAIN OF CUSTODY RECORD

Company Name: EIL
Company Address: 534 Duane St.
City: Glen Ellyn State: IL Zip:
Office: Mobile: 6307506550 Fax:
Email Address:
Project ID / Location:
Project Manager (Report to): Joe Miller
Sample Collector(s):

TURNAROUND TIME REQUESTED
☐ Normal ☐ RUSH*
* Must be pre-approved and surcharges apply. Checking this box indicates your approval of surcharges.
Date and Time Report Needed:

Specify Regulatory Program: ☐ None/Info Only
☐ LUST ☐ SRP ☐ SDWA
☐ 503 Sludge ☐ NPDES ☐ MWRDGC
☐ Disposal ☐ CCDD ☐ OTHER - Specify Below

ANALYSIS & METHOD REQUESTED
Enter an "X" in box below for request

Fecal Coliform

Page of
PO #
Report Type ☐ Normal ☐ Special*
* Additional charges apply for QC reports and raw data. Specify in comments section
Shipping Method

LAB USE ONLY
Work Order # 1907498
Temperature of Received Samples °C
Received within 24 hours of collection? ☐ No ☐ Yes

	SAMPLE IDENTIFICATION (Use 1 line per container type)	COLLECTION DATE	COLLECTION TIME	MATRIX	GRAB/ COMP.	CONTAINERS Qty	CONTAINERS SIZE & TYPE	PRESERVATIVE	Lab Comment	LAB #
1	EW-24	72219	930	Leachate	G	1		NAN		1A
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

MATRIX: Drinking Water (DW), Soil (S), Waste Water (WW), Surface Water(SW), Ground Water (GW), Solid Waste (WA), Sludge (U), Wipe (P) CONTAINER: 2oz, 4oz, 8oz, 40ml Vial, 500ml, Liter (L), Tube, Glass (G), Plastic (P) PRESERVATIVE: H_2SO_4, HCl, HNO_3, Methanol (MeOH) NaOH, Sodium Bisulfate (NaB), NaThio

COMMENTS & SPECIAL INSTRUCTIONS:

1. Relinquished By	Date	2. Relinquished By	Date	3. Relinquished By	Date	4. Relinquished By	Date
	72219						
Received By ☐ Ice	Time 14:47	Received By ☐ Ice	Time	Received By ☐ Ice	Time	Received By ☐ Ice	Time

THIS FORM MUST BE FILLED OUT COMPLETELY BY THE SAMPLE COLLECTOR OR SUBMITTER AND ORIGINAL FORM MUST ACCOMPANY SAMPLES AT ALL TIMES. Rev 2/17

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

December 17, 2018

Mr. Jim Lewis
REPUBLIC SERVICES (Zion)
VEOLIA ENVIRONMENTAL SERVICES
701 Green Bay Road
Zion, IL 60099

Project ID: Zion Landfill
First Environmental File ID: 18-6505
Date Received: October 29, 2018

Dear Mr. Jim Lewis:

The above referenced project was analyzed as directed on the enclosed chain of custody record.

All Quality Control criteria as outlined in the methods and current IL ELAP/NELAP have been met unless otherwise noted. QA/QC documentation and raw data will remain on file for future reference. Our accreditation number is 100292 and our current certificate is number 004324: effective 02/27/2018 through 02/28/2019.

I thank you for the opportunity to be of service to you and look forward to working with you again in the future. Should you have any questions regarding any of the enclosed analytical data or need additional information, please contact me at (630) 778-1200.

Sincerely,

Neal Cleghorn
Project Manager

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
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Case Narrative

REPUBLIC SERVICES (Zion)
Project ID: **Zion Landfill**

Lab File ID: **18-6505**
Date Received: **October 29, 2018**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The results in this report apply to the samples in the following table:

Laboratory Sample ID	Client Sample Identifier	Date/Time Collected
18-6505-001	EW06	10/29/18 12:00
18-6505-002	Trip Blank	

Sample Batch Comments:

Sample acceptance criteria were met.

Method Comments

Lab Number	Sample ID	Comments:
18-6505-001	EW06	*Total Metals* Chemical preservation pH adjusted in lab.
18-6505-001	EW06	*Total Mercury* Chemical preservation pH adjusted in lab.
18-6505-001	EW06	*Semi-Volatile Compounds* Surrogate recovery outside control limits; low bias due to matrix interference.
18-6505-001	EW06	*Semi-Volatile Pesticides* Surrogate recovery outside control limits; low bias due to matrix interference.

The following analyses have been subcontracted to the indicated laboratory:

Analysis	Subcontractor:
Alcohol Compounds	*KEYSTONE LABORATORIES, INC. Newton, IA*
Carbamate Pesticides	*STAT ANALYSIS CORP. Chicago, IL*
Dioxin, Low Resolution	*PACE Analytical Services Minneapolis, MN*
Herbicides Method 8321A	*STAT ANALYSIS CORP. Chicago, IL*

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Case Narrative

REPUBLIC SERVICES (Zion)
Project ID: **Zion Landfill**

Lab File ID: **18-6505**
Date Received: **October 29, 2018**

All quality control criteria, as outlined in the methods, have been met except as noted below or on the following analytical report.

The following is a definition of flags that may be used in this report:

Flag	Description	Flag	Description
A	Method holding time is 15 minutes from collection. Lab analysis was performed as soon as possible.		
B	Analyte was found in the method blank.	L	LCS recovery outside control limits.
<	Analyte not detected at or above the reporting limit.	M	MS recovery outside control limits; LCS acceptable.
C	Sample received in an improper container for this test.	P	Chemical preservation pH adjusted in lab.
D	Surrogates diluted out; recovery not available.	Q	Result was determined by a GC/MS database search.
E	Estimated result; concentration exceeds calibration range.	S	Analysis was subcontracted to another laboratory.
G	Surrogate recovery outside control limits.	T	Result is less than three times the MDL value.
H	Analysis or extraction holding time exceeded.	W	Reporting limit elevated due to sample matrix.
J	Estimated result; concentration is less than routine RL but greater than MDL.	N	Analyte is not part of our NELAC accreditation or accreditation may not be available for this parameter.
RL	Routine Reporting Limit (Lowest amount that can be detected when routine weights/volumes are used without dilution.)	ND	Analyte was not detected using a library search routine; No calibration standard was analyzed.

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion Landfill
Sample ID: EW06
Sample No: 18-6505-001

Date Collected: 10/29/18
Time Collected: 12:00
Date Received: 10/29/18
Date Reported: 11/29/18

Analyte	Result	R.L.	Units	Flags
Total Metals **Method: 6010C**		**Preparation Method 3010A**		
Analysis Date: 11/09/18		Preparation Date: 11/08/18		
Aluminum	< 1,000	1000	ug/L	
Antimony	< 60	60	ug/L	
Arsenic	< 20	20	ug/L	
Barium	< 1,000	1000	ug/L	
Beryllium	< 40	40	ug/L	
Boron	6,390	100	ug/L	
Cadmium	< 25	25	ug/L	
Chromium	39	25	ug/L	
Cobalt	< 200	200	ug/L	
Copper	< 50	50	ug/L	
Iron	1,470	200	ug/L	
Lead	< 25	25	ug/L	
Manganese	290	50	ug/L	
Nickel	450	100	ug/L	
Selenium	< 50	50	ug/L	
Silver	< 50	50	ug/L	
Thallium	< 50	50	ug/L	
Tin	< 100	100	ug/L	
Zinc	117	20	ug/L	
Calcium	183	10	mg/L	
Magnesium	242	10	mg/L	
Potassium	208	10	mg/L	
Sodium	914	10	mg/L	
Total Mercury **Method: 7470A**				
Analysis Date: 11/20/18				
Mercury	< 4.0	4	ug/L	
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 11/09/18				
Acetone	< 500	500	ug/L	
Benzene	< 20.0	20	ug/L	
Bromobenzene	< 20.0	20	ug/L	
Bromochloromethane	< 20.0	20	ug/L	
Bromodichloromethane	< 20.0	20	ug/L	
Bromoform	< 20.0	20	ug/L	
Bromomethane	< 20.0	20	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion Landfill
Sample ID: EW06
Sample No: 18-6505-001

Date Collected: 10/29/18
Time Collected: 12:00
Date Received: 10/29/18
Date Reported: 11/29/18

Analyte	Result	R.L.	Units	Date Analyzed	Method	Flag
Alkalinity, Bicarbonate (CaCO3)	3,300	10	mg/L	10/30/18 9:00	2320B 1997	
Ammonia (as N)	410	5	mg/L	11/05/18	350.1R2.0	
BOD, 5 Day	83	40	mg/L	10/31/18 9:00	5210B 2001	
Chloride	1,600	10	mg/L	10/31/18	4500Cl, E 1997	
Chromium, Hexavalent	< 25.0	25	ug/L	11/12/18	3500Cr,B 2009	
COD	632	40	mg/L	11/02/18	5220D 1997	
Cyanide, Total	< 0.050	0.050	mg/L	11/12/18	9010B/9014	
Fluoride	0.69	0.50	mg/L	11/02/18 10:00	4500F,C 1997	
Nitrate (as N)	< 5.00	5	mg/L	10/30/18	353.2R2.0	
Oil (Hexane soluble)	< 20	20	mg/L	11/16/18	1664B 2010	P
Phenols	< 100	100	ug/L	10/31/18	420.1	
Phosphorus (as P)	1.28	0.5	mg/L	10/31/18	4500P,E 1999	
Sulfate	264	50	mg/L	11/05/18	4500S04,E	N
TOC	110	10	mg/L	11/07/18	5310C 2000	
Total Dissolved Solids	4,560	10	mg/L	11/01/18 13:00	2540C 1997	
Total Suspended Solids	< 40	40	mg/L	11/02/18 12:45	2540D 1997	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion Landfill
Sample ID: EW06
Sample No: 18-6505-001

Date Collected: 10/29/18
Time Collected: 12:00
Date Received: 10/29/18
Date Reported: 11/29/18

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 11/09/18				
n-Butanol	< 2,500	2500	ug/L	
2-Butanone (MEK)	140	100	ug/L	
n-Butylbenzene	< 20.0	20	ug/L	
sec-Butylbenzene	< 20.0	20	ug/L	
tert-Butylbenzene	< 20.0	20	ug/L	
Carbon disulfide	< 20.0	20	ug/L	
Carbon tetrachloride	< 20.0	20	ug/L	
Chlorobenzene	65.4	20	ug/L	
Chlorodibromomethane	< 20.0	20	ug/L	
Chloroethane	< 20.0	20	ug/L	
2-Chloroethyl vinyl ether	< 20.0	20	ug/L	
Chloroform	< 20.0	20	ug/L	
Chloromethane	25.5	20	ug/L	
2-Chlorotoluene	< 20.0	20	ug/L	
4-Chlorotoluene	< 20.0	20	ug/L	
1,2-Dibromo-3-chloropropane	< 30.0	30	ug/L	
Dibromomethane	< 20.0	20	ug/L	
1,2-Dichlorobenzene	< 50.0	50	ug/L	
1,3-Dichlorobenzene	< 15.0	15	ug/L	
1,4-Dichlorobenzene	< 75.0	75	ug/L	
trans-1,4-Dichloro-2-butene	< 20.0	20	ug/L	
Dichlorodifluoromethane	< 20.0	20	ug/L	
1,1-Dichloroethane	< 20.0	20	ug/L	
1,2-Dichloroethane	< 10.0	10	ug/L	
1,1-Dichloroethene	< 20.0	20	ug/L	
cis-1,2-Dichloroethene	< 20.0	20	ug/L	
trans-1,2-Dichloroethene	< 20.0	20	ug/L	
1,3-Dichloropropene (total)	< 20.0	20	ug/L	
1,2-Dichloropropane	< 10.0	10	ug/L	
1,3-Dichloropropane	< 20.0	20	ug/L	
2,2-Dichloropropane	< 50.0	50	ug/L	
1,1-Dichloropropene	< 20.0	20	ug/L	
trans-1,3-Dichloropropene	< 20.0	20	ug/L	
Ethyl acetate	< 200	200	ug/L	
Ethylbenzene	29.8	20	ug/L	
Ethylene dibromide (EDB)	< 20.0	20	ug/L	

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Analytical Report

Client:	REPUBLIC SERVICES (Zion)	**Date Collected:**	10/29/18
Project ID:	Zion Landfill	**Time Collected:**	12:00
Sample ID:	EW06	**Date Received:**	10/29/18
Sample No:	18-6505-001	**Date Reported:**	11/29/18

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B**				
Analysis Date: 11/09/18				
2-Hexanone	< 100	100	ug/L	
Iodomethane	< 20.0	20	ug/L	
Isopropylbenzene	< 20.0	20	ug/L	
p-Isopropyltoluene	< 20.0	20	ug/L	
4-Methyl-2-pentanone (MIBK)	< 100	100	ug/L	
Methylene chloride	< 40.0	40	ug/L	
2-Propanol	< 1,000	1000	ug/L	
n-Propylbenzene	< 20.0	20	ug/L	
Styrene	< 20.0	20	ug/L	
1,1,1,2-Tetrachloroethane	< 20.0	20	ug/L	
1,1,2,2-Tetrachloroethane	< 20.0	20	ug/L	
Tetrachloroethene	< 20.0	20	ug/L	
Tetrahydrofuran	168	20	ug/L	
Toluene	21.2	20	ug/L	
1,2,3-Trichlorobenzene	< 20.0	20	ug/L	
1,1,1-Trichloroethane	< 20.0	20	ug/L	
1,1,2-Trichloroethane	< 20.0	20	ug/L	
Trichloroethene	< 20.0	20	ug/L	
Trichlorofluoromethane	< 20.0	20	ug/L	
1,2,3-Trichloropropane	< 50.0	50	ug/L	
1,2,4-Trimethylbenzene	< 50.0	50	ug/L	
1,3,5-Trimethylbenzene	< 15.0	15	ug/L	
Vinyl acetate	< 50.0	50	ug/L	
Vinyl chloride	< 20.0	20	ug/L	
Xylene, Total	52.4	20	ug/L	
m&p-Xylene	34.8	20	ug/L	
o-Xylene	< 20.0	20	ug/L	
Pesticides/PCBs **Method: 8081A/8082**		**Preparation Method 3510C**		
Analysis Date: 11/05/18		Preparation Date: 11/05/18		
Aldrin	< 10.0	10	ug/L	
Polychlorinated biphenyls (Total)	< 1.0	1	ug/L	
alpha-BHC	< 10.0	10	ug/L	
beta-BHC	< 1.0	1	ug/L	
gamma-BHC (Lindane)	< 1.0	1	ug/L	
delta-BHC	< 1.0	1	ug/L	
Chlordane (Technical)	< 10.0	10	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion Landfill
Sample ID: EW06
Sample No: 18-6505-001

Date Collected: 10/29/18
Time Collected: 12:00
Date Received: 10/29/18
Date Reported: 11/29/18

Analyte	Result	R.L.	Units	Flags
Pesticides/PCBs **Method: 8081A/8082**		**Preparation Method 3510C**		
Analysis Date: 11/05/18		Preparation Date: 11/05/18		
4,4'-DDD	< 1.0	1	ug/L	
4,4'-DDE	< 1.0	1	ug/L	
4,4'-DDT	< 10.0	10	ug/L	
Dieldrin	< 10.0	10	ug/L	
Endosulfan I	< 1.0	1	ug/L	
Endosulfan II	< 1.0	1	ug/L	
Endosulfan sulfate	< 1.0	1	ug/L	
Endrin	< 2.0	2	ug/L	
Endrin aldehyde	< 5.0	5	ug/L	
Heptachlor	< 1.0	1	ug/L	
Heptachlor epoxide	< 8.0	8	ug/L	
Methoxychlor	< 10.0	10	ug/L	
Toxaphene	< 10.0	10	ug/L	
Semi-Volatile Compounds **Method: 8270C**		**Preparation Method 3510C**		
Analysis Date: 11/13/18		Preparation Date: 11/01/18		
Acenaphthene	< 100	100	ug/L	
Anthracene	< 100	100	ug/L	
Benzo(a)anthracene	< 100	100	ug/L	
Benzo(a)pyrene	< 100	100	ug/L	
Benzo(b)fluoranthene	< 100	100	ug/L	
Benzo(k)fluoranthene	< 100	100	ug/L	
Benzo(ghi)perylene	< 100	100	ug/L	
bis(2-Chloroethoxy)methane	< 100	100	ug/L	
bis(2-Chloroethyl)ether	< 100	100	ug/L	
bis(2-Chloroisopropyl)ether	< 100	100	ug/L	
bis(Chloromethyl)ether	< ND		ug/L	NQ
bis(2-Ethylhexyl)phthalate	< 100	100	ug/L	
4-Bromophenyl phenyl ether	< 100	100	ug/L	
Butyl benzyl phthalate	< 100	100	ug/L	
2-Chloronaphthalene	< 100	100	ug/L	
2-Chlorophenol	< 500	500	ug/L	
4-Chlorophenyl phenyl ether	< 100	100	ug/L	
Chrysene	< 100	100	ug/L	
Dibenzo(a,h)anthracene	< 100	100	ug/L	
3,3'-Dichlorobenzidine	< 500	500	ug/L	
2,4-Dichlorophenol	< 500	500	ug/L	

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Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion Landfill
Sample ID: EW06
Sample No: 18-6505-001

Date Collected: 10/29/18
Time Collected: 12:00
Date Received: 10/29/18
Date Reported: 11/29/18

Analyte	Result	R.L.	Units	Flags
Semi-Volatile Compounds **Method: 8270C** Analysis Date: 11/13/18		**Preparation Method 3510C** Preparation Date: 11/01/18		
Diethyl phthalate	< 100	100	ug/L	
2,4-Dimethylphenol	< 500	500	ug/L	
Dimethyl phthalate	< 100	100	ug/L	
Di-n-butyl phthalate	< 100	100	ug/L	
4,6-Dinitro-2-methylphenol	< 500	500	ug/L	
2,4-Dinitrophenol	< 500	500	ug/L	
2,4-Dinitrotoluene	< 100	100	ug/L	
2,6-Dinitrotoluene	< 500	500	ug/L	
Di-n-octylphthalate	< 100	100	ug/L	
Fluoranthene	< 100	100	ug/L	
Fluorene	< 100	100	ug/L	
Hexachlorobenzene	< 100	100	ug/L	
Hexachlorobutadiene	< 100	100	ug/L	
Hexachlorocyclopentadiene	< 100	100	ug/L	
Hexachloroethane	< 100	100	ug/L	
Indeno(1,2,3-cd)pyrene	< 100	100	ug/L	
4-Methylphenol	< 500	500	ug/L	
Naphthalene	< 100	100	ug/L	
Nitrobenzene	< 100	100	ug/L	
2-Nitrophenol	< 500	500	ug/L	
4-Nitrophenol	< 500	500	ug/L	
n-Nitrosodimethylamine	< 100	100	ug/L	
n-Nitrosodi-n-propylamine	< 100	100	ug/L	
n-Nitrosodiphenylamine	< 100	100	ug/L	
Pentachlorophenol	< 500	500	ug/L	
Phenanthrene	< 100	100	ug/L	
Pyrene	< 100	100	ug/L	
1,2,4-Trichlorobenzene	< 50	50	ug/L	
2,4,6-Trichlorophenol	< 500	500	ug/L	
Semi-Volatile Pesticides **Method: 8270C** Analysis Date: 11/17/18		**Preparation Method 3510C** Preparation Date: 11/01/18		
Alachlor	< 20	20	ug/L	N
Atrazine	< 30	30	ug/L	N
Parathion	< 10	10	ug/L	

First Environmental Laboratories, Inc.
IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion Landfill
Sample ID: EW06
Sample No: 18-6505-001

Date Collected: 10/29/18
Time Collected: 12:00
Date Received: 10/29/18
Date Reported: 11/29/18

Analyte		Result	R.L.	Units	Flags
Carbamate Pesticides	**Method: 8321A**				
Analysis Date: 11/02/18					
Aldicarb		< 30	30	ug/L	NS
Carbofuran		< 400	400	ug/L	NS
Herbicides Method 8321A	**Method: 8321A**				
Analysis Date: 11/02/18					
2,4-D		< 20	20	ug/L	S
Silvex (2,4,5-TP)		< 20	20	ug/L	S
Alcohol Compounds	**Method: 8015B**				
Analysis Date: 11/05/18					
n-Propanol		< 2,500	2500	ug/L	NS
Dioxin, Low Resolution	**Method: 8280**				
Analysis Date: 11/06/18					
2,3,7,8-TCDD		< 5.0	5	ug/L	NS

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IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client:	REPUBLIC SERVICES (Zion)	**Date Collected:**	
Project ID:	Zion Landfill	**Time Collected:**	
Sample ID:	Trip Blank	**Date Received:**	10/29/18
Sample No:	18-6505-002	**Date Reported:**	11/29/18

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B** Analysis Date: 11/09/18				
Acetone	< 500	500	ug/L	
Benzene	< 20.0	20	ug/L	
Bromobenzene	< 20.0	20	ug/L	
Bromochloromethane	< 20.0	20	ug/L	
Bromodichloromethane	< 20.0	20	ug/L	
Bromoform	< 20.0	20	ug/L	
Bromomethane	< 20.0	20	ug/L	
n-Butanol	< 2,500	2500	ug/L	
2-Butanone (MEK)	< 100	100	ug/L	
n-Butylbenzene	< 20.0	20	ug/L	
sec-Butylbenzene	< 20.0	20	ug/L	
tert-Butylbenzene	< 20.0	20	ug/L	
Carbon disulfide	< 20.0	20	ug/L	
Carbon tetrachloride	< 20.0	20	ug/L	
Chlorobenzene	< 20.0	20	ug/L	
Chlorodibromomethane	< 20.0	20	ug/L	
Chloroethane	< 20.0	20	ug/L	
2-Chloroethyl vinyl ether	< 20.0	20	ug/L	
Chloroform	< 20.0	20	ug/L	
Chloromethane	< 20.0	20	ug/L	
2-Chlorotoluene	< 20.0	20	ug/L	
4-Chlorotoluene	< 20.0	20	ug/L	
1,2-Dibromo-3-chloropropane	< 30.0	30	ug/L	
Dibromomethane	< 20.0	20	ug/L	
1,2-Dichlorobenzene	< 50.0	50	ug/L	
1,3-Dichlorobenzene	< 15.0	15	ug/L	
1,4-Dichlorobenzene	< 75.0	75	ug/L	
trans-1,4-Dichloro-2-butene	< 20.0	20	ug/L	
Dichlorodifluoromethane	< 20.0	20	ug/L	
1,1-Dichloroethane	< 20.0	20	ug/L	
1,2-Dichloroethane	< 10.0	10	ug/L	
1,1-Dichloroethene	< 20.0	20	ug/L	
cis-1,2-Dichloroethene	< 20.0	20	ug/L	
trans-1,2-Dichloroethene	< 20.0	20	ug/L	
1,3-Dichloropropene (total)	< 20.0	20	ug/L	
1,2-Dichloropropane	< 10.0	10	ug/L	

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IL ELAP / NELAC Accreditation # 100292
1600 Shore Road • Naperville, Illinois 60563 • Phone (630) 778-1200 • Fax (630) 778-1233

Analytical Report

Client: REPUBLIC SERVICES (Zion)
Project ID: Zion Landfill
Sample ID: Trip Blank
Sample No: 18-6505-002

Date Collected:
Time Collected:
Date Received: 10/29/18
Date Reported: 11/29/18

Analyte	Result	R.L.	Units	Flags
Volatile Organic Compounds **Method: 5030B/8260B** Analysis Date: 11/09/18				
1,3-Dichloropropane	< 20.0	20	ug/L	
2,2-Dichloropropane	< 50.0	50	ug/L	
1,1-Dichloropropene	< 20.0	20	ug/L	
trans-1,3-Dichloropropene	< 20.0	20	ug/L	
Ethyl acetate	< 200	200	ug/L	
Ethylbenzene	< 20.0	20	ug/L	
Ethylene dibromide (EDB)	< 20.0	20	ug/L	
2-Hexanone	< 100	100	ug/L	
Iodomethane	< 20.0	20	ug/L	
Isopropylbenzene	< 20.0	20	ug/L	
p-Isopropyltoluene	< 20.0	20	ug/L	
4-Methyl-2-pentanone (MIBK)	< 100	100	ug/L	
Methylene chloride	< 40.0	40	ug/L	
2-Propanol	< 1,000	1000	ug/L	
n-Propylbenzene	< 20.0	20	ug/L	
Styrene	< 20.0	20	ug/L	
1,1,1,2-Tetrachloroethane	< 20.0	20	ug/L	
1,1,2,2-Tetrachloroethane	< 20.0	20	ug/L	
Tetrachloroethene	< 20.0	20	ug/L	
Tetrahydrofuran	< 20.0	20	ug/L	
Toluene	< 20.0	20	ug/L	
1,2,3-Trichlorobenzene	< 20.0	20	ug/L	
1,1,1-Trichloroethane	< 20.0	20	ug/L	
1,1,2-Trichloroethane	< 20.0	20	ug/L	
Trichloroethene	< 20.0	20	ug/L	
Trichlorofluoromethane	< 20.0	20	ug/L	
1,2,3-Trichloropropane	< 50.0	50	ug/L	
1,2,4-Trimethylbenzene	< 50.0	50	ug/L	
1,3,5-Trimethylbenzene	< 15.0	15	ug/L	
Vinyl acetate	< 50.0	50	ug/L	
Vinyl chloride	< 20.0	20	ug/L	
Xylene, Total	< 20.0	20	ug/L	
m&p-Xylene	< 20.0	20	ug/L	
o-Xylene	< 20.0	20	ug/L	

R 001816

CHAIN OF CUSTODY RECORD

Page___ of ___ pgs

First Environmental Laboratories, Inc.

First Environmental Laboratories
1600 Shore Road, Suite D
Naperville, Illinois 60563
Phone: (630) 778-1200 • Fax: (630) 778-1233
E-mail: firstinfo@firstenv.com • www.firstenv.com
IEPA Certification #100292

Company Name: Zion Landfill

Street Address:

City: State: Zip:

Phone: e-mail:

Send Report To: Joe Miller

Sampled By:

Project I.D.:

P.O. #:

Matrix Codes: S = Soil W = Water O = Other

Analyses

Date/Time Taken	Sample Description	Matrix	Hold – Do Not Analyze	Comments	Lab I.D.
102918/1200	FW06	W			18-65505-001
	TRIP BLANK – MG	W			-002

FOR LAB USE ONLY:

Cooler Temperature: 0.1-6°C Yes__ No__ ____°C
Received within 6 hrs. of collection:____
Ice Present: Yes__ No__

Sample Refrigerated: Yes__ No__
Refrigerator Temperature:____°C
5035 Vials Frozen: Yes__ No__
Freezer Temperature:____°C

Program: ☐ TACO/SRP ☐ CCDD ☐ NPDES ☐ LUST ☐ SDWA

Notes and Special Instructions:

Relinquished By: Date/Time 102918/1547 Received By: Date/Time 10/29/18 15:47

Relinquished By: Date/Time Received By: Date/Time

Rev. 5/17

Appendix E-7

Construction Acceptance Report, Site 1, Phase A Leachate Extraction System, September 27, 2000

September 27, 2000
Project No. 0120-37-25

CONSTRUCTION ACCEPTANCE REPORT
Site 1, Phase A Leachate Extraction System
Onyx Zion Landfill
IEPA Site No. 0978020001
RCRA Permit Log No. B-23-M-21

Prepared For:

BFI Waste Systems of North America, Inc.
2495 East 117th Street
Inver Grove Heights, Minnesota 55077

Submitted To:

Illinois Environmental Protection Agency
Division of Land Pollution Control
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Weaver Boos & Gordon, Inc.

GEO-ENVIRONMENTAL ENGINEERS AND SCIENT
Chicago, IL Griffith, IN Albuquerque

Weaver Boos & Gordon, Inc.

ALBUQUERQUE, NM
CHICAGO, IL
GRIFFITH, IN

415 TAFT AVENUE • GLEN ELLYN, ILLINOIS 60137 • 630/858-2490 FAX 630/858-2762

September 27, 2000
Project No. 0120-37-25

Ms. Joyce Munie, P.E.
Manager, Solid Waste Branch
Permit Section, Bureau of Land
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: Construction Acceptance Report
Site 1, Phase A Leachate Extraction System
Onyx Zion Landfill
IEPA Site No. 0978020001
RCRA Permit Log No. B-23-M-21

Dear Ms. Munie:

Enclosed is a Construction Acceptance Report for a Leachate Extraction System at Onyx Zion Landfill in Zion, Illinois. An original and three (3) copies are enclosed for your review.

The enhancements to the leachate extraction system were carried out from July to September 2000. Weaver Boos & Gordon, Inc. (*Weaver Boos*) performed the Construction Quality Assurance (CQA) monitoring and this document is provided as an Acceptance Report for the construction of the leachate extraction system.

Attached figures provide the as-built information pertaining to the Site 1, Phase A (*Site 1A*) leachate extraction system enhancements prepared by Weaver Boos as part of this CQA Acceptance Report.

The daily summary reports documenting the construction progress are included in Appendix A. Manufacturer information concerning equipment and material installed as a part of this project is included in Appendix B. Appendix C contains air pressure test results of the new piping. Construction photographs are included in Appendix D.

We appreciate your review of the enclosed documentation. If you have any additional questions or comments, please contact us.

Sincerely,
Weaver Boos & Gordon, Inc.

Megan Jewett, E.I.T.
Staff Engineer

Ali Hashimi, P.E.
Senior Project Manager

cc: Mr. Tim Ralston, BFI Waste Systems of North America, Inc.
Mr. Jim Lewis, Onyx Zion Landfill
Ms. Rebecca Ries, Ries Environmental, Inc.
Mr. Marc Marszalek, Weaver Boos & Gordon, Inc.

CONSTRUCTION ACCEPTANCE REPORT
Site 1, Phase A Leachate Extraction System
Onyx Zion Landfill
IEPA Site No. 0978020001
RCRA Permit Log No. B-23-M-21

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CONSTRUCTION ACCEPTANCE REPORT
Site 1, Phase A Leachate Extraction System
Onyx Zion Landfill
IEPA Site No. 0978020001
RCRA Permit Log No. B-23-M-21

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Appendix C Air Pressure Test Results

Appendix D Construction Photographs

1.0 INTRODUCTION

This report and accompanying plans document the enhancements to the Onyx Zion Landfill Site 1, Phase A (*Site 1A*) leachate extraction system. These modifications supplement the current system to provide additional landfill gas and leachate control on Site 1A.

The work on Site 1A was completed during the 2000 construction season by Weaver Boos & Gordon, Inc (*Weaver Boos*). New leachate forcemains were constructed from EW-21 to the manhole on the southwest side of Site 1A and from the Site 1A storage tank to the existing 2-inch diameter forcemain on the west side of Site 1A. Pumps were installed in 23 of the 28 existing Site 1A extraction wells to collect leachate and discharge it to the existing leachate management system. A new section of 2-inch HDPE SDR 11 air supply piping was constructed through EW-21, EW-22, EW-23, and EW-24. Additional work was done to modify the leachate piping and air supply piping between Site 1A and Site 2 to allow each site to operate independently of the other. A leachate load-out pad was also constructed at the Site 1A and Site 2 storage tanks.

Daily summary reports documenting the construction progress are included in Appendix A. Manufacturer information concerning equipment and material installed as a part of this project is included in Appendix B. Appendix C contains air pressure test results. Construction photographs are included as Appendix D.

2.0 SITE 1A LEACHATE EXTRACTION SYSTEM

2.1 Construction of Additional Leachate Forcemains

Two additional sections of leachate forcemain were constructed on Site 1A. The first is a 3"x6" dual-contained HDPE forcemain and accompanying 2-inch diameter HDPE SDR 11 air supply piping on the west side of Site 1A constructed on July 12 to 19, 2000. This piping connects to the existing 2-inch diameter HDPE SDR 11 forcemain and 2-inch diameter HDPE SDR 11 air supply piping on the west side of Site 1A. A butterfly valve was installed at the forcemain connection to allow the system to be shut off if necessary. The new forcemain extends approximately 670 feet west from the existing forcemain, then 370 feet south, where it is directed above the ground surface via a 90° elbow and attaches to the Site 1A storage tank. A leak detection riser was constructed at the low point along the pipe route. The 3"x6" forcemain and a 2-inch diameter HDPE SDR 11 air supply piping were laid parallel in a trench approximately 5 feet deep. The pipes were bedded in sand before the trench was backfilled with soil. Caution tape and an electrical signal wire were also placed in the trench to indicate the pipe's location.

The excavation to locate the existing leachate and air supply piping on the west side of Site 1A was extended into the waste as the existing piping was located below the liner. Since Site 1A is a hazardous waste landfill, waste excavated below the liner was placed in a roll-off container that is being stored on site until it can be shipped for disposal.

The second section of new leachate forcemain is a 2"x4" dual-contained HDPE forcemain constructed on August 30 and 31, 2000. It is accompanied by a 2-inch diameter HDPE SDR 11 air supply piping and laid in a trench approximately 3 feet deep. The air supply and leachate piping is connected to the existing leachate discharge and air supply systems at EW-21 and extends approximately 240 feet southwest, where it enters a manhole at the southwest corner of Site 1A. The air supply and leachate piping was bedded in sand before the trench was backfilled with soil. A pump was installed inside the manhole via a pitless adaptor to pump leachate up to the existing leachate discharge piping at EW-21 to maintain the appropriate leachate level within the manhole (1 foot above the manhole bottom).

Prior to connection of the air supply and leachate piping to the existing system, this piping was pressure tested to confirm its integrity. The results of this testing, included in Appendix C, indicate that the piping meets the project requirements.

2.2 Pump Installation and Wellhead Reconfiguration

Pneumatic pumps were installed in 23 of the 28 existing extraction wells on Site 1A to discharge leachate from the wells to the existing leachate management system. The pumps were connected to the air supply and leachate discharge piping via flexible hose. Operation of the pumps is controlled by a 1-inch diameter stainless steel ball valve on the air supply piping and a 1¼-inch diameter stainless steel ball valve on the leachate discharge piping. A needle valve installed on the air exhaust line from the pump can also be used to control pump operation.

At the 23 wellheads where pumps were installed, the flange was reconstructed to allow for an air exhaust line and pressure regulator for the pump. A 4-inch diameter HDPE wye with a 2-inch gate valve at the end was installed at each wellhead to replace the existing ball valve. A length of flexible hose runs from the pump, through the wye, and into the leachate piping stub to allow leachate pumped from the extraction well to discharge into the existing leachate line. A ball valve to control leachate flow is located on the flexible hose inside the wellhead near the wye. A section of 4-inch diameter flexible hose covers the leachate hose from the end of the wye to the stickup, providing dual containment for the leachate discharge system. New 1-inch diameter stainless steel ball valves were installed on all air supply piping stubs at the wellheads. Details can be seen on Figure 3.

At the five extraction wells that did not have leachate pumps installed, the valves on the air supply stubs were replaced with stainless steel caps. No modifications were made to the wellheads or leachate stubs.

3.0 AIR SUPPLY AND LEACHATE PIPING MODIFICATIONS

On July 25 and 26, 2000, Site 2 air supply and leachate piping was separated from the piping for Site 1A. The air supply systems for Site 1A and Site 2 were separated by modifying the air supply piping at five (5) locations. At EW-22, EW-23, and EW-24, the existing air supply piping was cut and capped at the wellhead. Both the air supply and leachate piping were cut and both ends were capped at a point east of EW-24, between Site 1A and Site 2. At valve box V-4, the air supply piping was also cut and capped. These modifications isolated the existing air supply and leachate systems for Site 2 from Site 1A.

A new air supply system was installed on Site 1A as shown on Figure 1. These modifications included the installation of new 2-inch diameter HDPE SDR 11 air supply piping from the blower building to the existing air supply piping located on the west side of Site 1A between EW-19 and EW-20. Additional new 2-inch diameter HDPE SDR 11 air supply piping was installed between EW-21, EW-22, EW-23, and EW-24. This piping was located within the protective cover layer as not to compromise the integrity of the final cover barrier layer.

After completion of the air supply system modifications, an air pressure test was performed to verify the integrity of the Site 1A air supply system. The results of this testing, in Appendix C, indicate that piping meets the project requirements.

A new air compressor and air dryer were installed in the blower building in the flare compound on August 1, 2000. New electrical wiring was also installed for the air compressor, air dryer, exhaust fan, and Site 1A and Site 2 storage tanks. The air supply system was equipped new solenoid valves to control its operation. If an alarm condition occurs on either Site 1A or Site 2 (e.g., tank full), the other system will be allowed to operate.

4.0 LEACHATE LOAD-OUT PAD

A leachate load-out pad was constructed in the flare compound for Site 1A and Site 2. This pad will provide spill control for emptying the on-site storage tanks. The 40-foot by 14-foot concrete pad includes footings at a depth of 4.5 feet and four foot deep concrete bearing walls. It is sloped to the center where it drains through a floor drain. The floor drain is piped to a sump, which contains an automatic float-controlled pump to convey liquid from the pad to the Site 1A storage tank. The combined capacity of the pad, sump, and vault is approximately 6000 gallons, which exceeds the volume of an over-the-road tanker truck.

5.0 ENGINEERING CERTIFICATION STATEMENT

Based upon the data presented, as well as the observations of CQA monitoring personnel, the leachate extraction system is in general accordance with the engineering design plans and authorized pursuant to RCRA Permit Log No. B-23-M-21.

Certified by: _____

Weaver Boos & Gordon, Inc.
Ali Hashimi, P.E.
Project CQA Officer
Illinois P.E. No. 062-049264
Expires November 30, 2001

ALI HASHIMI
062-049264
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS

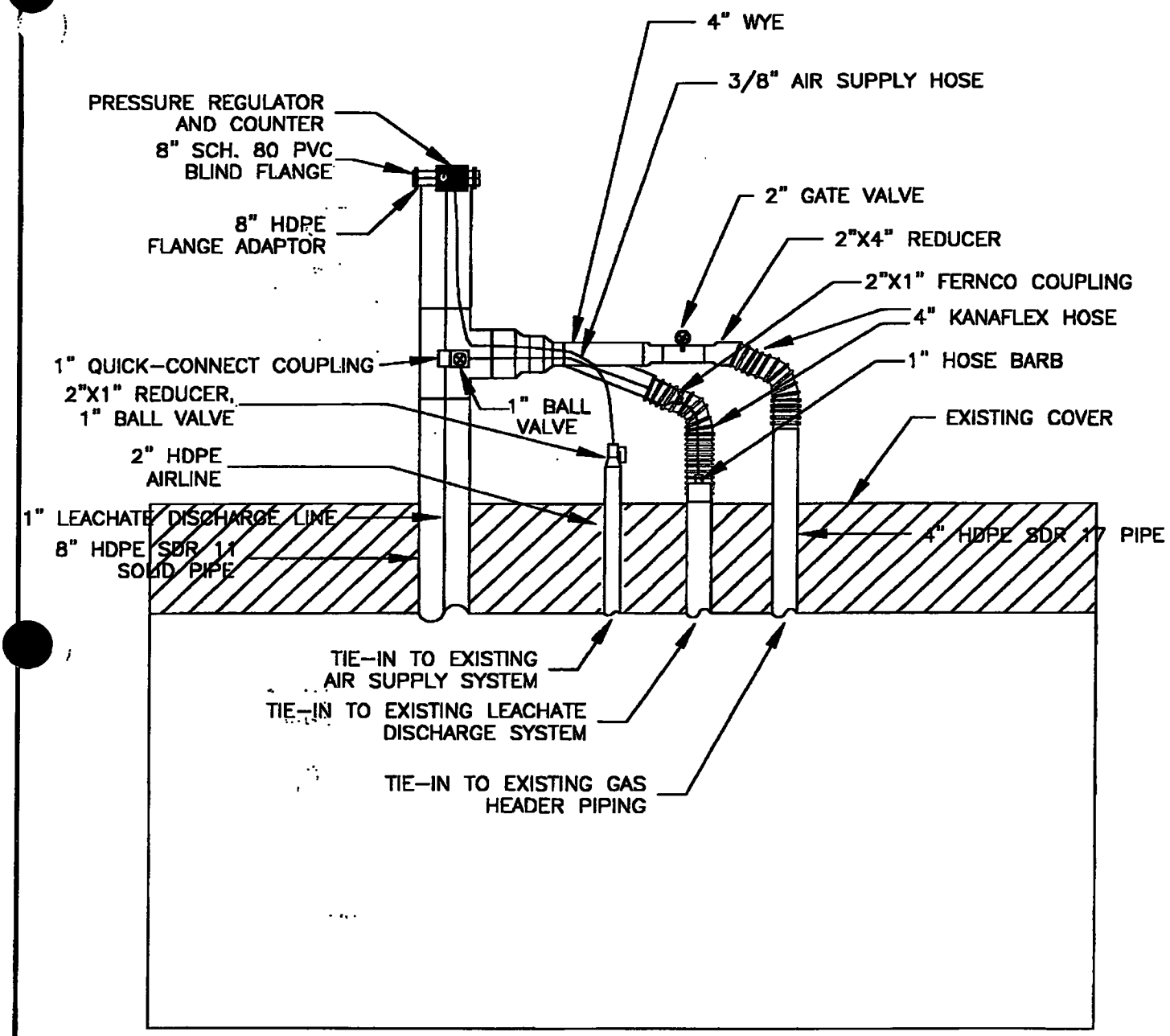
Date: 9/27/00

IR 001828

FIGURES

LIST OF FIGURES

Figure 1	Site 1A/Site 2 Air & Leachate Piping Modifications
Figure 2	Site 1A New Forcemain Profiles
Figure 3	Site 1A Extraction Well Details
Figure 4	Leachate Load-Out Pad Record Drawing



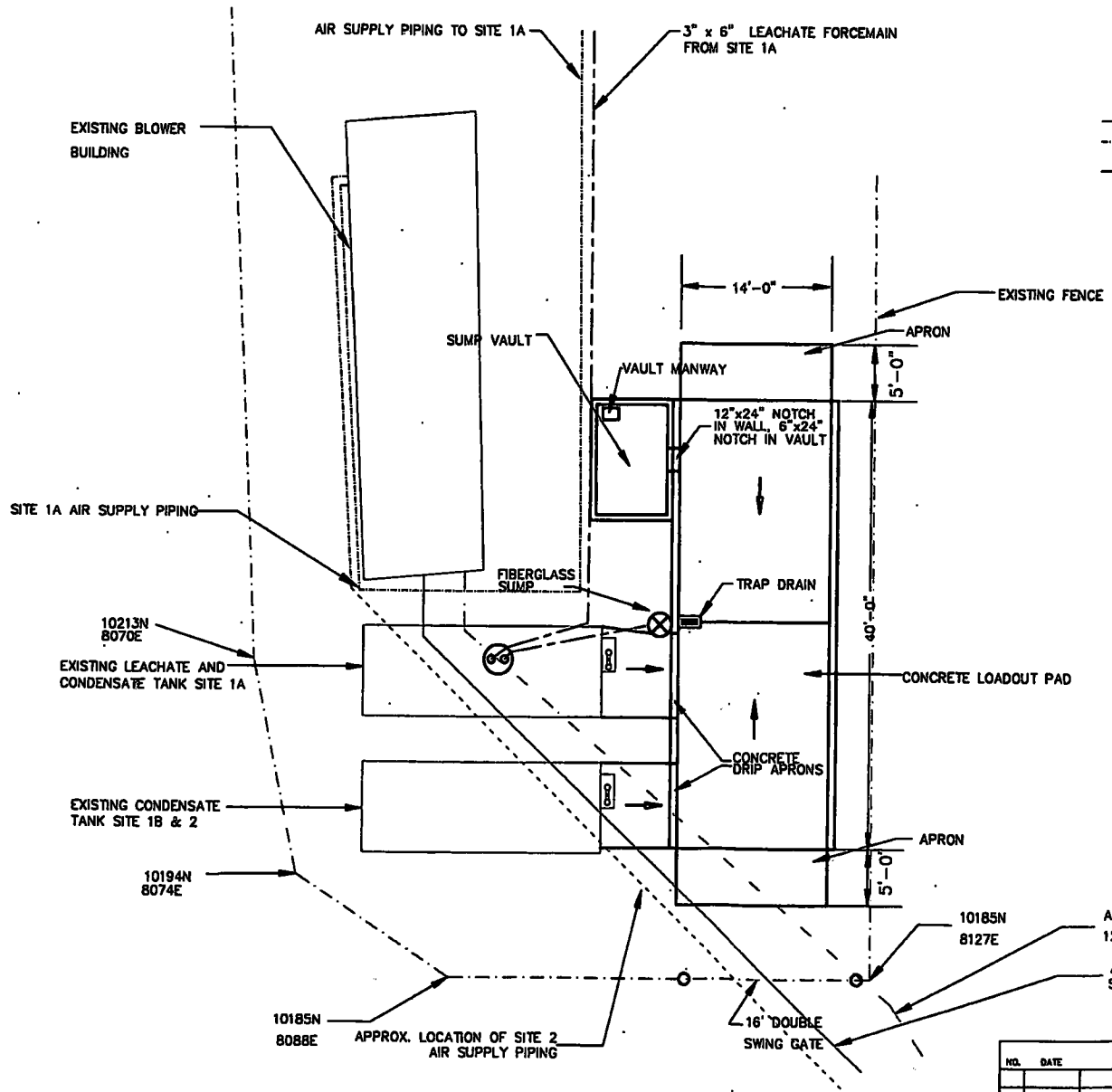
SITE 1A
EXTRACTION WELLHEAD DETAILS

ONYX ZION LANDFILL
ZION, ILLINOIS

Weaver Boos & Gordon, Inc.
GLEN ELLYN, IL (630) 858-2480 | CHICAGO, IL (312) 922-1030 | SPRINGFIELD, IL; GRIFFITH, IN | ALBUQUERQUE, NM

DRAWN BY: MJJ	DATE: 9/27/00	FILE: 0120-37-25
REVIEWED BY: AAH	CAD: ZN000021.DWG	FIGURE 3 OF 4

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LEGEND

- SLOPE INDICATOR
- FENCE
- AIR SUPPLY PIPING
- LEACHATE FORCEMAIN

NOTES:

1. LOCATION OF THE GAS COLLECTION PIPING IN THE FLARE COMPOUND IS SHOWN AS APPROXIMATE. DURING CONSTRUCTION OF THE LEACHATE LOAD-OUT PAD, EXCAVATION FOR THE FOOTINGS CONFIRMED THAT THESE PIPES WERE NOT LOCATED WITHIN THE FOOTINGS.
2. LOCATION OF CONDENSATE DISCHARGE AND SITE 2 AIR SUPPLY PIPING FROM SITE 1A AND SITE 2 NOT PROVIDED ON RECORD DRAWING.

NORTH

SCALE

0 5' 10' 20'

LEACHATE LOAD-OUT PAD RECORD DRAWING

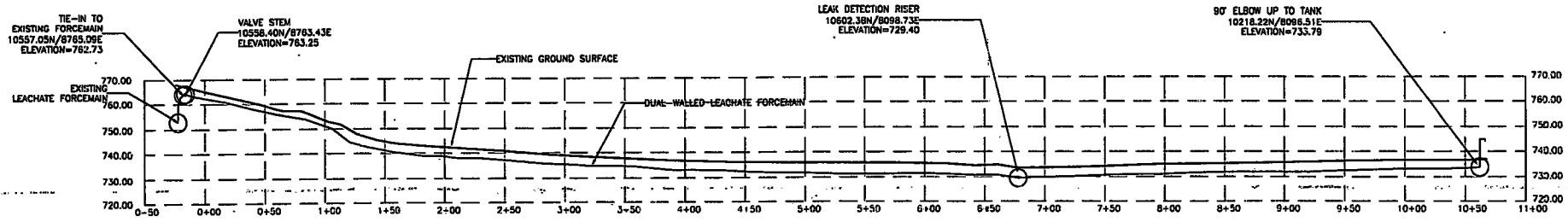
ONYX ZION LANDFILL
ZION, ILLINOIS

REVISIONS NO.	DATE	DESCRIPTION

Weaver Boos & Gordon, Inc.
CHICAGO, IL (312)922-1030 GLEN ELLYN, IL (630)858-2480 GRIFFITH, IN (219)923-9600 ALBUQUERQUE, NM SPRINGFIELD, IL

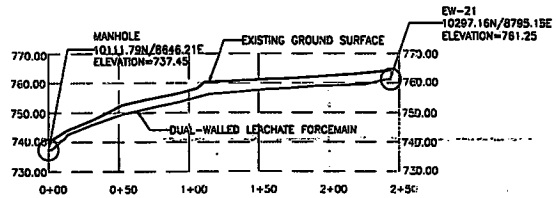
DRAWN BY: MAJ	DATE: 9/27/00	FILE: 0120-37-25
REVIEWED BY: AAH	CAD: ZN000020.DWG	FIGURE 4 OF 4

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1/2 SITE 1A 3"X6" LEACHATE FORCEMAIN

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 20'



2/2 SITE 1A 2"X4" LEACHATE FORCEMAIN

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 20'

☐ DRAFT
☒ PERMIT APPLICATION
☐ APPROVED FOR CONSTRUCTION
☐ CLIENT APPROVAL BY: _____

DATE: 6/27/01
FILE: 0°30-37-23
CAD: 2N000025.DWG

DRAWN BY: MAH
DESIGN BY: AAH
REVIEWED BY: AAH

PREPARED FOR
BFI WASTE INDUSTRIES OF NORTH AMERICA, INC.
2400 E. 171ST STREET
RIVER GROVE HEIGHTS, IMI 60077

NO.	DATE	DESCRIPTION

SITE 1A
NEW FORCEMAIN PROFILES

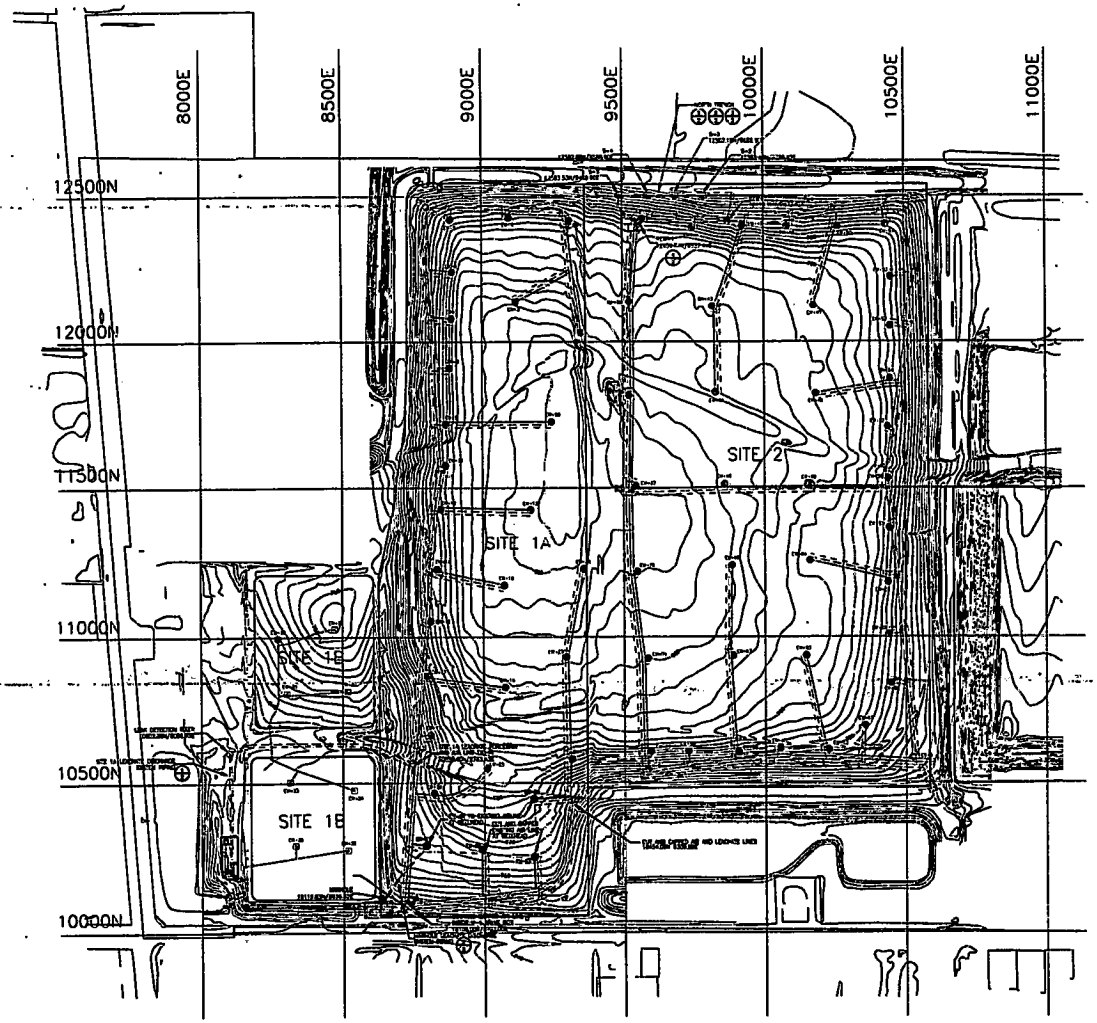
ONYX ZION LANDFILL
ZION, ILLINOIS

Weaver Boos & Gordon, Inc.

DRAWING 2 OF

R 001834

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LEGEND

- EXISTING EXTRACTION WELL
- NORTH TRENCH SUMP
- REMOTE UPSLOPE WELLHEADS
- CONDENSATE SUMP
- VALVE BOX
- MANHOLE
- PIPE CAP
- GAS HEADER PIPING
- LEACHATE FORCEMAIN PIPING
- CONDENSATE DISCHARGE PIPING
- AIR SUPPLY PIPING

NOTES

1. LOCATION OF THE GAS COLLECTION PIPING IN THE FLARE COMPOUND IS SHOWN AS APPROXIMATE. DURING CONSTRUCTION OF THE LEACHATE LOAD-OUT PAD, EXCAVATION FOR THE FOOTINGS CONFIRMED THAT THESE PIPES WERE NOT LOCATED WITHIN THE FOOTINGS.

NORTH

SCALE
0 100' 200' 400'

DRAFT
PERMIT APPLICATION
APPROVED FOR CONSTRUCTION
CLIENT APPROVAL BY: _____

DATE: 9/22/09
FILE: 0130-27-D90
CAD: D9000023.DWG
DRAWN BY: RAF
DESIGN BY: AMI
REVIEWED BY: AMI

REUSE OF DOCUMENTS

PREPARED FOR
BFI WASTE INDUSTRIES OF NORTH AMERICA, INC.
3480 E. 110TH STREET
RIVER GROVE HEIGHTS, MN 55077

REVISIONS

NO.	DATE	DESCRIPTION

SITE 1A AND SITE 2
AIR & LEACHATE
PIPING MODIFICATIONS
ONYX ZION LANDFILL
ZION, ILLINOIS

Weaver Boos & Gordon, Inc.

DRAWING 1 OF 1

R 001885

SITE PLAN ADAPTED FROM EXCEL HILL PROPOSED GAS SYSTEM PLAN VIEW LAYOUT SHEET 17 OCT. 1995.

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APPENDIX A

APPENDIX A

Daily Summary Reports

WEAVER BOOS & GORDON, INC.
200 S. Michigan, Suite 900, Chicago, IL 60604 Phone: (312) 922-1030 Fax: (312) 922-0201
1944 N. Griffith, Unit C, Griffith, IN 46319 Phone: (219) 923-9606 Fax: 923-9641

Daily Summary Report

Owner: Zion Landfill
Project: Leachate Systems Modifications
Project No.: 0120-37-25
Report No: 1
Page: 1 of 1
Date: June 6, 2000 Day: Tuesday

Weather Temp.(°F): A.M. Sunny High 70 Low 50 P.M. Sunny Rain N

Contractor(s): None
Contractor Sub(s): None

Summary of Daily Construction Progress and Inspections:

0730. Arrived onsite & checked in @ scale house.
- Found control from CQM on site 1A&2. Used these points to stake trench location.
- Staked locations of 5 trench risers & connection to existing system. Also set excalidation control points by G160 & G161.

~~Drilg location~~

0830- Met w/ Jim Lewis. Told him stone & pipe will be on site @ 7:00. Asked if he could help unload pipe if needed, he said ok, but let him know what was coming.
- We agreed to stage materials along road seperating Site 1A & 2 for trench. Material for force main will be staged north of flare & west of landfill.

0930- Began staking forcemain from flare compound to Site 1A. Set additional control point due to obstruction from roll off boxes.
- Checked rating on air compressor in blower bldg. Name plates on several pieces of equipment state Class I Group D.

1215- Finished staking forcemain. Returned compound keys to Jim Lewis and left the site.

Signature: Ali Herk

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Daily Summary Report

Owner: Zion Landfill
Project: Leachate System Modifications
Project No.: 0120-37-25
Report No: -2
Page: 1 of 1
Date: June 7, 2000 Day: Wednesday

Weather
Temp.(°F): High 88 Low _____ A.M. _____ P.M. Sunny Rain No

Contractor(s): None
Contractor Sub(s): None

Summary of Daily Construction Progress and Inspections:

1330- Arrived on-site. Ali Hashim, Darren Fry, & Jennifer Knapp.
- Setup to proof wells

1430- Proofed wells EW-1, EW-3, and RW-2.
- Setup equipment @ EW-2B.
- Refer to Table of proofing results includes
  - Depth to liquid
  - ~~Depth to~~ Total depth
  - stickup
  - dist. to air / leachate lines

1730- Off site

Signature: Ali Hash

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Daily Summary Report

Owner: Zion Landfill
Project: Leachate Systems Mod.
Project No.:
Report No: 3
Page: 1 of 1
Date: June 9, 2000 Day: Thursday

Weather Temp.(°F): High ____ Low ____
A.M. 75° F P.M. 90°F Rain No

Contractor(s): None
Contractor Sub(s): None

Summary of Daily Construction Progress and Inspections:

0730. Arrived on-site continued proofing wells.
- completed wells EW-12 through EW-22 and EW-24 through EW-28
- Refer to table of results for measurements taken.

1730. Offsite

Signature: Ali Hall

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Daily Summary Report

Owner: Zion Landfill Report No: _____

Project: Leachate System Mod. Page: 1 of 1

Project No.: 012-37-25 Date: 6/20/00 Day: Tuesday

Weather A.M. Rain P.M. Cloudy

Temp.(°F): High 65° Low 50° Rain _____

Contractor(s): None

Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

1045. Took measurements on EW-8, EW-9, EW-10, & EW-11.

1430. Took measurements on the blower bldg. for tower & fan placement.

1600. Offsite

Signature: Ali Hadi

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Daily Summary Report

Owner: Zion Landfill Report No: _____

Project: Gas/Leachate System Page: 1 of 1

Project No.: 0120-37-25 Date: 7/10/00 Day: Monday

Weather A.M. Rain P.M. Sunny

Temp.(°F): High 95 Low 70 Rain _____

Contractor(s): Ryan Inc.

Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

0930. Onsite. Met w/ Ryan to discuss work for project.
- Reviewed plans & specs w/ MEM.

1200. Unloaded truck from Forrer Supply w/ HDPE materials for project. Reloaded 3" ϕ SDR17 pipe ordered by mistake.

1400. Weaver Boos began fusing pipe for 6" ϕ force main from Site 1A to tank area.
- Weaver Boos began fusing fittings for north trench installation.

1730. 400' of 6" ϕ SDR17 pipe fused for force main.
- Picked up work area for the evening.

1800. Offsite

Signature: Ali Hall

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate Modification
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 7/11/00 Day: Tuesday

Weather A.M. overcast P.M. sunny
Temp.(°F): High 85 Low 65 Rain no

Contractor(s): Ryan Inc.
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0615 (Megan Ali, Marc, Brian B, Larry M). Excavator onsite to remove gravel from load-out pad area. Also checking south end of load-out pad area (near fence) for location of existing gas headers. Location of gas headers will determine exactly where load-out pad is built. Fuse 6" perforated & solid pipe for north trench on Site 2, also fuse air and leachate stickups for north trench. Ordered sand for pipe bedding material for all trenches.

No gas headers were located in load-out pad area (they are deeper beneath the surface), so corners of the pad were staked out. Fuse 6" and 3" solid pipe for the north trench and for Site 1A forcemain. Excavator began removing 3' cover from north trench area. Worked on Site 1A wellhead completions.

Offsite @ 1930 hrs

Signature: _____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate Systems
Project No.: 0120-37-25
Report No:
Page: 1 of 1
Date: 7/12/00 Day: Wednesday
Weather A.M. Cloudy P.M. Sunny
Temp.(°F) High 85 Low 60 Rain no

Contractor(s): Ryan
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0615 (Ali, Megan, Marc, Brian, Larry M). Work on excavating Site 2 north trench near S-1. After exposing the stub near the base of S-1, found it was oriented the wrong direction. Turned the sump to align stub with the trench. Excavation on trench was stopped after 20' of the wall between S-1 and S-2 failed. Backfilled that portion of the trench and will attempt excavating at a later date.

Began excavating Site 1A forcemain trench to approximately 4' below ground surface. Completed approx. 175' of trench today. Continued fusing pipe for Site 1A forcemain and Site 2 north trench.

Offsite @ 1830 hrs

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Daily Summary Report

Owner: Zion Landfill Report No: _____
Project: Gas/Leachate Maint. Page: 1 of 1
Project No.: 0120-37-25 Date: 7/13/00 Day: Thursday

Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 90 Low 60 Rain no

Contractor(s): Ryan Const.
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0630 (Ali, Megan, Marc, Larry M, Brian). Continue excavating Site IA forcemain trench. Problems with equipment — a lot of down time in morning while equipment being repaired. Work on fusing 3" pipe for forcemain and threading it through 6" containment pipe for Site IA. Once excavator repaired, continue excavating trench and placing sand blanket. Lay portion of 3x6 forcemain and accompanying 2" airline in trench, Survey in as-built location. Place sand and caution tape over pipes in the trench. Clean up site before leaving for evening.

Offsite @ 1800 hrs

Signature Meg Tuttle

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: _____
Page: 1 of 1
Date: 7/17/00 Day: Monday
Weather A.M. Sunny P.M. Sunny
Temp.(°F): High. 87 Low 75 Rain none

Contractor(s): Ryan Construction
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Arrived @ 0600 (Ali, Megan, Al, Heather, Brian B.). Surveyed and staked out line between EW-21 and EW-24 to run new site 1A airline. Excavated forcemain trench to the west and to the north from the north side of the fence by the flare station. Worked on fusing dual-contained pipe for forcemain. Once trench was finished, pipe laid in trench and as-built locations surveyed in. Began filling in sand blanket around forcemain in trench.

Pump set up to pump down the high groundwater in area of north trench excavation. As per Lake County Health Department, stormwater on the north side will be handled as leachate.

Late in afternoon, began 2½' trench for airline at EW-21, Lift site at 1900 hrs.

Signature: Megan Truitt

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: _____
Page: 1 of 1
Date: 7/18/00 Day: Tuesday

Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 85 Low 70 Rain none

Contractor(s): Ryan Construction.
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite at 0600 (Ali, Megan, Al, Heather, Brian B, Marc M, Jerry L, & Larry M). Continued as-built survey of forcemain in trench as pipe is laid in. Leak detection riser constructed near flare station for forcemain. After forcemain was been surveyed in, shovel sand blanket around pipe and then began back filling trench. Completed trench for Site IA airlines running between EW-21 and EW-24.

Staked out forcemain tee tie-in and tee for airline Shutoff on Site IA. After much excavation, gas, leachate, air, and condensate lines located 20' east of where they had been staked on west side of Site IA. Excavation was into garbage, which is hazardous waste. All garbage removed was placed in dumpster and covered with a tarp to keep water out. At the end of the day excavation covered in case of rain overnight. Left site @ 2000 hrs.

Signature: Megan Jandt

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/leachate System
Project No.: 0120-37-25

Report No:
Page: 1 of 1
Date: 7/19/00 Day: Wednesday

Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 85 Low 70 Rain none

Contractor(s): Ryan Construction, Bieha Construction
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Marc M, Larry M, Al, Brian B, Jerry L, Al, Heather, Megan). Megan and Heather staked corners of load-out pad, footings, and vault for Bieha when they arrived onsite. Continued as-built survey of dual-contained forcemain and airline. Pipes bedded in sand and trench backfilled as survey completed.

Bieha excavated for both footings at load-out pad, poured east footing.

Forcemain and airline tied into existing system at west side of Site IA, locations surveyed in. Sealed with volclay chips, then replaced clay layer and compacted clay with jack. Replaced geocomposite before replacing protective cover layer, bringing soil back to original grade. Excavated garbage still in dumpster where it had been placed the day before. Partial air flow started in new airline and left on overnight to check for leaks in system.

Dual-contained pipe going from forcemain in trench up to Site IA leachate collection tank was constructed. Pipe was welded on to end of forcemain and stands up out of trench, but it is not attached to Site IA tank yet. Location of 90° on pipe going up to tank surveyed in. Left site @ 1930 hrs.

Signature: Megan Truett

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Daily Summary Report

Owner: Zion Landfill
Project: Gas / Leachate System
Project No.: 0170-37-25
Report No: ____
Page: 1 of 1
Date: 7/20/00 Day: Thursday
Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 85 Low 70 Rain none

Contractor(s): Ryan Construction, Bielss Construction
Contractor Sub(s): ____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Marc M, Ali, Megan, Al, Jerry L). Backfill remainder of west foreman's trench near load-out pad just up to Cutler pipe connect up for Site 1A leachate tank.

Bielss poured west footing, leaving drain for sump and notch cut out on north end for vault. Also poured east wall and set up forms for west wall.

In north trench, pipe laid between S-2 & S-3 and S-3 & S-4. Locations of pipe surveyed in. Pipe bedded in stone with soil placed over it. Geomembrane panels placed, one between S-2 & S-3, one between S-3 & S-4. Corners of panels surveyed in before soil cover placed over them.

Work done connecting new airlines between EW-21 and EW-24 to separate from old system, also air & leachate lines in north trench.

Left site @ 1800 hrs.

Signature: Megan Griffith

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 7/21/00 Day: Friday

Weather
Temp.(°F): High 95 Low 70
A.M. Sunny P.M. Sunny
Rain none

Contractor(s): Ryan Construction, Biehn Construction
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Marc M, Ali, Al, Megan, Jerry L). Continue north trench between S-1 and S-2. Groundwater coming into excavation was pumped into 1500 gal poly tank delivered by Advanced Waste. Water from tank later pumped into a 5000 gal truck (Advanced Waste) and hauled offsite. Pipe laid between S-1 & S-2, surveyed in. Pipe bedded in stone with soil placed ontop of it. Geomembrane panel placed over soil, corners surveyed in and soil cover placed over it.

Completed new airlines between EW-21 and EW-24, surveyed in as built locations.

Excavate between S-4 and S-5 at north trench. Pipe laid in, surveyed in, and pipe bedded in stone before begin backfilling trench. Geomembrane panel laid over, corners shot in. Finish working on north trench air & leachate lines and began extending lines toward remote wellheads.

Biehn poured west footing wall at load-out pad.

Offsite @ 1930 hrs.

Signature: Megan Smith

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: _____
Page: 1 of 1
Date: 7/24/00 Day: Monday
Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 80 Low 55 Rain none

Contractor(s): Ryan Construction
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Marc M, Ali, Megan, Jerry L.). Cleaned up around flare area. Dig for upslope piping at west side of north trench to connect to existing system. Laid most of pipe up toward tie-in area and surveyed in locations.

Excavated for sump and vault at load-out pad. Vault arrived in ~~PM~~ AM and was rejected as concrete had not filled keyway. Vault will be replaced by Wednesday (7/26/00).

Advanced Waste truck came and pumped approx. 4500 gal liquid from north trench area: ~1500 gal from poly tank and ~3000 gal directly from north trench.

Excavate for upslope piping at east end of north trench. Approx 1'-2' trash cut from trench and hauled to working part of landfill for disposal. Pipe laid in trench and surveyed in. Began backfilling around pipe near S-1 but not all the way uphill to tie-in.

Offsite @ 1810.

Signature: _____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0170-37-25

Report No. _____
Page: 1 of 1
Date: 7/25/00 Day: Tuesday

Weather Temp.(°F): A.M. Sunny P.M. clouds late
High 80 Low 60 Rain none

Contractor(s): Ryan Construction, Biehn Construction
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Marc M, Jerry C, Brian B, Megan). In AM, excavate to locate existing air and leachate lines east of EW-24. Removed protective cover (stockpiled along side), removed geocomposite, and removed clay cover (stockpiled along side) until located the lines. Will cut air and leachate lines at the tees and cap each end tomorrow (7/26/00) to separate Site 1A from Site 2.

Air and leachate lines in Site 2 north trench air tested – leachate at 10psi for 30 minutes (OK) air at 15psi for 30 minutes (OK).

Biehn poured concrete for load'-out pad in early afternoon.

In PM, excavate to locate existing air and leachate lines near V-3 and V-4 on south side of Site 1A. Stockpiled protective cover and clay cover as we did in AM with other excavation. Large amounts of groundwater flowed into excavation above and below geocomposite. Start pumping water directly from excavation to manhole downhill to the west of V-3 and V-4. Truck from Advanced Waste arrived and pumped approx. 5000 gal liquid directly from excavation. After dewatering and finishing excavating to locate piping, it was decided to cut and cap airline inside V-4 valve box. That will be done tomorrow (7/26/00). Replaced & compacted clay cover in excavated area then replaced geocomposite and sealed with bentonite chips. Replaced protective soil cover over that and brought it to original grade.

Offsite @ 1900 hrs.

Signature: _____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No:
Page: 1 of 1
Date: 7/26/00 Day: Wednesday
Weather A.M. Pt. Cloudy P.M. Sunny
Temp.(°F): High 82 Low 60's Rain none

Contractor(s): Ryan Construction
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Megan, Brian B, Jerry L). Cut and capped leachate and air lines at tie-in east of EW-24 and surveyed in locations. Air tested new lines - OK. Replaced and compacted clay cover, then replaced geocomposite, then replaced protective cover layer and brought area back to original grade.

Cut and capped air line inside V-4 valve box. Air tested new line - OK. Site 1A now separated from Site 2.

Advanced Waste truck arrived to pump out S-1 on Site 2 - approx. 990 gal removed from S-1. Another truck arrived to pump out haz. waste manhole on Site 1A and removed 4436 gal from there (approx. 5500 gal total between 2 trucks).

Air and leachate 2" lines tied into existing system at west side upslope of north trench (Site 2). Was surveyed in and system turned back on before realizing that connection had been made backwards: new air was tied into existing leachate and new leachate was tied into existing air. This was discovered late in the day so it was decided not to repair it until tomorrow (7/27/00). West remote upslope wellhead (6") was constructed and surveyed in. It was ~~decided~~ not tied into existing system as electrafusion saddle has not arrived yet. Trench was partially backfilled.

Offsite @ 1820.

Signature: Megan Justice

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Daily Summary Report

Owner: Zion Landfill
Project: Gas / Leachate System
Project No.: 0120-37-25
Report No:
Page: 1 of 1
Date: 7/27/00 Day: Thursday

Weather A.M. lt. rain early P.M. pt. Cloudy
Temp.(°F): High 85 Low 75 Rain yes

Contractor(s): Ryan Construction
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Al, Megan, Jerry L, Brian B). At west remote upslope wellhead cut and crossed air and leachate lines to correct hoses - they had been connected yesterday. Continued work on west remote upslope wellhead. Surveyed in and backfilled trench.

Advanced Waste arrived and picked up poly tank we had been using at north trench.

New vault arrived from Lemon Precast. Excavation for vault was leveled before vault was placed. Vault was set and sealed inside and out with NP-1 and the black stuff. Crack on the floor of the vault was also caulked with NP-1.

Air compressor arrived from A-1. Was placed near flare outside blower building until room can be made for it inside.

At east end of north trench, air and leachate was tied into existing system. East remote upslope wellhead was constructed. Location was surveyed in and trench backfilled.

Offsite @ 1830 hrs.

Signature: Megan Jerry

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: ____
Page: 1 of 1
Date: 7/28/00 Day: Friday
Weather A.M. foggy early P.M. Sunny
Temp.(°F): High 82 Low 65 Rain none

Contractor(s): Biehn Construction
Contractor Sub(s): ____

Summary of Daily Construction Progress and Inspections:

On Site @ 0600 (Megan, Jerry L.). Worked on assembling HDPE reducers, transitions, and valves for air & leachate lines for the 23 Site 1A wells that will be getting pumps.

Biehn Construction arrived and poured concrete for north and South drip aprons at load-out pad. Also poured drip apron below Site 2 leachate tank and began caulking load-out pad. They will not do any more concrete until Sump arrives and is in place.

Finished as many air and leachate fittings as we could before running out of parts. Worked on remote wyslope well heads, connecting with Kanaflex hose and making sure everything is hooked up properly. After finishing, notified Steve that they were complete so he could "turn Site 2 back on for the weekend.

Off Site @ 1400 hrs

Signature: Megan Jutt

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: _____
Page: 1 of 1
Date: 7/31/00 Day: Monday
Weather A.M. Overcast/Rain P.M. Rain
Temp.(°F): High 72° Low 65° Rain YES

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Arrived on site @ 1020 hrs. overcast and humid. Heather Foech, Terry Jay, and Larry Martin (Weaver Boos and Gordon) already on site. Terry and Heather are investigating an air pressure loss in the System @ EW-40. Terry and I are assembling connectors/valves for air and leachate line to be hooked up to well-head. Began to rain around 1130 hrs and rained rest of the day. At 1200 hrs, Heather and Larry discovered that the air loss of pressure was coming from an open valve @ well EW-69 (was inadvertently left open by Steve - Landfills Leadfor gas/leachate operator). Once the valve was closed air pressure in the system began to rise. At 1300 hrs the pressure in the system rose to 50 psi from a low of 40 psi before valve was shut-off. The air pressure continued to rise and @ the end of the day was @ 70 psi. Did an inventory check of well head parts and planned how to piece them together when Rain ~~Rain~~ lets up; so instead of ~~Trying to~~ remove air compressor in the afternoon, will do first thing tomorrow morning. Left site @ 1615 hrs.

Signature: Allen Sellmer

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 8/11/00 Day: Tuesday

Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 82° Low 68° Rain No

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Arrived on site @ 0600 hrs, sunny. Jerry Lay, Heather Foesch, Jamie and Larry Martin on site (WBG), Larry checked the air pressure in the system first thing and it was now up to 80 psi. Jerry continued to assemble air/leachate fittings. The rest of the crew (WBG) began to disassemble the current air compressor/dryer after Steve (Onyx Landfill) shut down the flare system (air/electrical). Removed the smaller compressor/dryer by hand and had the landfills cat backhoe help to remove the larger air compressor. Had the old equipment out by 1000 hrs and had new air compressor/dryer in by 1130 hrs with the help of the landfills backhoe. After lunch, Jerry continued to assemble air/leachate fittings while the rest of the crew planned the positioning of the new compressor/dryer taking up to consideration the piping and electrical work required. Had Steve come to the flare building to see if he liked the positioning chosen and said he was happy with the compressor/dryer locations. Bolted the air dryer down to the floor of the building and assembled electrical conduit and air piping the remainder of the afternoon. Left site @ 1630 hrs.

Signature Allen McAloney

WEAVER BOOS & GORDON, INC.

200 S. Michigan, Suite 900, Chicago, IL 60604 Phone: (312) 922-1030 Fax: (312) 922-0201

1944 N. Griffith, Unit C, Griffith, IN 46319 Phone: (219) 923-9606 Fax: 923-9641

Daily Summary Report

Owner: Zion Landfill Report No: _____

Project: Gas/Leachate System Page: 1 of 1

Project No.: 0120-37-25 Date: 8/2/00 Day: Wednesday

Weather A.M. Sunny P.M. Sunny

Temp.(°F): High 85° Low 65° Rain None

Contractor(s): _____

Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Arrived on site @ 0600 hrs, sunny and warm. Heather, Larry and Jamie on site. Continued to assemble the air compressor/dryer - electrical/piping. 730 hrs. Larry left the site to get parts for compressor/dryer assembly. Rest of crew worked on installation of air intake louvres for air compressor cooling fan. Cut hole in building on the NE side and had to cut flanges from aluminum angle iron in order to install the louvres. 0930 hrs. Jerry on site, he started to place sand between loadout pad and concrete leachate vault. 1230 hrs, unloaded delivery truck, had 23 pumps and plastic hose for running the leachate system. After lunch WBG continued to work on electrical and air line plumbing for air compressor/dryer. 1600 hrs, Jamie Martin left site. Need some parts to complete assembly of air compressor/dryer, will finish tomorrow - almost complete - Left site @ 1800 hrs after cleaning up.

Signature: Allan Sellmer

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Daily Summary Report

Owner: Zion Landfill
Project: Gas / Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 8/3/00 Day: Thursday

Weather Temp.(°F): A.M. Sunny P.M. Cloudy/windy High 72° Low 55° Rain light

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Arrived on site @ 0600 hrs, sunny and cool. Larry, Terry and Heather on site. 0630 hrs. Threw out trash that had accumulated near loading dock area - cardboard, plastic, wood, skids etc. Also, discovered that exhaust fan and inside shutters for intake had been delivered. 0700 hrs, Larry continues to work on electrical wiring for compressor/dryer, Heather is again cleaning the inner/outer grounds, while Terry and I are installing the exhaust fan. 1000 hrs, Jason from Sullair A-1 Air compressors on site to help start the system. 1100 hrs, finished the installation of the exhaust fan along with the inner/outer shrouds and remaining air plumbing, started air compressor, Jason showed BBG and Steve how to run it, trouble shooting / maintenance etc. Have it tuned to run @ 147 psi. A lot of leaks were present in the air plumbing pipe - pipe tape was no good - after lunch Larry went for more supplies and purchased some liquid loctite for the threads - Rest of crew completely disassembled the air plumbing, cleaned the threads, and used the loctite on them before reassembling. Went to check the leachate level in S-1, it's about 10-15' below ground surface, area looks good, no leachate breakouts on the slope, tanker truck continues to pump down the leachate in S-1 until system is up and running. 1630 hrs. restarted air compressor, fixed a few leaks, (one still left) - 1745 hrs. Steve started flare system. - Left site @ 1800 hrs.

Signature: Allan Acklosser

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1944 N. Griffith, Unit C, Griffith, IN 46319 Phone: (219) 923-9606 Fax: 923-9641

Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: _____
Page: 1 of 1
Date: 8/4/00 Day: Friday
Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 86° Low 60° Rain None

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

6:00 - LARRY, JERRY & HEATHER
REPAIRED LAST LEAKING AIR LINE THREADED CONNECTION INSIDE FLARE BUILDING OF AIR COMPRESSOR. HDPE 2" AIR LINES TO SITE 1A AND SITE 2 WERE HOOKED UP TO MANIFOLD ON OUT SIDE OF FLARE BUILDING. CLEANED UP SOME INSIDE BUILDING.
10:00 - WITH STEVES ASSISTANCE WE STARTED AIR COMPRESSOR AND FLARE LET AIR PRESSURE TO SITE 2A SLOWLY, SYSTEM SEEMS OK CLEANED UP AROUND OUTSIDE AREA.
11:45 - LARRY LEFT TO GO HOME, JERRY & HEATHER STAYED TO INVENTORY PACKS FOR PUMPS AND TO CLEAN UP AND LOCK TRAILER UP.
3:30 JERRY & HEATHER LEFT SITE.

Signature: _____

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1944 N. Griffith, Unit C, Griffith, IN 46319 Phone: (219) 923-9606 Fax: 923-9641

Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 8/7/00 Day: Monday

Weather Temp.(°F): A.M. Sunny P.M. Sunny High 88 Low 70 Rain none

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0930 (Megan, Jerry L.). Conducted inventory of all remaining parts in storage room. With Steve's help, took louvers down to blower building. After lunch, placed 2x4s around opening and mounted louvers directly on the 2x4s. Continued assembly of 4x2 HDPE reducers and 2" transitions for the Site 1A wellheads. Left site @ 1600 hrs.

Signature: _____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 8/8/00 Day: Tuesday

Weather A.M. PC, Cloudy P.M. Sunny
Temp.(°F): High 85 Low 70 Rain none

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Megan, Jerry, Al, Larry M & Junie). Finish welding 4x2 HDPE reducers to 2" stainless transitions. Water has accumulated in excavation for sump and around vault - use sump pump to get water out of there and into ditch. Pump periodically throughout day, also pump water out of the inside of the vault (which is supposed to be watertight).

Work on wiring exhaust fan inside blower building. Run conduit to load-out pad from main control panel near flare station. Once exhaust fan is finished, it is turned on and flare is turned on again - everything seems to be working well.

Clean up site before leaving for day.

Offsite @ 1610 hrs

Signature: _____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: _____
Page: 1 of 1
Date: 8/9/00 Day: Wednesday
Weather A.M. Pt. cloudy P.M. Sunny
Temp.(°F): High 85 Low 75 Rain none

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Mega-, Al, Jerry, Larry M, Jamie, Al;). Continue working on running conduit to load-out pad from main control panel. Transfer LP tank for flare pilot light from old location South of Site 2 leachate tank to new pad near main control panel. Run new electrical lines from control panel to both Site 1A and site 2 leachate tanks. Complete wiring at main control panel and clean up area around the flare station.

Start 8hr pressure test of Site 1A airlines @ 1430 – 50 psi on the lines.

Completely assemble one prototype pump to make sure it will fit in well. Put pump in EW-9 and it fits fine. Remove pump for the night to continue working on the design – EW-9 is covered temporarily until pump is finished.

Offsite @ 1805 hrs

Signature: _____

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1944 N. Griffith, Unit C, Griffith, IN 46319 Phone: (219) 923-9606 Fax: 923-9641

Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 2120-37-25

Report No:
Page: 1 of 1
Date: 8/10/00 Day: Thursday

Weather Temp.(°F): A.M. foggy P.M. Sunny High 85 Low 65 Rain none

Contractor(s):
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Megan, Al, Marc, Jerry Larry M). Assemble gate valves and transitions to 4" wyes. Assemble cables that all pumps will be hung from inside wells - cables all cut to proper lengths. Work on assembling regulators that will go on each well.

Make complete assembly (pump, valve, flange w/ holes drilled in it) for EW-9. Pump is set in EW-9. Leachate valve inside EW-9 is closed, also, red flex hose should be cut to 4" lengths (was cut to 6" for EW-9). Need to put cable tie around quick coupler. Flange attached and well is closed back up. Clean up work area.

Dumpster of excavated material (from 7/18/00) was inspected as a lot of water has collected on tarp covering the dumpster. The water needs to be removed but will be too difficult to sweep off or bail out. Make plans to remove dumpster in near future - hopefully water will run off the top then.

Offsite @ 1700 hrs.

Signature: Megan Smith

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: _____
Page: 1 of 1
Date: 8/11/00 Day: Friday
Weather A.M. Sunny P.M. Sunny
Temp.(°F): High 85 Low 70 Rain none

Contractor(s): _____
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0700 (Al & Megan). Continue assembling regulators to go on each EW. Measuring & assembling hoses & cables to the specific lengths for pumps for each well. Pumps are labeled for the well they will be placed in. After assembling regulators, work on valves for leachate lines that will be placed inside each EW.

Megan left @ 1400. Heather Foesch (WBG) arrived @ 1530 to drop off drawing plans. Bentonite was delivered and unloaded into work area. Site cleaned and locked up.

Offsite @ 1630 hrs

Signature: _____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25

Report No:
Page: 1 of 1
Date: 8/14/00 Day: Monday

Weather
Temp.(°F): High 85 Low 70
A.M. Pt. Sunny P.M. Sunny
Rain none

Contractor(s): Ryan Construction
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0700 (Al, Megan, Larry M, Marc, Jerry). Continue assembling pumps for EW's and Sumps. All pump # and corresponding well # are recorded in field book. Finish assembling values for leachate lines and regulators. A box of site-specific spare parts is assembled.

Disassemble all 2x1¼ transitions & reducers that had been previously put together as they are too long to use at the wells. The hose barbed piece (Pvc) is saved. Hose barb is threaded into 2" HDPE pieces that have a 1" hole drilled and tapped. These shorter pieces will be used on the air line stick-ups at each well.

Template is created for the holes that need to be drilled on all the flanges. Begin working on the flanges for a few wells.

Pressure left 3" leachate line in dual-contained forcemain. Turn on to 50 psi and leave on overnight. Was still at 0 psi when left site in evening. Operator grading some of gravel in load-out pad area. Clean up work area before leaving. Have 14 pumps completed, including ones that had been started on Friday.

Offsite @ 1830hrs

Signature:

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Daily Summary Report

Owner: Zion Landfill
Project: Gas / Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 8/15/00 Day: Tuesday

Weather A.M. Sunny, humid P.M. Sunny, humid
Temp.(°F): High 90 Low 75 Rain none

Contractor(s): Ryan Construction
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Megan, Al, Marc, Jerry, Larry M). Leachate line had been pressure tested overnight @ 50 psi - had dropped to 44 psi which is probably due to the temperature differences. Remove leaky valves from air lines on EW-21 → EW-24 line, tighten them up but did not replace them on air lines yet. Continue assembling pumps - by end of day, all 28 pumps have been completed and have been brought inside for storage. Work area was cleaned up.

Big task for day is sealing leachate vault. Go inside cut off cable loops and ground off all rough edges. Used Shop vac to get remaining water off of floor - also brought in fresh water to scrub down floors and walls. Set blower inside to keep drying it - repositioned blower throughout day to help entire floor dry. On the outside, cleaned & recaulked crack around base (where walls meet the floor), then painted up to 6" above & below crack with tar. Sealed area around opening between load-out pad & vault w/ SL-1. Sealed around base of vault w/ bentonite chips before backfilling & compacting w/ jack. Also re-caulked around vault lid w/ NP-1.

Sump arrived and was set - piped to steam trap w/ PVC (6" & 3" dual-contained). Photos taken - backfilled just enough to hold sump in place.

Gravel around load-out pad graded & contoured to help w/ drainage.

2 more air tests of 3" leachate attempted w/ 15 psi - both failed. First one failed as a valve was partially open further up the line, reason for 2nd failure was not inspected as of yet.

Trash picked up around load-out pad @ end of day.

Offsite @ 1930 hrs

Signature _____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 8/16/00 Day: Wednesday

Weather A.M. Pt. cloudy P.M. sunny
Temp.(°F): High 80 Low 60 Rain none

Contractor(s): Ryan Construction
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Megan A, Marc, Larry M, Jerry). Made repairs to remote upslope wellheads near north trench. Measured inside of vault & cut pieces of LLDP liner to line the inside — one base piece for floor, then another floor piece & "curtain" to go completely around walls with some overlap. Curtain will be extrusion welded to upper floor piece. Continue cleaning & drying inside of vault — recaulked around base & also sealed floor cracks. Finished conduit for sump & Josam trap. Start looking for leak in leachate lines that had been failing air tests yesterday. Seems that several valves have small, slow leaks so valves are tightened. 4" x 2" HDPE pipe attached to sump comes straight up toward Site 1A leachate tank. Backfill around sump and Josam trap — grade gravel in area.

In afternoon, remove flanges from wellheads so holes can be drilled in them — cover temporarily w/ plywood pieces. Paint floor & base of walls inside of vault w/ tar. Clean up load-out pad area including shoveling & sweeping off pad. Sump pump set near Josam trap in case of rain overnight. Removed valves from leachate lines & capped w/ threaded caps to try to remedy leaks. After finishing that, try air testing leachate line again @ 50psi. Bled down to 15psi within ~20 minutes, so there is still a leak somewhere.

Larry & Marc left site @ 1530 hrs

Megan & Jerry cleaned & locked up, left site @ 1715 hrs.

Al left @ 1840 hrs after finishing capping leachate lines and running air test.

Signature: _____

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Phone: (312) 922-1030 Fax: (312) 922-0201 Phone: (219) 923-9606 Fax: 923-9641

Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No: ____
Page: 1 of 1
Date: 8/17/00 Day: Thursday

Weather A.M. rain P.M. —
Temp.(°F): High — Low 60 Rain yes - storms

Contractor(s): —
Contractor Sub(s): ____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0630 (Megan, AI). Is raining and forecast is rain for most of the day. Check pressure test on Site 1A leachate line that was started last night - still holding at 15 psi. Check on load-out pad and vault area to see if water is draining away from it. Appears that some rain water is still getting into vault. Sump pump in hole with foam trap not operating as enough water has not yet filled hole to actuate pump.

As it was raining, decided to pack up all equipment that needs to go back to office and leave

Offsite @ 0650 hrs

Signature: Megan Tuttle

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25
Report No:
Page: 1 of 1
Date: 8/29/00 Day: Tuesday

Weather
Temp.(°F): High 75 Low 70 A.M. Pt. cloudy P.M. overcast Rain no

Contractor(s): Ryan Construction
Contractor Sub(s):

Summary of Daily Construction Progress and Inspections:

Onsite @ 0700 (Ali, Megan, Brian B). Excavated around Site 1A 3x6 forcemain valve as it had been leaking. After exposing valve pressurized line and located 3 small leaks in extrusion weld on top of valve where flange is connected to 3" pipe. After repairing, pressure test 6" containment line at 10psi. Did not pass — dropped to 8.5 psi. Measured remaining 2" HDPE line on site to decide how much more to order for new airline and 2x4 leachate forcemain between EW-21 and Site 1A manhole. Started attaching new valves on Site 1A airline stickups. Attached threaded rod for new louvers on flare station. Pressurize 6" line to 10 psi again to air test overnight.

Offsite @ 1800 hrs

* Site 1A leachate tank drip apron and area around Jasam trap were paved by Bicha Construction sometime since WBG's last day on site.

Signature:

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Daily Summary Report

Owner: Zion Landfill
Project: Gas / Leachate System
Project No.: 0120-37-25
Report No: ____
Page: 1 of 1
Date: 8/30/00 Day: Wednesday
Weather: A.M. cloudy, fog P.M. overcast
Temp.(°F): High 75 Low 70 Rain no

Contractor(s): Ryan Construction
Contractor Sub(s): ____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0600 (Ali, Megan, Brian B, Larry M, Jerry, Joe M). Truck arrived from Foster Supply and pipe was unloaded. Operator arrived and started excavating trench from Site 1A manhole uphill to EW-21 (for 4x2 leachate forcemain and 2" airline). Work on setting pumps in Site 1A extraction wells. Two holes cored into concrete for manhole – one 6" for forcemain and one 2" for airline. Four-inch pipe for forcemain fused & pressure tested – it passed (started @ 10psi, ended @ 9.7psi). Trench bedded with sand. Once 4" line tested, 2" pipe run through it and laid into trench with valve end extending into manhole. Two-inch airline also laid in trench with valve end extending into manhole. Trench not backfilled yet as want to pressure test 2" airline first.

Offsite @ 2000 hrs

Signature: ____

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Daily Summary Report

Owner: Zion Landfill
Project: Gas / Leachate System
Project No.: 0120-37-25
Report No: ____
Page: 1 of 1
Date: 8/31/00 Day: Thursday

Weather Temp.(°F): High 90 Low 70
A.M. Sunny P.M. Sunny humid
Rain No

Contractor(s): Ryan Construction
Contractor Sub(s): ____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0630 (Joe M, Megan, Brian B, Larry M, Jerry, Cory Pettijohn). Continue setting pumps in extraction wells and reconfiguring air and leachate connections on Site 1A. Survey in new foreman and airline in trench. Once connections made at EW-21, backfill trench with sand except at 2 ends, then backfill with soil when sand in place. Continue work on assembling wellhead flanges. Put lintseal around 4x2 (remain going into) manhole. Pressurize Site 1A airline to 50 psi to test for tight, will check in morning before backfilling remainder of trench. Started up pumps in EW-2, EW-13, and EW-28 to make sure they work - all are pumping OK.

Offsite @ 1815 hrs

Signature: Meg Smith

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Daily Summary Report

Owner: Zion Landfill
Project: Gas/Leachate System
Project No.: 0120-37-25

Report No: _____
Page: 1 of 1
Date: 9/1/00 Day: Friday

Weather
Temp.(°F): High 94 Low 75
A.M. Sunny, humid P.M. Sunny, humid
Rain 10

Contractor(s): Ryan Construction
Contractor Sub(s): _____

Summary of Daily Construction Progress and Inspections:

Onsite @ 0630 (Megan, Jerry L.). Site 1A airline pressure test from last night @ 42 psi. Drop probably due to change in temperature overnight. Removed 4 remaining Site 1A wellhead flanges that need regulators attached and replaced with temporary plywood caps. Collected samples from haz. waste dumpster (excavated 7/18/00) to send to PDC Labs for analysis. Analytical results of samples will determine where dumpster needs to be shipped for disposal. Placed sand bedding around airlines at EW-21 and backfilled. Placed bentonite around 4" link-seal going into manhole before bedding pipes in sand and backfilling. Placed sand around 3x1e forcemain valve on west side of Site 1A and backfilled.

Offsite @ 1430 hrs

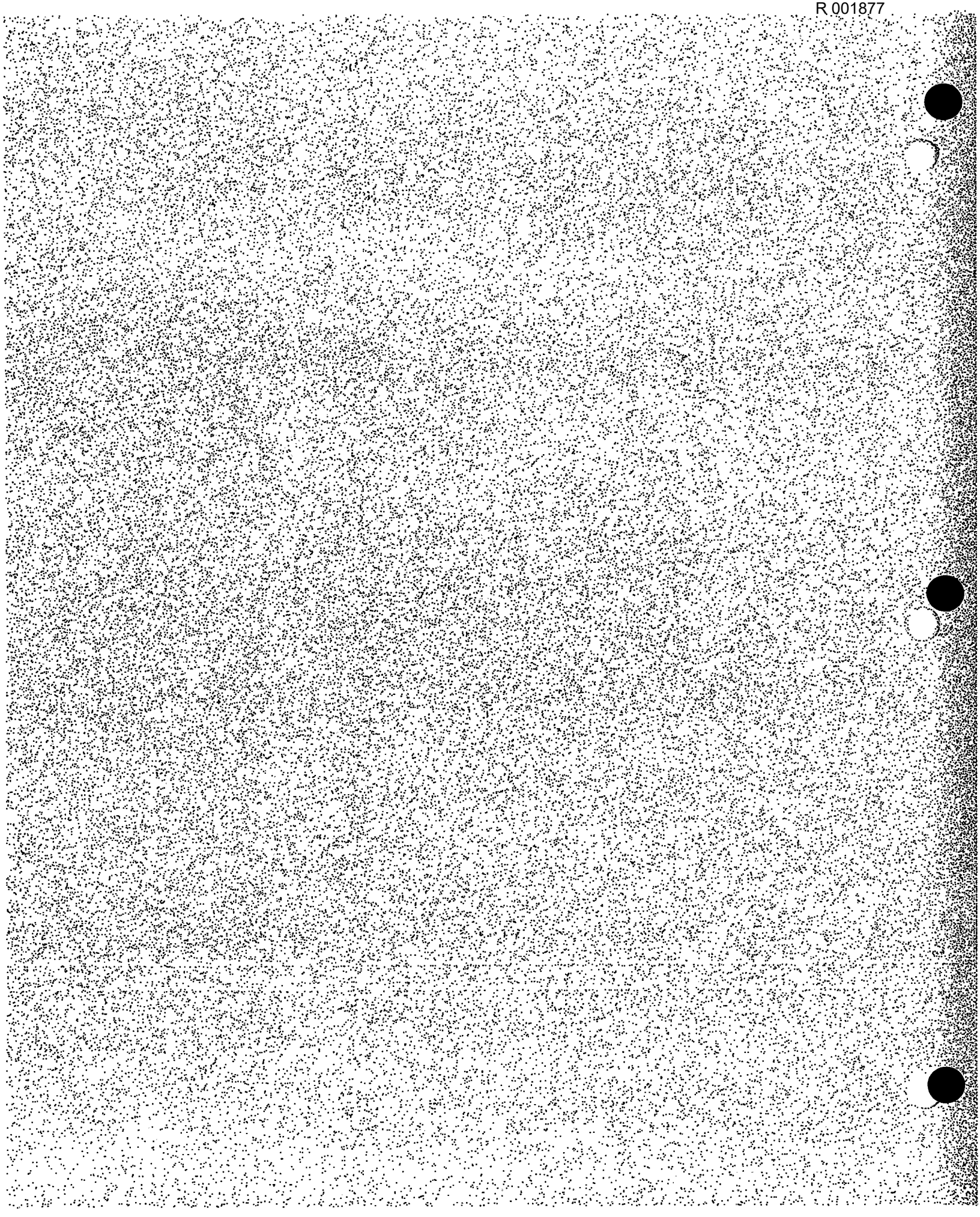
Signature: _____

APPENDIX B

Manufacturer Information

LIST OF APPENIDIX B

B.1 Pipe Information
B.2 Pump Information
B.3 Counter and Regulator Information
B.4 Josam Trap Information
B.5 Fiberglass Sump Information
B.6 Air Compressor Information
B.7 Air Dryer Information
B.8 Exhaust Fan/Hood Information
B.9 Stainless Steel Ball Valve Information
B.10 Zoeller Pump Information
B.11 Solenoid Check Valve Information
B.12 Dual-Contained Valve Information



Appendix B.1

Pipe Information

Chevron

PLEXCO®
Performance Pipe Division - Chevron Chemical Company LLC
1050 IL Route 83, Suite 200 - Bensenville, IL 60106
Phone: 630-350-3758 *Fax: 630-350-2704*

February 19, 1999

Forrer Supply Co., Inc.
W194 N11811 McCormick Drive
P.O. Box 220
Germantown, WI 53022-0220
(414) 255-3030 Fax (414) 255-4064

This letter has been prepared at your request, concerning PLEXCO HDPE pipe and fittings.

PLEXCO pipe and fittings are manufactured from PPI listed PE3408 HDPE resins. These resins have a minimum cell classification of PE345444C when classified in accordance with ASTM D3350. These resins are extra high molecular weight, high density polyethylene resins which meet the requirements of Type III, Class C, Category 5, Grade P34 pipe grade materials in accordance with ASTM D1248-84. (ASTM D1248 no longer pertains to pipe grade resins and its reference in future specifications should be removed. It has been included here for historical perspective only.) PLEXCO has a Plastic Pipe Institute (PPI) recommended hydrostatic basis of 1600 psi at 23° C based on TR3 as derived from ASTM D2837 test methods.

The dimensional characteristics and pressure capabilities of PLEXCO are established in accordance with ASTM F714-94 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter. This standard is marked in the print line on each pipe.

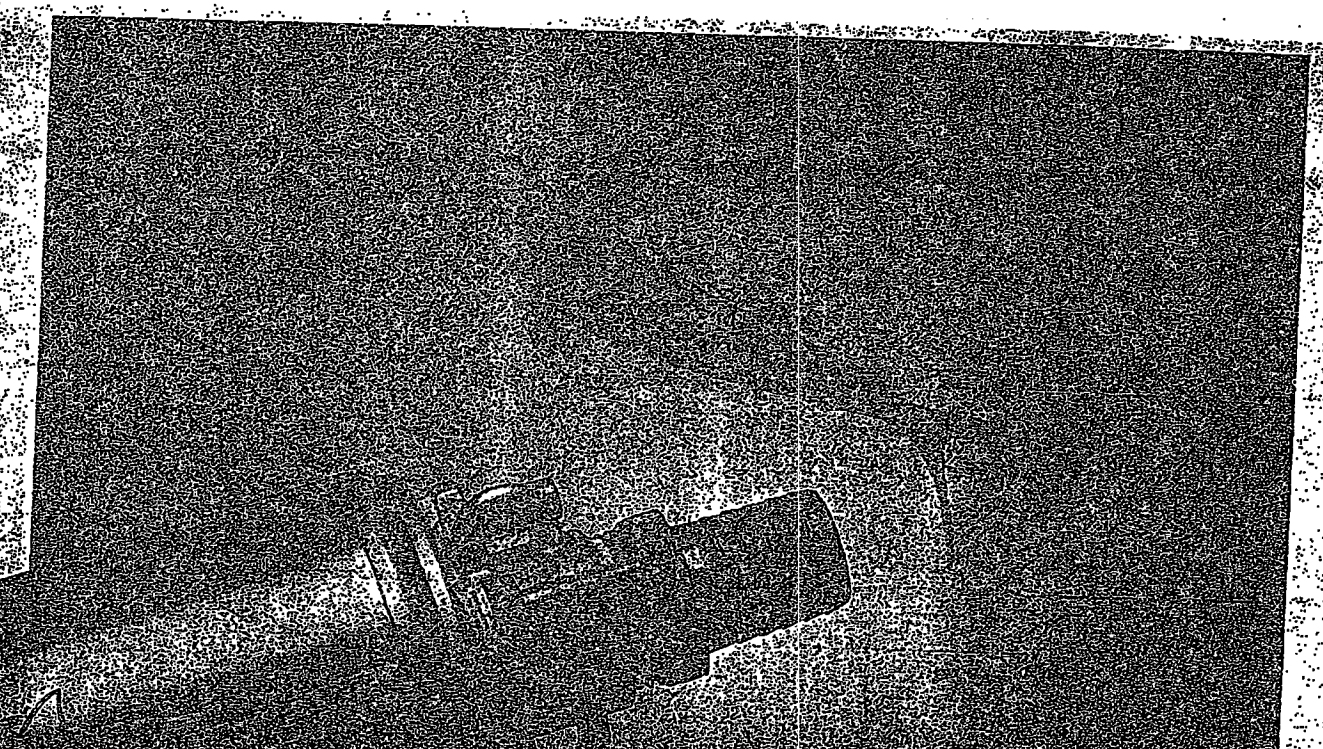
Sincerely,

Lee Mizell
Municipal Products Manager

LM:dmd

Appendix B.2

Pump Information



HammerHead™

H4 Series (wells 4" & up)

INSTALLATION & OPERATION MANUAL

Models H45SSB, H45SEB, HF45SSB, HF45SEB,
H45SET, HF45SET, and HF43SET

HAMMERHEAD™
CLEANUP PUMPS

QED Ground Water Specialists®
P.O. Box 3726 Ann Arbor, MI 48106 USA

Part No. 95067

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H4 SERIES MODEL CODE SYSTEM

Each letter or number represents a different descriptive characteristic of the model.

H45SET
H = HammerHead Pump Series (standard 3/4" discharge tube)
4 = Well Size, minimum (4")
5 = Nominal Pump Length (5')
S = Pump Material (Stainless Steel)
E = Float (Epoxy for free product)
T = Inlet style (Top)

HF45SET
HF = HammerHead Pump Series (high flow 1.25" discharge tube)
4 = Well Size, minimum (4")
5 = Nominal Pump Length (5')
S = Pump Material (Stainless Steel)
E = Float (Epoxy for free product)
T Inlet style (Top)

HF43SET
HF = HammerHead Pump Series (high flow 1.25" discharge tube)
4 = Well Size, minimum (4")
3 = Nominal Pump Length (3')
S = Pump Material (Stainless Steel)
E = Float Material (Epoxy for free product)
T = Inlet style (Top)

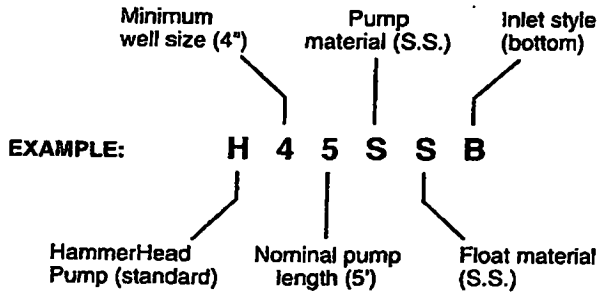
S4S, S6S, S8S, S4L, S6L, S8L, S4X, S6X, S8X, V4S, V6S, V8S, V4X, V6X, V8X—Well Caps
Example:
S = Slip-fit cap, or V (vacuum)
4 = 4" Well Size (or 6" or 8")
S = SPTUBE, or L (hose, 1" I.D.), X (MAXTUBE)

H45SSB
H = HammerHead Pump Series (standard 3/4" discharge tube)
4 = Well Size, minimum (4")
5 = Nominal Pump Length (5')
S = Pump Material (Stainless Steel)
S = Float Material (Stainless Steel)
B = Inlet style (Bottom)

H45SEB
H = HammerHead Pump Series (standard 3/4" discharge tube)
4 = Well Size, minimum (4")
5 = Nominal Pump Length (5')
S = Pump Material (Stainless Steel)
E = Float Material (Epoxy for free product)
B = Inlet style (Bottom)

HF45SSB
HF = HammerHead Pump Series (high flow 1.25" discharge tube)
4 = Well Size, minimum (4")
5 = Nominal Pump Length (5')
S = Pump Material (Stainless Steel)
S = Float Material (Stainless Steel)
B = Inlet style (Bottom)

HF45SEB
HF = HammerHead Pump Series (high flow 1.25" discharge tube)
4 = Well Size, minimum (4")
5 = Nominal Pump Length (5')
S = Pump Material (Stainless Steel)
E = Float Material (Epoxy for free product)
B = Inlet style (Bottom)



HAMMERHEAD™ CLEANUP PUMPS

HammerHead™ H4 Series pumps (patent pending) are high-rate, air-driven pneumatic pumps primarily useful for total fluids applications. They run automatically, with the Hammer Drive magnetic relay and internal float system. The system senses liquid level in the pump, turning the air supply on when the pump is full, and turning it off as soon as the pump empties.

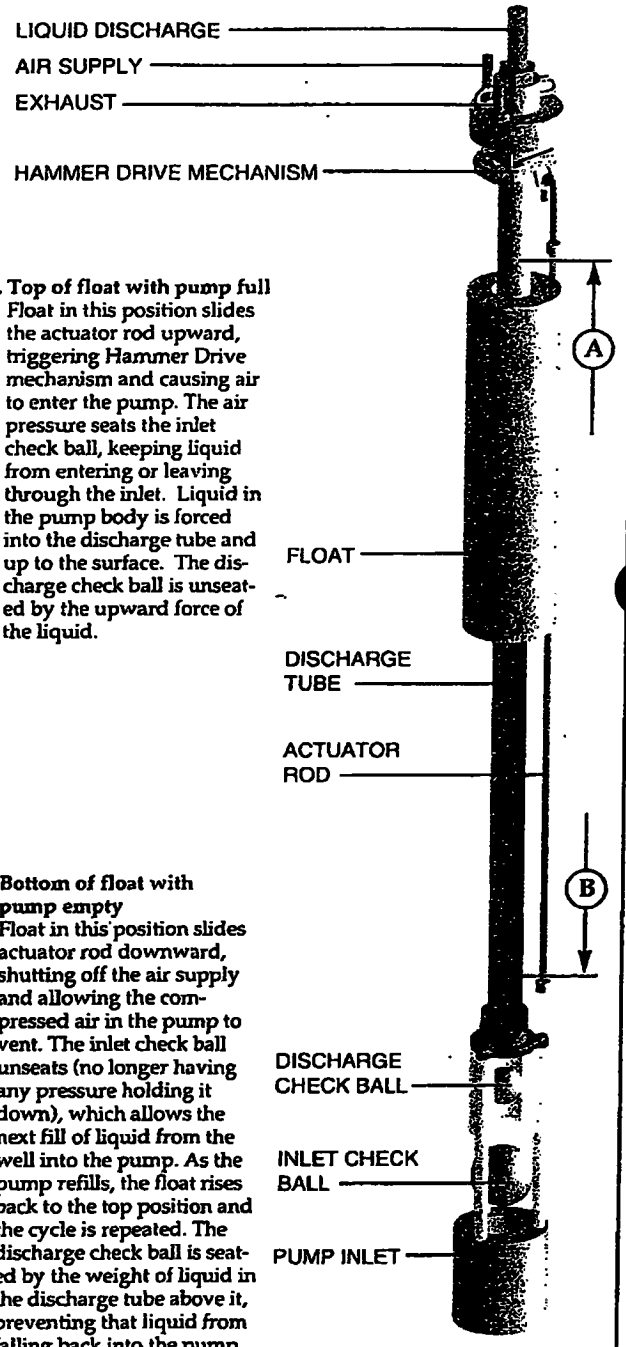
With built-in control, a HammerHead pump doesn't require air cycle timers or on-off level controls at the wellhead, simplifying system design. System setup is easy—just run air to each well. Continued operation is truly hands-off. The pump constantly reacts to changes in well yield, so it always pumps at the highest rate possible, and shuts down automatically when the well drops below pumping level. (NOTE: H4 Series pumps require a minimum of 3.5 feet of liquid above the bottom of the inlet in order to run.)

Because cycling is controlled downwell, a HammerHead pump is either refilling or discharging 100% of the time. There's no waiting between active phases of the cycle for the entire length of air supply tubing to re-pressurize. This operating efficiency enables H4 Series pumps to deliver maximum flow rates of more than 11 gallons per minute while also saving on air supply requirements. It also keeps air out of the liquid discharge system, preventing over-pumping, foaming, and emulsification.

The HammerHead pumping mechanism uses the same high-clearance design and stay-clean ball check valves that set the PULSE PUMP® standard for field performance without clogging or breakdowns. All parts, including the Hammer Drive system, are easily field serviceable.

HOW THE HAMMERHEAD PUMP WORKS

- An H4 Series pump requires a minimum depth of 42" of liquid (measured from the bottom of the pump) to begin pumping.
- The pump automatically shuts off when the liquid level is pumped down below this level, and will automatically begin pumping again once well level has recovered.



A. Top of float with pump full
Float in this position slides the actuator rod upward, triggering Hammer Drive mechanism and causing air to enter the pump. The air pressure seats the inlet check ball, keeping liquid from entering or leaving through the inlet. Liquid in the pump body is forced into the discharge tube and up to the surface. The discharge check ball is unseated by the upward force of the liquid.

B. Bottom of float with pump empty
Float in this position slides actuator rod downward, shutting off the air supply and allowing the compressed air in the pump to vent. The inlet check ball unseats (no longer having any pressure holding it down), which allows the next fill of liquid from the well into the pump. As the pump refills, the float rises back to the top position and the cycle is repeated. The discharge check ball is seated by the weight of liquid in the discharge tube above it, preventing that liquid from falling back into the pump body.

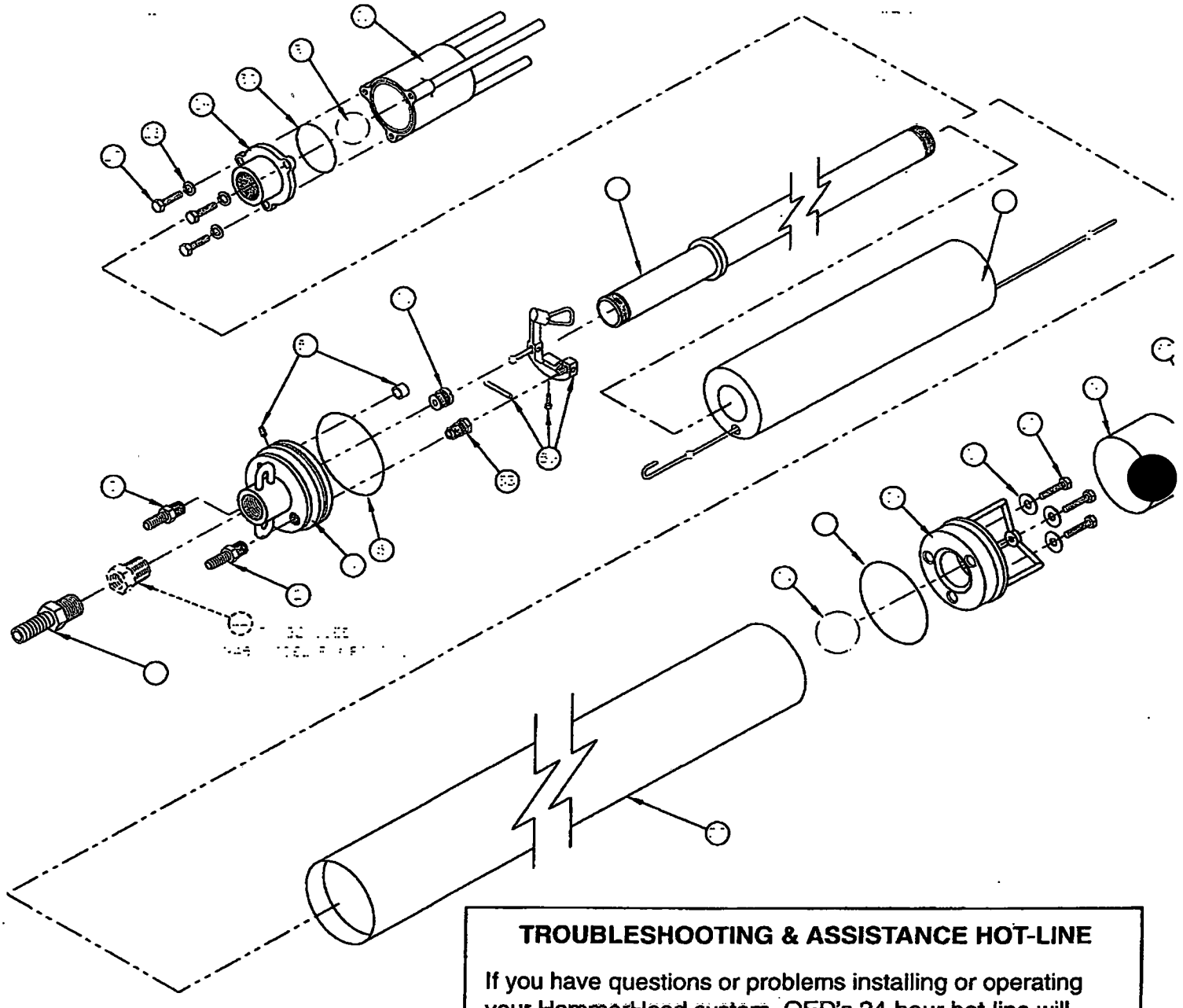
H4 SERIES SPECIFICATIONS

	H4 Series Bottom Inlet	H4 Series Top Inlet	Short H4, Top Inlet
Model No.	H45SSB, H45SEB, HF45SSB, HF45SEB	H45SET, HF45SET	HF43SET
Pump Type	Positive Air Displacement	Positive Air Displacement	Positive Air Displacement
Inlet	Bottom	Top	Top
O.D.	3.5" (89 mm)	3.5" (89 mm)	3.5" (89 mm)
Length	55" (140 cm)	60" (152 cm)	42" (105 cm)
Weight	23.5 lbs. (10.7 kg)	24.0 lbs. (10.9 kg)	16.0 lbs. (7.3 kg)
Materials	Stainless steel construction, with Teflon® inlet and discharge check balls, stainless steel or epoxy float, Viton O-rings	Stainless steel, Q-Tal & brass construction, with Teflon® inlet and discharge check balls, epoxy float, Viton O-rings	Stainless steel, Q-Tal & brass construction, with Teflon® inlet and discharge check balls, epoxy float, Viton O-rings,
Fittings: Type*	Barb	Barb	Barb
Sizes: Liquid Discharge	3/4" (19 mm) O.D. (H45SSB, H45SEB) or 1-1/4" (32 mm) O.D. (HF45SSB, HF45SEB)	3/4" (19 mm) O.D. (H45SET) or 1-1/4" (32 mm) O.D. (HF45SET)	1 1/4" (32 mm) O.D. Tube
Air Supply	3/8" (9 mm) O.D. Tubing	3/8" (9 mm) O.D. Tubing	3/8" (9 mm) O.D. Tubing
Exhaust	1/2" (13 mm) O.D. Tubing	1/2" (13 mm) O.D. Tubing	1/2" (13 mm) O.D. Tubing
Pump Stroke	0.8 gal. (2850 ml.)	0.8 gal. (2850 ml.)	0.32 gal. (1200 ml.)
Operating pressure range	10-160 psi (70-1,100 kPa)	10-160 psi (70-1,100 kPa)	10-100 psi (70- 695 kPa)
Maximum lift	300 ft. (90 m)	300 ft. (90 m)	200 ft. (60 m)
Maximum flow rate	14+ GPM (54+ LPM) HF45SSB, HF45SEB	11+ GPM (41+ LPM) HF45SET	10 GPM (38 LPM)
Minimum submergence	42" (107 cm) above pump bottom	Top Inlet Port— 58" (147 cm) above bottom of pump	Top Inlet Port— 38" (97 cm) above bottom of pump
Density of pumped liquid	1.0 g/cc (stainless float); 0.7 g/cc up (epoxy float)	0.7 g/cc up (epoxy float)	0.7 g/cc up (epoxy float)
Cap sizes**	4", 6", and 8" (100, 150, & 200 mm) diameter (standard and vacuum seal)	4", 6", and 8" (100, 150, & 200 mm) diameter (standard and vacuum seal)	4", 6", and 8" (100, 150, & 200 mm) diameter (standard and vacuum seal)

* Note: Pumps are available with tubing or hose; quick disconnect fittings are available on request.

** Special caps available.

PUMP ASSEMBLY DIAGRAM



TROUBLESHOOTING & ASSISTANCE HOT-LINE

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PARTS LIST—HF45SSB

ITEM	P/N	DESCRIPTION
53	37025	Seat, Air Supply - Kit
52	37030	Seat, Exhaust - Kit
51	37031	Magnet - Kit
50	37024	Cam Assembly - Kit
37	37006	Bolt, hex 1/4-20 x 1/2
36	36852	Screen
35	36832	Inlet, EP
34	36902	Ball , 2 dia. Teflon
33	37151	Body, H4
32	36830	Housing, EP
31	36901	Ball, 1-1/2 dia. Teflon
30	36464	O-ring Viton L/F 2-034
29	36834	Cover, EP
28	35584	Washer, 5/16" Belleville
27	36912	Bolt, 1/4-20 x 1"
26	37008	Actuator Assembly (S.S. Float)
25	36836	Dip-tube, H4
5	35325	O-ring Viton L/F 2-235
4	36831	Head, EP
3	36401	Barb, 1/2 T x 3/8 MPT
2	37159	Check Barb, 3/8 T x 1/4 MPT
1	37005	Barb, 1-1/4 T x 1 MPT

PARTS LIST—HF45SEB

ITEM	P/N	DESCRIPTION
53	37025	Seat, Air Supply - Kit
52	37030	Seat, Exhaust - Kit
51	37031	Magnet - Kit
50	37024	Cam Assembly - Kit
37	37006	Bolt, hex 1/4-20 x 1/2
36	36852	Screen
35	36832	Inlet, EP
34	36902	Ball , 2 dia. Teflon
33	37151	Body, H4
32	36830	Housing, EP
31	36901	Ball, 1-1/2 dia. Teflon
30	36464	O-ring Viton L/F 2-034
29	36834	Cover, EP
28	35584	Washer, 5/16" Belleville
27	36912	Bolt, 1/4-20 x 1"
26	37054	Actuator Assembly (Epoxy Float)
25	36836	Dip-tube, H4
5	35325	O-ring Viton L/F 2-235
4	36831	Head, EP
3	36401	Barb, 1/2 T x 3/8 MPT
2	37159	Check Barb, 3/8 T x 1/4 MPT
1	37005	Barb, 1-1/4 T x 1 MPT

PARTS LIST—H45SSB

ITEM	P/N	DESCRIPTION
53	37025	Seat, Air Supply - Kit
52	37030	Seat, Exhaust - Kit
51	37031	Magnet - Kit
50	37024	Cam Assembly - Kit
44	37088	Bushing, Reducer, 3/4 FPT x 1 MPT
37	37006	Bolt, hex 1/4-20 x 1/2
36	36852	Screen
35	36832	Inlet, EP
34	36902	Ball , 2 dia. Teflon
33	37151	Body, H4
32	36830	Housing, EP
31	36901	Ball, 1-1/2 dia. Teflon
30	36464	O-ring Viton L/F 2-034
29	36834	Cover, EP
28	35584	Washer, 5/16" Belleville
27	36912	Bolt, 1/4-20 x 1"
26	37008	Actuator Assembly (S.S. Float)
25	36836	Dip-tube, H4
5	35325	O-ring Viton L/F 2-235
4	36831	Head, EP
3	36401	Barb, 1/2 T x 3/8 MPT
2	37159	Check Barb, 3/8 T x 1/4 MPT
1	36634	Barb, 3/4 T x 1 MPT

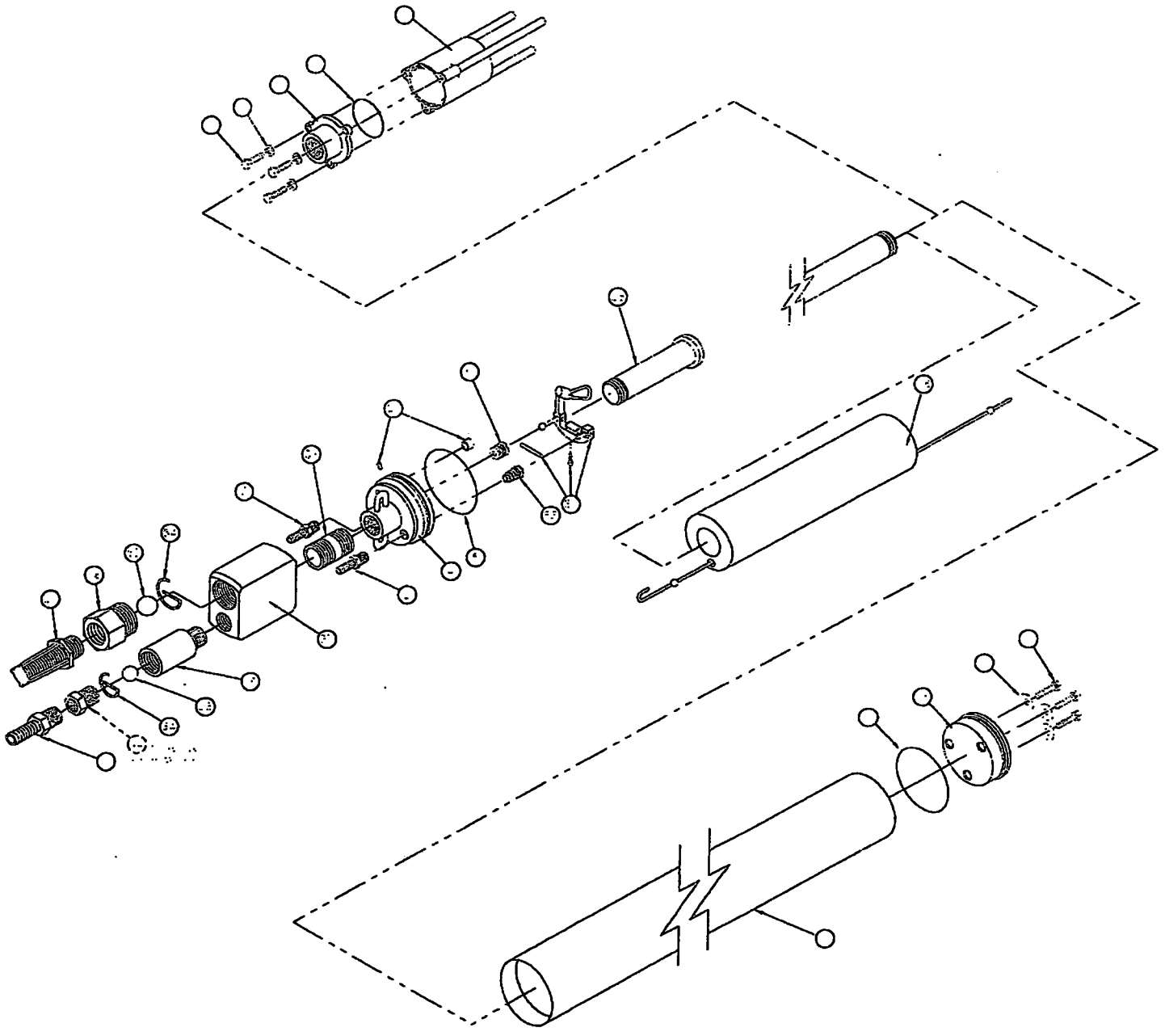
PARTS LIST—H45SEB

ITEM	P/N	DESCRIPTION
53	37025	Seat, Air Supply - Kit
52	37030	Seat, Exhaust - Kit
51	37031	Magnet - Kit
50	37024	Cam Assembly - Kit
44	37088	Bushing, Reducer, 3/4 FPT x 1 MPT
37	37006	Bolt, hex 1/4-20 x 1/2
36	36852	Screen
35	36832	Inlet, EP
34	36902	Ball , 2 dia. Teflon
33	37151	Body, H4
32	36830	Housing, EP
31	36901	Ball, 1-1/2 dia. Teflon
30	36464	O-ring Viton L/F 2-034
29	36834	Cover, EP
28	35584	Washer, 5/16" Belleville
27	36912	Bolt, 1/4-20 x 1"
26	37054	Actuator Assembly (Epoxy Float)
25	36836	Dip-tube, H4
5	35325	O-ring Viton L/F 2-235
4	36831	Head, EP
3	36401	Barb, 1/2 T x 3/8 MPT
2	37159	Check Barb, 3/8 T x 1/4 MPT
1	36634	Barb, 3/4 T x 1 MPT

TUBING CLAMPS

HF45SSB, HF45SEB		H45SSB, H45SEB	
37032	Clamp, 1-1/4 O.D.	35211	Clamp, 3/4 O.D.
35209	Clamp, 1/2 O.D.	35209	Clamp, 1/2 O.D.
35187	Clamp, 3/8 O.D.	35187	Clamp, 3/8 O.D.

PUMP ASSEMBLY DIAGRAM



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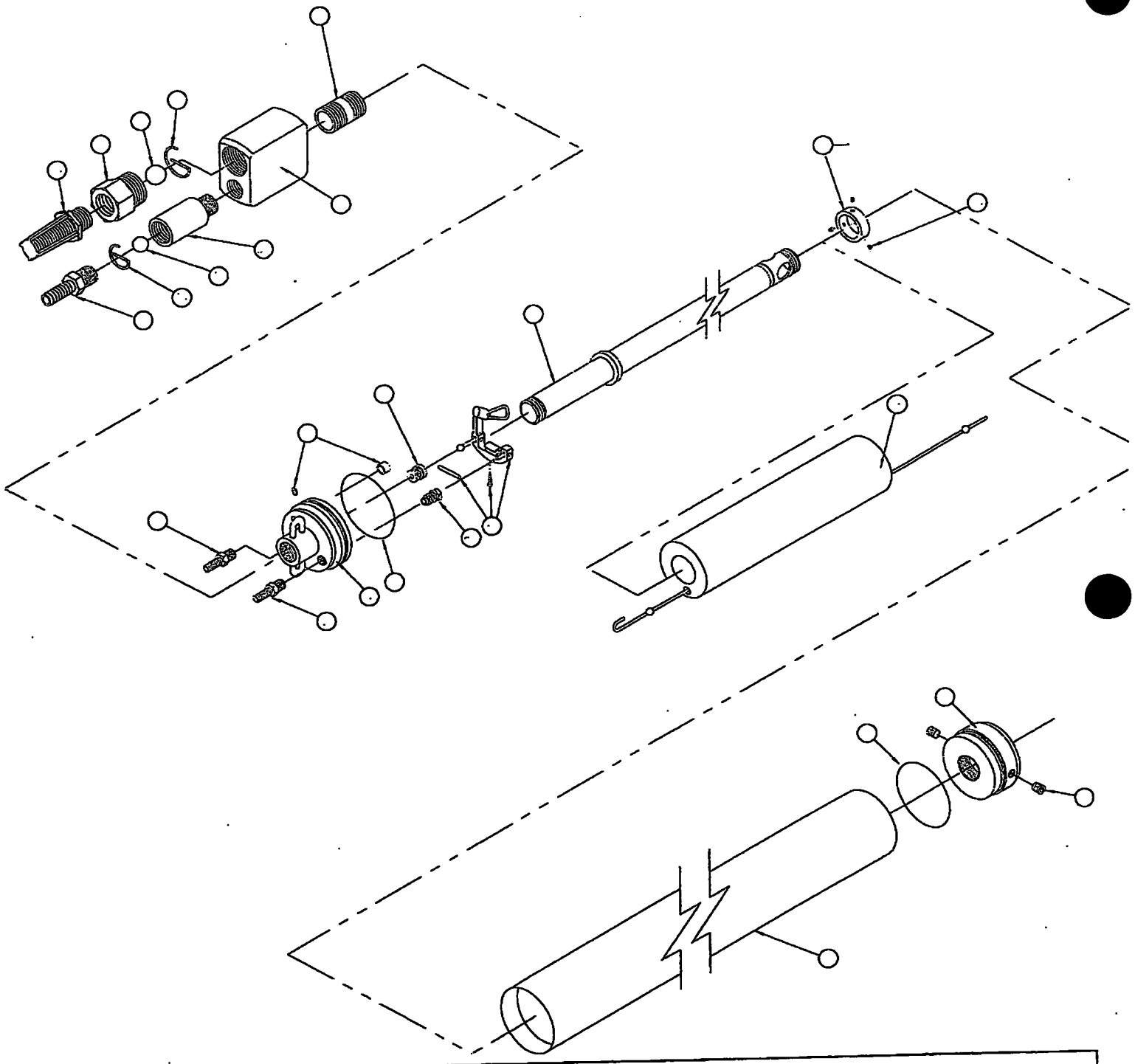
PARTS LIST—H45SET

ITEM	P/N	DESCRIPTION
59	37143	Washer, Sealing
58	37163	Inlet, Solid H4
57	37164	Screen, Nylon H4
56	37169	Seat, Check H4
55	37172	Ball, Teflon 1 3/16" Dia.
54	37170	Ring, Retainer "G"
53	37025	Seat, Air Supply—Kit
52	37030	Seat, Exhaust—Kit
51	37031	Magnet—Kit
50	37024	Cam Assembly—Kit
44	37088	Bushing, Reducer 1" MPT x 3/4" FPT
37	37160	Body, Top Inlet
36	37161	Check, Cartridge
35	36936	Ball, Teflon 7/8" Dia.
34	37162	Ring, Retainer "G"
33	37151	Body W/Shark Logo
32	36830EP	Housing EP
31	37087	Nipple S.S. 1" NPT x 2" Long
30	36464	O-Ring Viton L/F 2-034
29	36834EP	Cover EP
28	35584	Washer, 5/16" Bellville
27	36912	Bolt, 1/4-20 x 1"
26	37054	Actuator Assembly, Epoxy
25	36836	Dip-tube
5	35325	O-Ring Viton L/F 2-235
4	36831EP	Head EP
3	36401	Barb, 1/2 T x 3/8 MPT
2	37159	Check Barb Kit 3/8"T x 1/4" MPT
1	36634	Barb, 3/4 T x 3/4 MPT

PARTS LIST—HF45SET

ITEM	P/N	DESCRIPTION
59	37143	Washer, Sealing
58	37163	Inlet, Solid H4
57	37164	Screen, Nylon H4
56	37169	Seat, Check H4
55	37172	Ball, Teflon 1 3/16" Dia.
54	37170	Ring, Retainer "G"
53	37025	Seat, Air Supply—Kit
52	37030	Seat, Exhaust—Kit
51	37031	Magnet—Kit
50	37024	Cam Assembly—Kit
37	37160	Body, Top Inlet
36	37161	Check, Cartridge
35	36936	Ball, Teflon 7/8" Dia.
34	37162	Ring, Retainer "G"
33	37151	Body W/Shark Logo
32	36830EP	Housing EP
31	37087	Nipple S.S. 1" NPT x 2" Long
30	36464	O-Ring Viton L/F 2-034
29	36834EP	Cover EP
28	35584	Washer, 5/16" Bellville
27	36912	Bolt, 1/4-20 x 1"
26	37054	Actuator Assembly, Epoxy
25	36836	Dip-tube
5	35325	O-Ring Viton L/F 2-235
4	36831EP	Head EP
3	36401	Barb, 1/2 T x 3/8 MPT
2	37159	Check Barb Kit 3/8"T x 1/4" MPT
1	37005	Barb, 1 1/4 T x 1 MPT

PUMP ASSEMBLY DIAGRAM



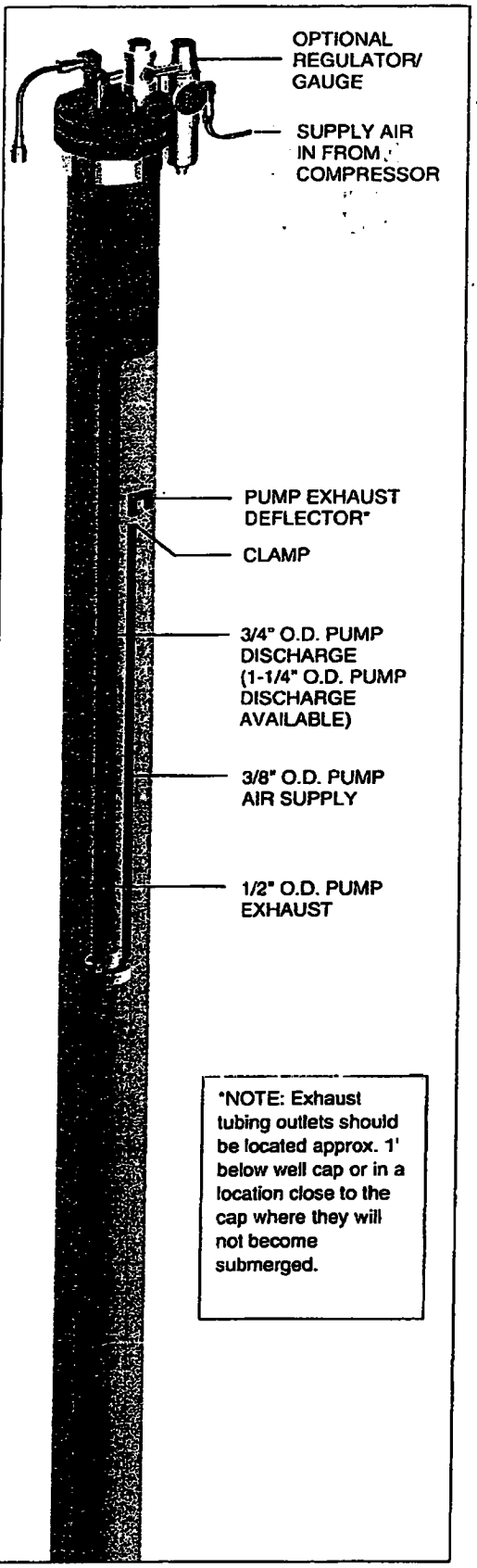
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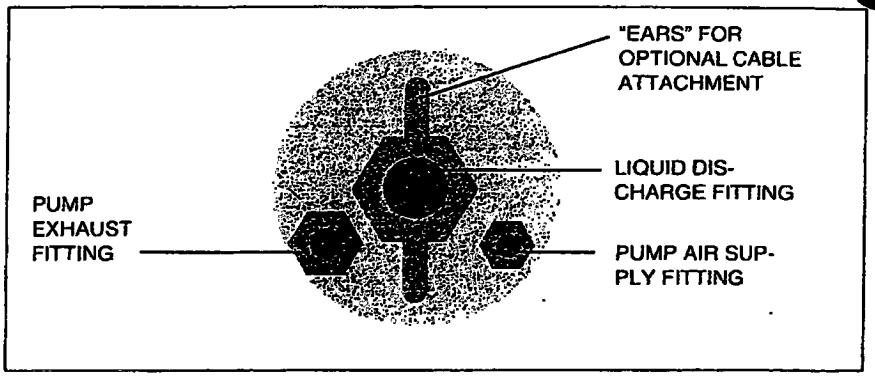
PARTS LIST—HF43SET

ITEM	P/N	DESCRIPTION
63	37025	Seat, Air Supply—Kit
62	37030	Seat, Exhaust—Kit
61	37031	Magnet—Kit
60	37024	Cam Assembly—Kit
57	37227	Plug, Pipe 1/4" MPT Brass
56	37191	Collar, Clamping S.S.
55	37187	Inlet, Solid Short Body
54	37164	Screen, Nylon H4
53	37169	Seat, Check H4
52	37172	Ball, Teflon 1 3/16" Dia.
51	37170	Ring, Retainer "G"
37	37160	Body, Top Inlet
36	37161	Check, Cartridge
35	36936	Ball, Teflon 7/8" Dia.
34	37162	Ring, Retainer "G"
33	37195	Body Short W/Shark Logo
31	37087	Nipple S.S. 1" NPT x 2" Long
26	37190	Actuator Assembly, Epoxy
25	37189	Dip-tube
5	35325	O-Ring Viton L/F 2-235
4	36831EP	Head EP
3	36401	Barb, 1/2 T x 3/8 MPT
2	37159	Check Barb Kit 3/8"T x 1/4" MPT
1	37005	Barb, 1 1/4 T x 1 MPT

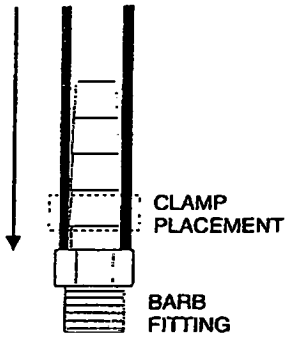
INSTALLATION/OPERATION



*NOTE: Exhaust tubing outlets should be located approx. 1' below well cap or in a location close to the cap where they will not become submerged.



STEP 1. Attach Tubing to Pump



A. Cut back sheathing on tubing set approximately 1 foot.

B. Slip clamps over appropriate tubes prior to connecting to barbs.

C. Push tubing down flush with the fitting's nut if possible; cover at least 3 barbs if 3 or more are present. (Note: in freezing weather, this is easier if tubing is dipped in warm water for a few seconds to soften the nylon.)

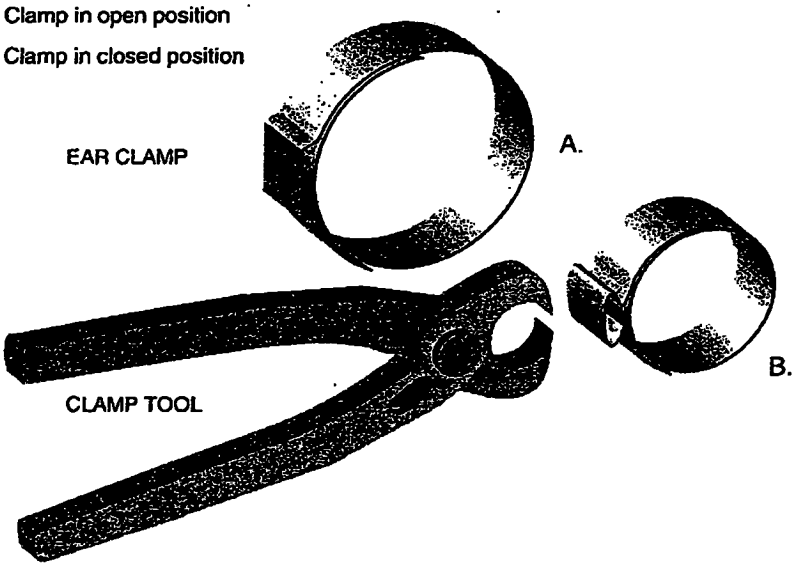
D. Place clamp over lowest barb completely covered by tubing.

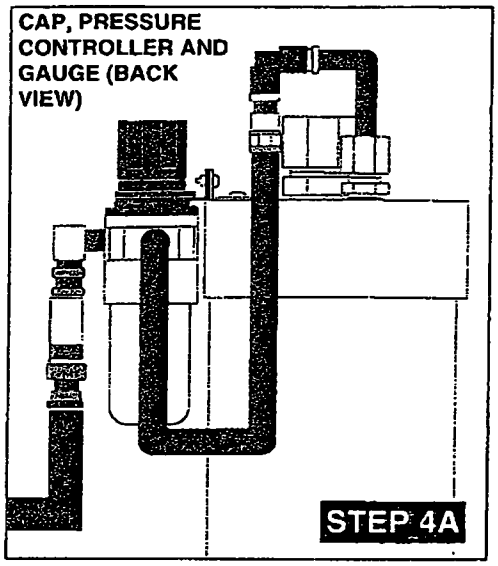
STEP 2. Tighten Clamps

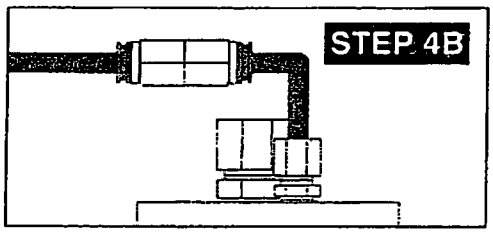
A. Place clamp tool over the dimpled ear portion of the clamp and squeeze ear together (as shown).

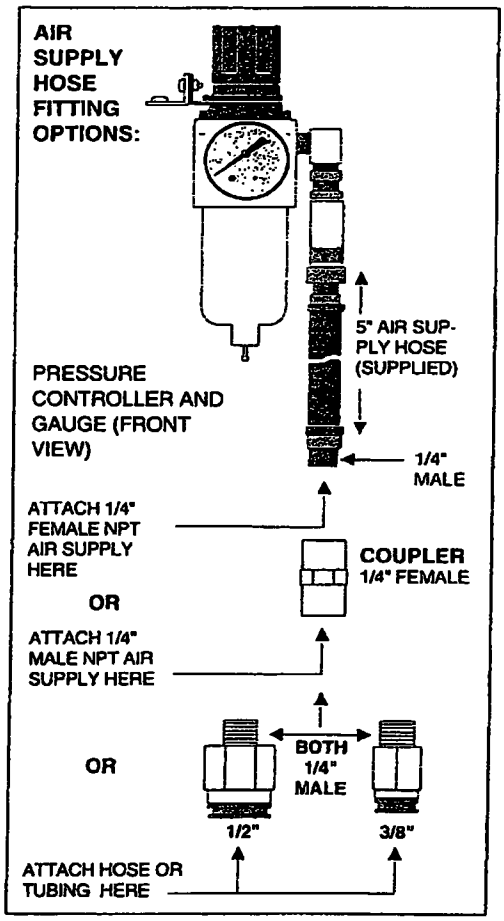
A. Clamp in open position

B. Clamp in closed position









STEP 3. Install Pump in Well

A. Lower pump to desired depth.

B. Once pump depth has been determined, measure off approximately 1 ft. of tubing length (measured from the top of well casing) from the pump exhaust line.

C. Cut exhaust line.

D. Attach the pump exhaust deflector to the pump exhaust line. (See clamp instructions in step 2.)

E. Pass pump discharge and air supply lines through the well cap: place well cap on casing.

F. Re-adjust pump to desired depth.

G. Cut air supply and discharge tubes to desired length.

H. Tighten fittings down onto air/discharge lines, and tighten well cap clamp if present.

STEP 4. Connect Air Supply and Discharge

A. If optional pressure regulator is used, connect short (≈1 foot) hose from regulator to pump air supply line with attached push-on elbow; attach 5' flexible hose to quick-connect fitting on regulator and to air supply line from compressor. See illustration at lower left for air supply hose fitting options.

OR

B. If optional pressure regulator is not used, connect air supply line from compressor directly to pump air supply line above well cap (fittings and coupler for 3/8" and/or 1/2" connections).

C. Connect pump discharge tube to discharge header. (Barb and clamps supplied with pump.)

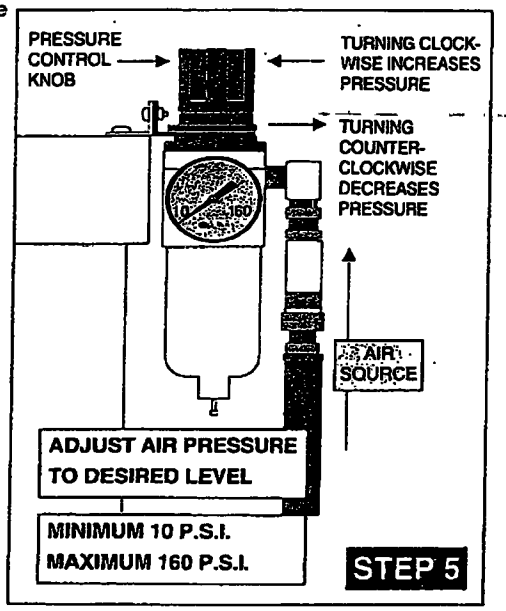
STEP 5. Set Air Pressure

NOTE: Flow Rate is dependent on the amount of air pressure that is received by the pump. Flow rates can be increased by increasing air pressure to the pump or decreased by decreasing air pressure to the pump. For satisfactory performance, pressure should be set at or above 1 psi for every 2 feet of total discharge head—i.e., a pump with T.D.H. of 200' would require 100 psi or more to pump effectively.

A. Adjust air pressure to desired level at compressor—minimum 10 psi, maximum 160 psi.

OR

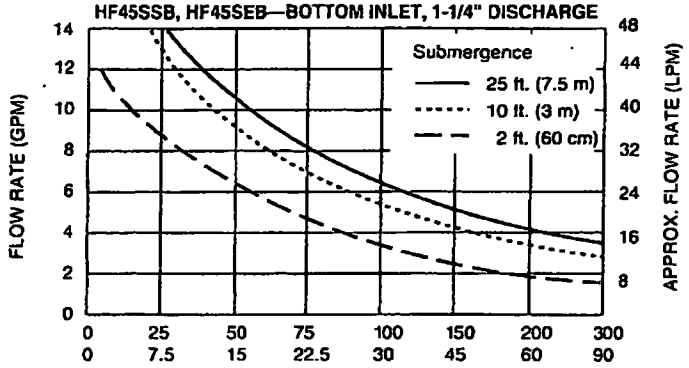
B. Adjust air pressure with optional pressure regulator (see illustration).



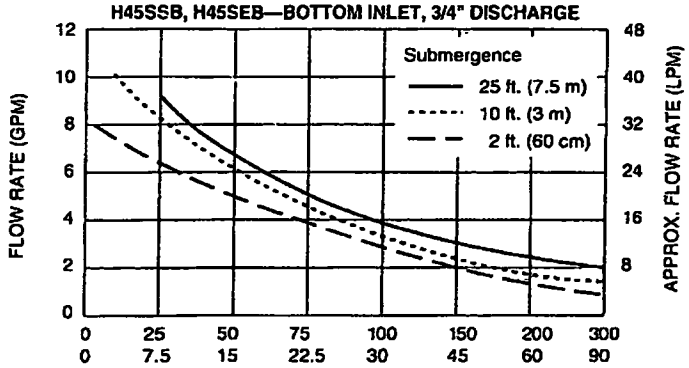
H4 SERIES FLOW PERFORMANCE CURVES

*100 psi (700 kPa) drive air pressure was supplied for all pump depths less than 150 feet (45 meters); 160 psi was supplied for all pump depths greater than 150 feet.

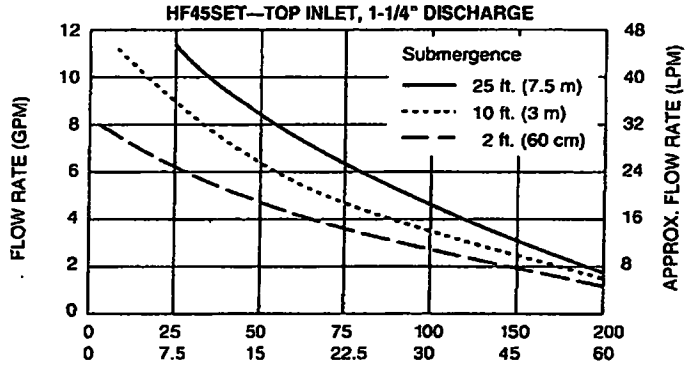
HF45SSB, HF45SEB—BOTTOM INLET, 1-1/4" DISCHARGE



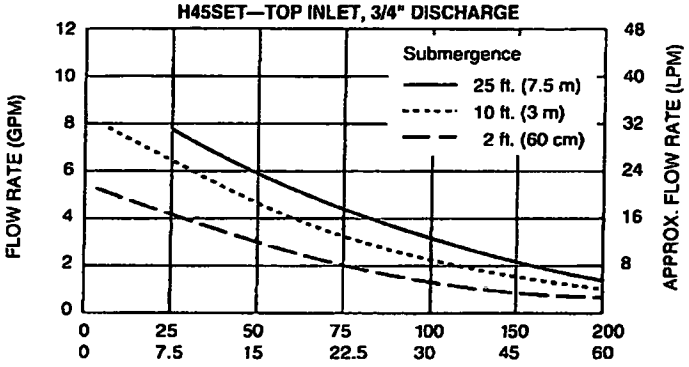
H45SSB, H45SEB—BOTTOM INLET, 3/4" DISCHARGE



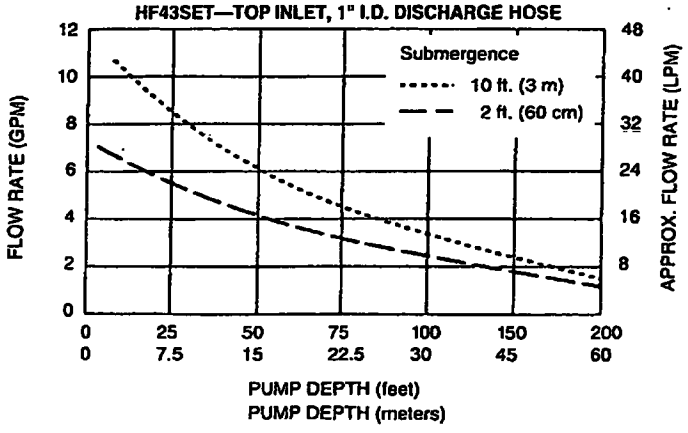
HF45SET—TOP INLET, 1-1/4" DISCHARGE



H45SET—TOP INLET, 3/4" DISCHARGE



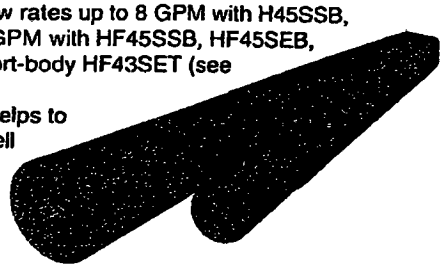
HF43SET—TOP INLET, 1" I.D. DISCHARGE HOSE



NOTE: Pump depth is measured down from the top of the well casing to the top of the pump fittings. Submergence is measured up from the lowest inlet point on the pump inlet to the top of the static water or product in the well.

TUBING

Two tubing packages are available for H4 series pumps. The standard SPTUBE provides flow rates up to 8 GPM with H45SSB, H45SEB, and H45SET models. The high flow MAXTUBE increases maximum flow up to 14+ GPM with HF45SSB, HF45SEB, and HF45SET pumps. Hoses and quick-connects are available for all models, including the short-body HF43SET (see "Accessories" for details).



Both sets are QED's exclusive Jacketed Tubing, with a smooth, continuous nylon sheath that helps to prevent hangups and kinks, makes pump installation easier (especially in narrow or obstructed well casing), and eliminates the nicked fingers and other hazards of old-fashioned tubing ties.

Tubing sets are supplied cut to custom lengths. Jacketed tubing and sheath are both Nylon 12, which doesn't swell in water and provides excellent resistance to most liquids and cleanup conditions, including hydrocarbons, fuels, and alkalies. For extremes of acidity, consult QED for alternative.

Model	SPTUBE	MAXTUBE
Description	Contains 4 tubes—discharge, exhaust, air supply, and bubbler tubing*	Contains 3 tubes—discharge, exhaust and air supply
Discharge O.D.	3/4" (19 mm)	1-1/4" (32 mm)
Exhaust O.D.	1/2" (13 mm)	1/2" (13 mm)
Air Supply O.D.	3/8" (9 mm)	3/8" (9 mm)
Bubbler O.D.	1/4" (6 mm)	—
Min. Bend Radius	7" (18 cm)	12" (30 cm)
Max. Pressure	325 psi (2,250 kPa)	165 psi (1,150 kPa)
†Max. Cont. Length	200' (60 m)	150' (45 m)

*Bubbler tubing is used for referenced depth measurement. More information on this is supplied with custom wellhead completion packages.

† These are maximum lengths that can be shipped via UPS. For longer continuous lengths, consult QED.

HAMMERHEAD CAPS AND ACCESSORIES

NOTE: each cap, flange and accessory kit comes with an illustrated instruction sheet.

STANDARD (SLIP-FIT) CAPS

MODEL**	PUMP MODEL	WELL DIAM.	DESCRIPTION	TUBING TYPE
S4S	All H4 pumps	4" (100 mm)	Cap - Standard	SPTUBE
S6S	All H4 pumps	6" (150 mm)	Cap - Standard	SPTUBE
S8S	All H4 pumps	8" (200 mm)	Cap - Standard	SPTUBE
‡S4L	All HF4 pumps	4" (100 mm)	Cap - High Flow	HOSE, 1" I.D.
‡S6L	All HF4 pumps	6" (150 mm)	Cap - High Flow	HOSE, 1" I.D.
‡S8L	All HF4 pumps	8" (200 mm)	Cap - High Flow	HOSE, 1" I.D.
S4X	All HF4 pumps	4" (100 mm)	Cap - High Flow	MAXTUBE
S6X	All HF4 pumps	4" (100 mm)	Cap - High Flow	MAXTUBE
S8X	All HF4 pumps	4" (100 mm)	Cap - High Flow	MAXTUBE

VACUUM CAPS

MODEL**	PUMP MODEL	WELL DIAM.	DESCRIPTION	TUBING TYPE
V4S	H45SSB, H45SEB, H45SET	4" (100 mm)	Cap - Standard - Vacuum	SPTUBE
V6S	H45SSB, H45SEB, H45SET	6" (150 mm)	Cap - Standard - Vacuum	SPTUBE
V8S	H45SSB, H45SEB, H45SET	8" (200 mm)	Cap - Standard - Vacuum	SPTUBE
V4X	HF45SSB, HF45SEB, HF45SET	4" (100 mm)	Cap - High Flow - Vacuum	MAXTUBE
V6X	HF45SSB, HF45SEB, HF45SET	6" (150 mm)	Cap - High Flow - Vacuum	MAXTUBE
V8X	HF45SSB, HF45SEB, HF45SET	8" (200 mm)	Cap - High Flow - Vacuum	MAXTUBE

**Add F after Model Number to include Filter/Regulator/Gauge with cap.

‡ Hose option to be sold with support line (cable or rope)

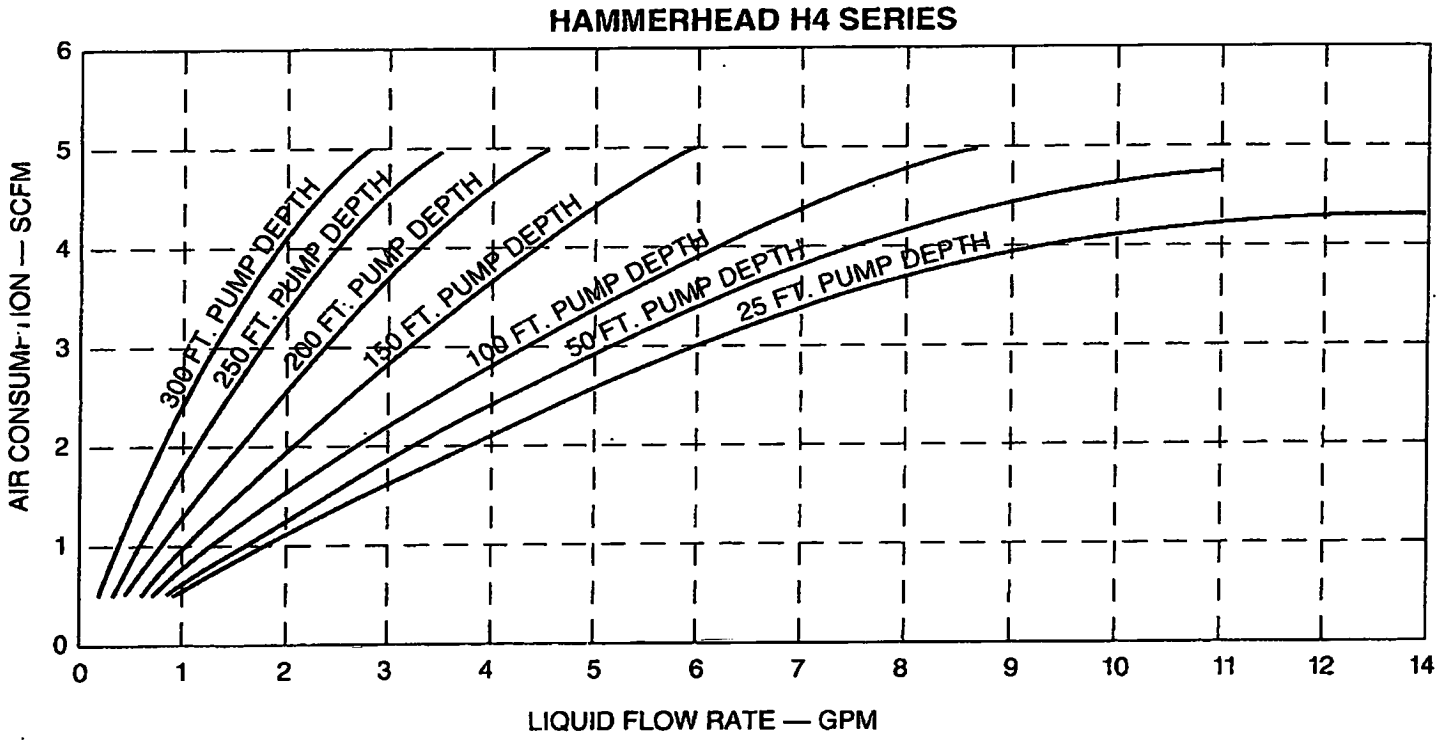
ACCESSORIES

MODEL	PUMP MODEL	DESCRIPTION
37000	All Models	Pump Cycle Counter (for Flow Totalization)
L374	All Models	Tank Full Shutoff
37050	All Models	Kit - Regulator/Gauge
KIH4ST	All Bot. Inlet mod.	Kit - Top Inlet Conversion - H4
KIH4SB	All Top Inlet mod.	Kit - Bottom Inlet Conversion - H4
CH52	All Bot. Inlet mod.	Can - 2' (60 cm) Length (Leachate)
95067	All Models	HammerHead O&M Manual
SPTOOLS	All Models	Clamp Tool, Tube Cutter

MODEL	PUMP MODEL	DESCRIPTION
37058	All Models	Kit - Cable Attachment
37060	All Models	Cable - 3/16" (5 mm) S.S. - order by ft.
37207	All Models	Rope - 3/8" (9 mm) Polypro. - order by ft.
37212	All Models	Cable Sling Assembly
37216	HF4 Series	* Hose - 1" (25 mm) I.D. Discharge (Black)
37217	HF4 Series	* Hose - 3/8" (9 mm) I.D. Air Supply (Red)
37218	HF4 Series	* Hose - 3/8" (9 mm) I.D. Exhaust (Gray)
37208	HF4 Series	Kit - Quick Connect - Discharge/Air Supply - Pump
37209	HF4 Series	Kit - Quick Connect - Discharge/Air Supply - Well Top
36824	All Models	Flow Throttle Valve

* Hose to be sold with quick connects only

AIR CONSUMPTION



IMPORTANT — AIR FLOW IS ACTUAL. A MAXIMUM "ON-TIME" DUTY CYCLE FOR THE COMPRESSOR MUST BE CONSIDERED IN SELECTING A COMPRESSOR CAPACITY.

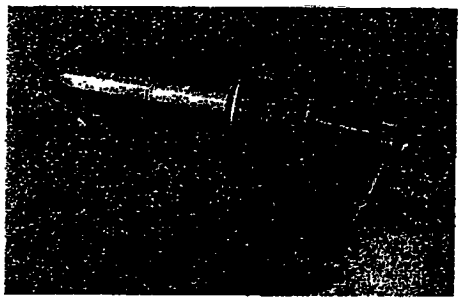
MINIMUM AIR FLOW REQUIRED 0.5 SCFM @ 10 PSI
MAXIMUM AIR PRESSURE 160 PSI

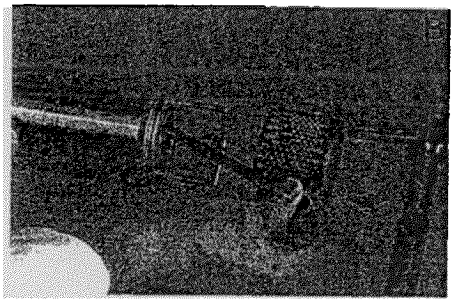
H4 SERIES: REMOVING SHIPPING FLOAT RESTRAINT BEFORE USE

Remove single screw securing inlet screen with 7/16" socket (preferred) or other wrench of your choice (A).

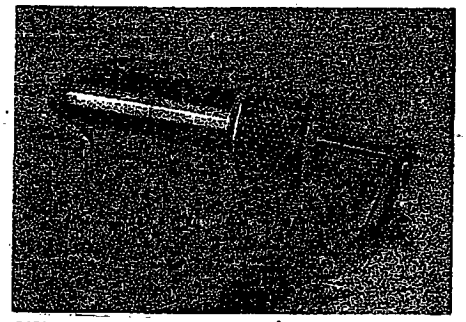
Remove inlet screen and pull out full length of protective shipping tube protruding out of inlet (B).

Reattach inlet screen. Internal float should move freely when pump is tipped from bottom to top.





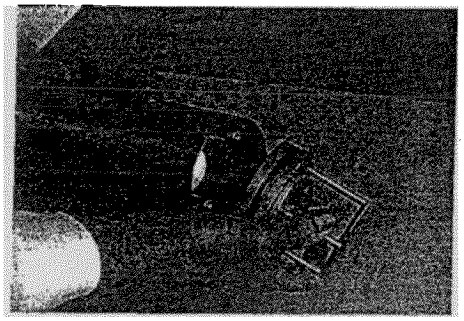
BOTTOM FILLING PUMPS: DISASSEMBLY/REASSEMBLY FOR CLEANING



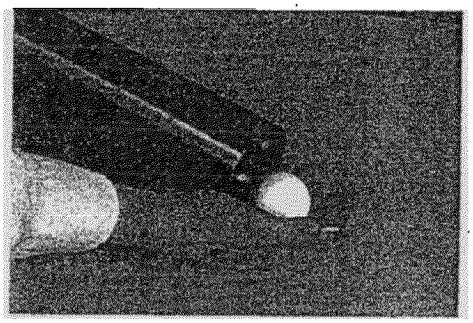
STEP 1: Remove 1 screw from inlet screen using 7/16" socket wrench. Then remove inlet screen.



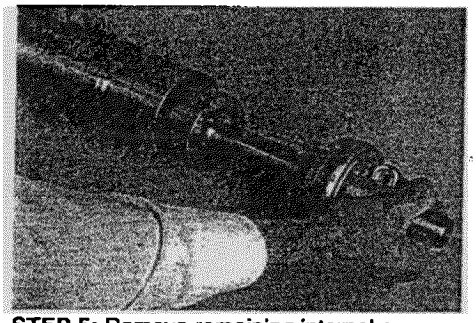
STEP 2: Remove 3 screws and 3 washers from inlet using 7/16" socket wrench.



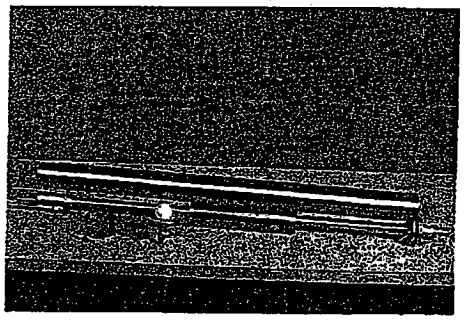
STEP 3: Remove inlet—wiggle side to side while pulling out.



STEP 4: Tip pump to allow inlet check ball to roll out.



STEP 5: Remove remaining internal pump subassembly—grasp top of pump, wiggle side to side and twist while pulling out of body.



STEP 6: All parts are now removed from pump. Reverse the process to reassemble pump, starting with STEP 7.

STEP 7: Slide internal subassembly into pump body. O-ring should slide into body. NOTE: body is universal—pump can slide into either end.

STEP 8: Replace inlet check ball (2" diameter) between 3 "legs" inside lower end of pump.

STEP 9: Replace inlet. Push inlet in and rotate until the 3 legs inside body line up with the 3 counterbores. Then, push inlet in the rest of the way, so O-ring is sealed inside pump body.

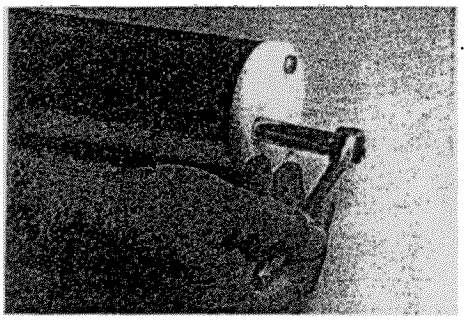
STEP 10: Make sure threads on 3 inlet screws and 3 inlet legs (inside body) are clean and free of silt or sediment. Place washers on screws, insert, and tighten with 7/16" socket wrench.

STEP 11: Place inlet screen over 3 legs of inlet. Insert to reattach screen. As in Step 10, make sure screw and threads are clean. Finish tightening with 7/16" socket wrench.

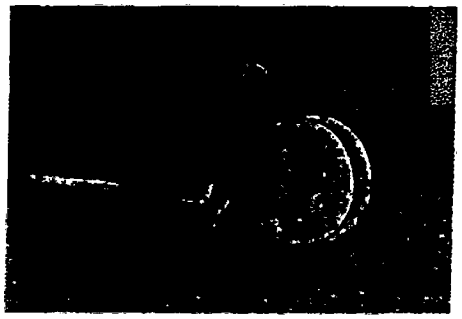
STEP 12: Tip pump over from top to bottom. You should hear float sliding freely inside body.

Note: for field repair or service of parts, please contact customer service at 1-800-624-2026.

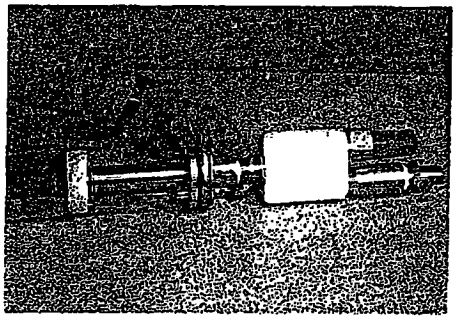
TOP FILLING PUMPS: DISASSEMBLY/REASSEMBLY FOR CLEANING: MODELS H45SET AND HF45SET



STEP 1: Remove 3 screws and 3 sealing washers from bottom plate using the 7/16" socket wrench provided.



STEP 2: Remove bottom plate.



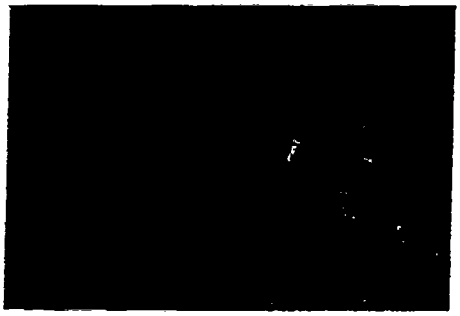
STEP 3: Remove remaining internal pump subassembly—grasp top of pump, wiggle side to side and twist while pulling out of body. Reverse the process to reassemble the pump, starting with STEP 4.

STEP 4: Slide internal subassembly into pump body. O-ring should slide into body. NOTE: body is universal—pump can slide into either end.

STEP 5: Replace bottom plate. Push in and rotate until the 3 legs (inside body) line up with the 3 counterbores. Then, push the plate in the rest of the way, so O-ring is seated inside pump body.

STEP 6: Make sure threads on 3 bottom plate screws and 3 legs (inside body) are clean and free of silt or sediment. Place sealing washers on screws—insert and tighten. Finish tightening with 7/16" socket wrench. Do not over-torque.

SHORT BODY MODEL HF43SET



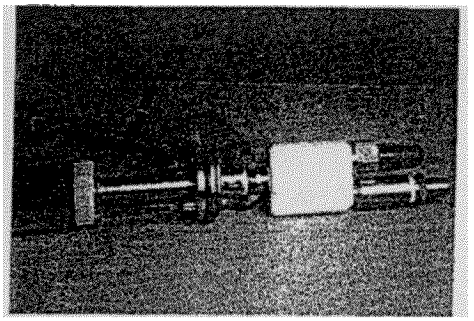
STEP 1: Remove 1/4" pipe plug using 1/4" hex wrench.



STEP 3: Remove bottom plate.



STEP 2: Insert screw driver into hole. Unthread bottom plate (CCW direction).



STEP 4: Remove remaining internal pump subassembly—grasp top of pump, wiggle side to side and twist while pulling out of body. Reverse the process to reassemble the pump, starting with STEP 5.

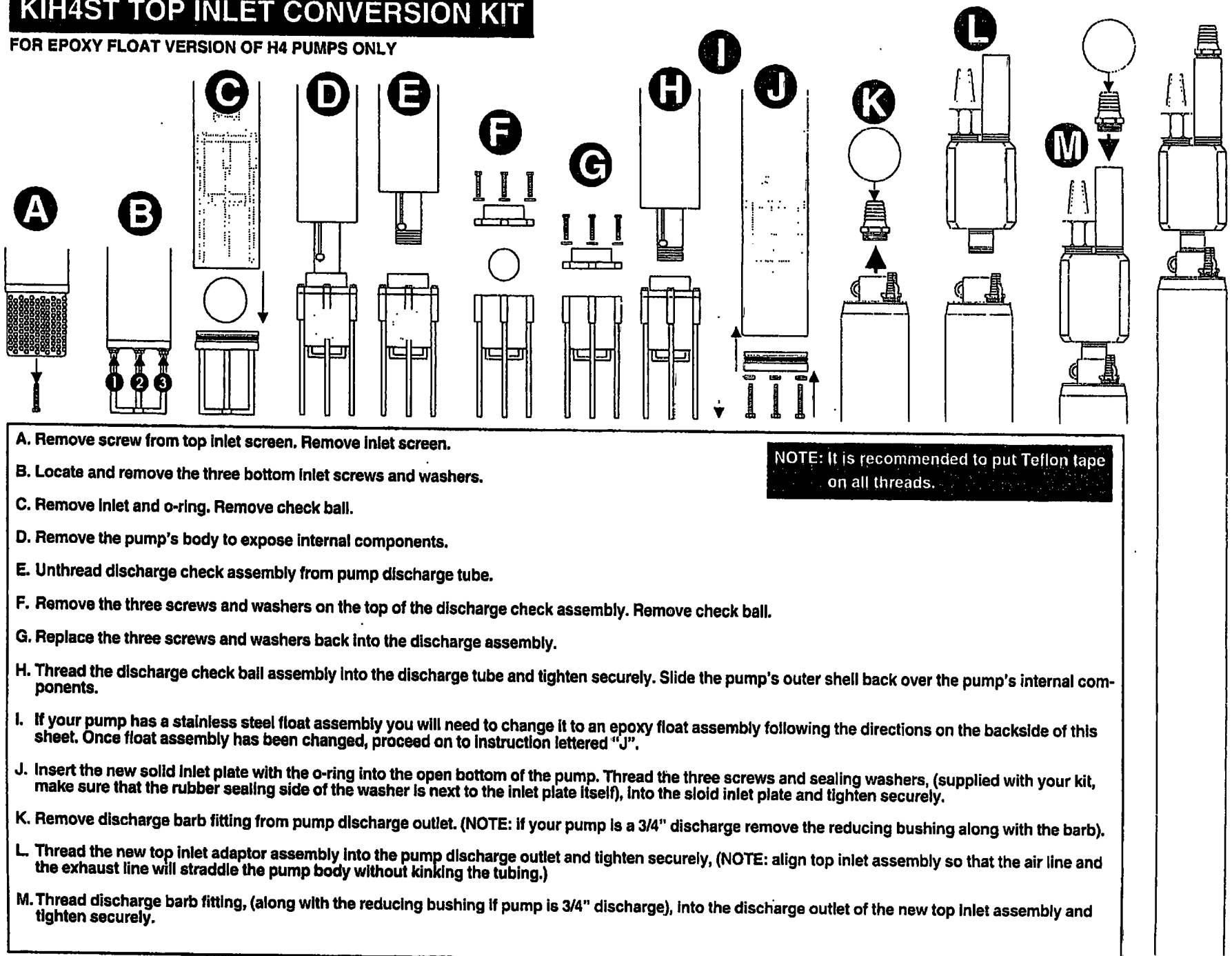
STEP 5: Slide internal subassembly into pump body. O-ring should slide into body. NOTE: body is universal—pump can slide into either end.

STEP 6: Replace bottom plate. Align threads in bottom plate with threads on dip tube.

STEP 7: Insert screw driver into the 1/4" pipe plug hole and tighten bottom plate (clockwise direction). Do not over-tighten. Insert 1/4" pipe plug and tighten with 1/4" hex wrench. It is recommended to use Teflon tape on threads of dip tube and 1/4" pipe plug.

KIH4ST TOP INLET CONVERSION KIT

FOR EPOXY FLOAT VERSION OF H4 PUMPS ONLY



A. Remove screw from top inlet screen. Remove inlet screen.

B. Locate and remove the three bottom inlet screws and washers.

C. Remove inlet and o-ring. Remove check ball.

D. Remove the pump's body to expose internal components.

E. Unthread discharge check assembly from pump discharge tube.

F. Remove the three screws and washers on the top of the discharge check assembly. Remove check ball.

G. Replace the three screws and washers back into the discharge assembly.

H. Thread the discharge check ball assembly into the discharge tube and tighten securely. Slide the pump's outer shell back over the pump's internal components.

I. If your pump has a stainless steel float assembly you will need to change it to an epoxy float assembly following the directions on the backside of this sheet. Once float assembly has been changed, proceed on to instruction lettered "J".

J. Insert the new solid inlet plate with the o-ring into the open bottom of the pump. Thread the three screws and sealing washers, (supplied with your kit, make sure that the rubber sealing side of the washer is next to the inlet plate itself), into the sloid inlet plate and tighten securely.

K. Remove discharge barb fitting from pump discharge outlet. (NOTE: if your pump is a 3/4" discharge remove the reducing bushing along with the barb).

L. Thread the new top inlet adaptor assembly into the pump discharge outlet and tighten securely, (NOTE: align top inlet assembly so that the air line and the exhaust line will straddle the pump body without kinking the tubing.)

M. Thread discharge barb fitting, (along with the reducing bushing if pump is 3/4" discharge), into the discharge outlet of the new top inlet assembly and tighten securely.

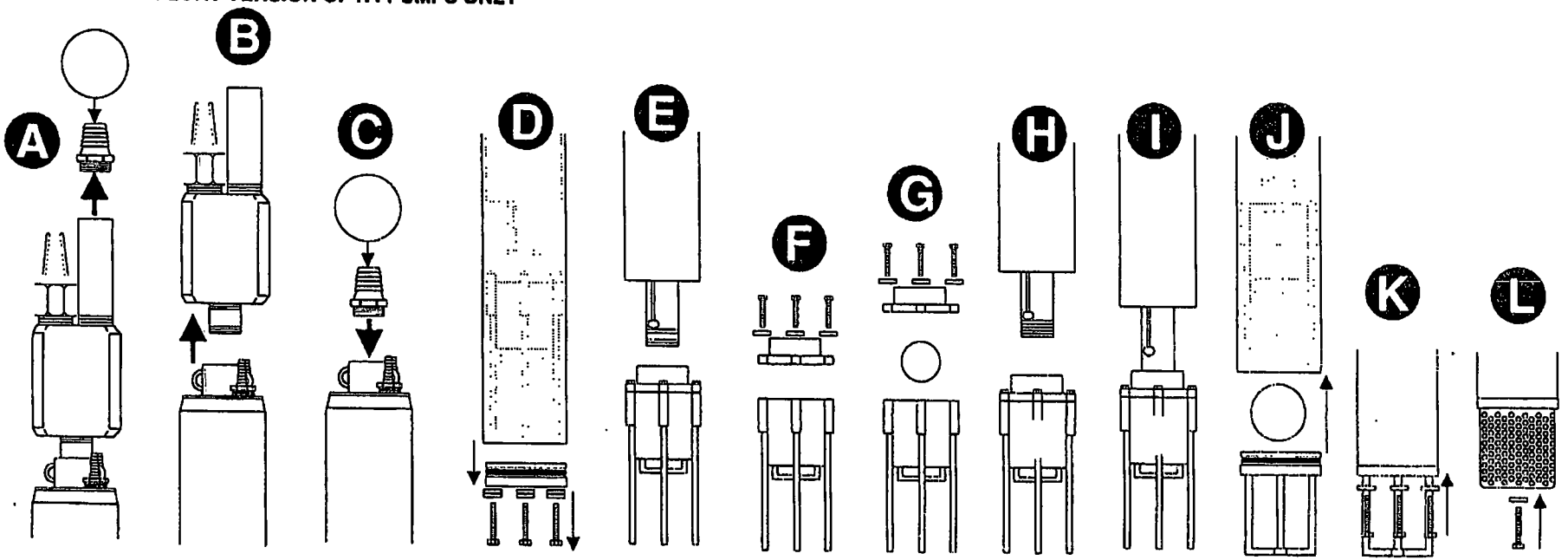
NOTE: It is recommended to put Teflon tape on all threads.

P/N 95091 REV.#2 11-15-94

R 001898

KIH4SB BOTTOM INLET CONVERSION KIT

FOR EPOXY FLOAT VERSION OF H4 PUMPS ONLY



A. Unthread and remove pump discharge fitting, (along with the reducing bushing if pump is 3/4" discharge), from the discharge outlet of the top inlet adaptor.

NOTE: It is recommended to put Teflon tape on all threads.

B. Unthread and remove the top inlet adaptor assembly from the pump discharge outlet.

C. Thread discharge barb fitting, (along with the reducing bushing if pump is 3/4" discharge), into the pump discharge outlet. Tighten securely.

D. Remove the three screws and sealing washers holding the solid bottom inlet plate in place. Remove the solid bottom inlet plate and o-ring.

E. Remove the pump's body to expose internal components. Unthread the discharge check ball assembly from the discharge tube.

F. Remove the three screws and washers from the top of the discharge check ball assembly.

G. Place the smaller check ball, (from your kit), into the discharge check ball assembly. Replace the three screws and washers. Tighten securely.

H. Thread discharge check ball assembly back onto the pump discharge tube. Tighten securely.

I. Slide the pump's body back over the pump's internal components.

J. Place the larger check ball, (from your kit), into the pump bottom. Insert the inlet and o-ring, (from your kit), into the pump bottom.

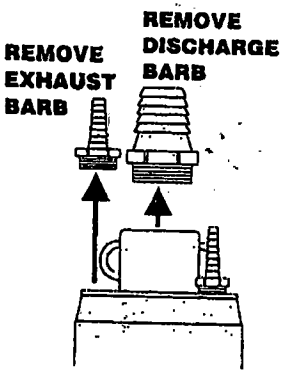
K. Align the three screw holes on the inlet and thread in the three screws and sealing washers (provided with your kit). Tighten securely.

L. Slide the pump inlet screen, (from your kit), over the inlet assembly. Thread in the screw and tighten securely.

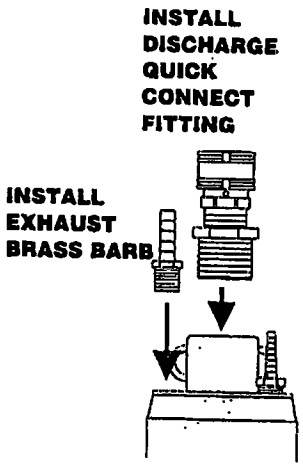
P/N 95092 REV.#2 11-15-94

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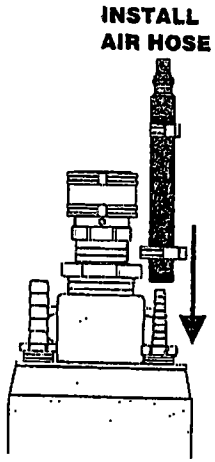
37208 KIT FOR USE WITH 4" HAMMERHEADS WITH HOSE



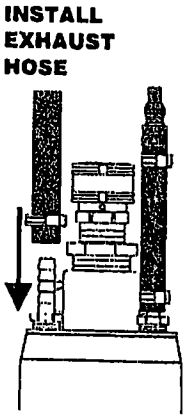
STEP 1



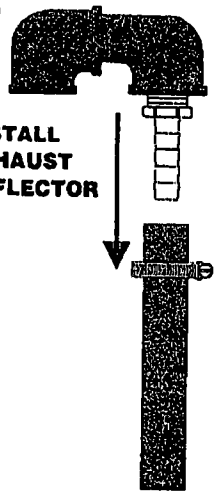
STEP 2



STEP 3



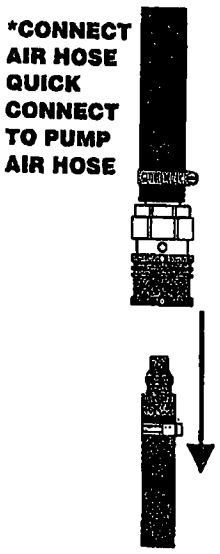
STEP 4



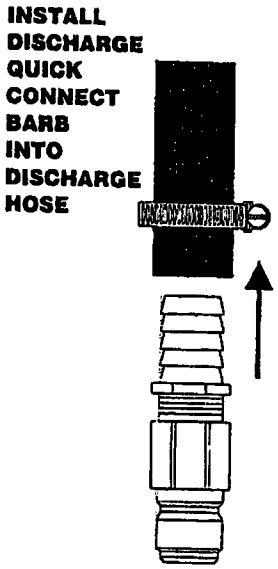
STEP 5



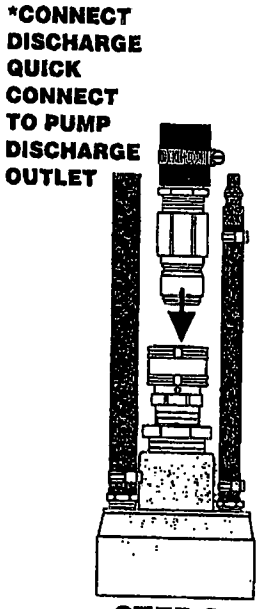
STEP 6



STEP 7



STEP 8

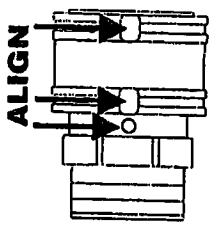


STEP 9

* USE OF LOCKING QUICK CONNECTS

*QUICK CONNECT FITTINGS HAVE A LOCK MECHANISM

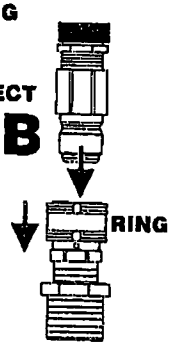
A



TO UNLOCK FITTING ALIGN UP NOTHCHES WITH FITTING BALL AS SHOWN

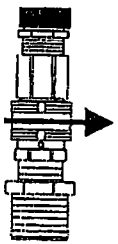
TO INSERT FITTING INTO QUICK CONNECT

B



SLIDE RING DOWN AND HOLD WHILE FULLY INSERTING FITTING INTO QUICK CONNECT THEN RELEASE RING

C



TO LOCK FITTING TURN RING SO THAT NOTCHES ARE NO LONGER IN ALIGNMENT WITH FITTING BALL

P/N 95100 11-3-94

R 001900

PULSE PUMP™ WARRANTY

QED Environmental Systems, Inc. (QED) warrants to the original purchaser of its products that, subject to the limitations and conditions provided below, the products, materials and/or workmanship shall reasonably conform to the descriptions of the products and shall be free of defects in materials and workmanship. Any failure of the products to conform to this warranty will be remedied by QED in the manner provided herein.

This warranty shall be limited to the duration and the conditions set forth below. All warranty durations are calculated from the original date of purchase.

1. Liquid contacting equipment including pumps (QED bladder style pumps are excluded from this warranty), and tubing are warranted for one year.
2. Control devices, control device mounting, and surface air supply hose are warranted for one year.
3. Separately sold parts and spare parts kits are warranted for ninety (90) days.
4. Repairs performed by QED are warranted for ninety (90) days from date of repair or for the full term of the original warranty, whichever is longer.

Buyer's exclusive remedy for breach of said warranty shall be as follows, if, and only if, QED is notified in writing within the applicable warranty period of the existence of any such defects, shall find the same to be within the term of the warranty running from QED to Buyer, QED will, at its option, as soon as reasonably possible, replace or repair any such product, without charge to Buyer. If QED for any reason cannot repair a product covered hereby within four (4) weeks after receipt of the original Purchaser's/Buyer's notification of a warranty claim, then QED's sole responsibility shall be, at its option, either to replace the defective product with a comparable new unit at no charge to the Buyer, or to refund the purchase price. In no event shall such allegedly defective products be returned to QED without its consent, and QED's obligations of repair, replacement or refund are conditioned upon the Buyer's return of the defective product to QED.

IN NO EVENT SHALL QED ENVIRONMENTAL SYSTEMS, INC. BE LIABLE FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF SAID WARRANTY.

The foregoing warranty does not apply to major subassemblies and other equipment, accessories, and other parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties, if any, supplied by their respective manufacturers. QED makes no warranty concerning products or accessories not manufactured by QED. In the event of failure of any such product or accessory, QED will give reasonable assistance to Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY (INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE), WHICH OTHER WARRANTIES ARE EXPRESSLY EXCLUDED HEREBY, and of any other obligations or liabilities on the part of QED, and QED neither assumes nor authorizes any person to assume for it any other obligation or liability in connection with said products, materials and/or workmanship.

It is understood and agreed that QED shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use, or exposure to chemical or physical environment beyond the designated limits of materials and construction will also void this warranty.

Chemical attack to liquid contacting equipment and supplies shall not be covered by this warranty. A range of materials is available from QED and it is the Buyer's responsibility to select materials to fit the Buyer's application. QED will only warrant that the supplied liquid contacting materials will conform to published QED specifications and generally accepted standards for that particular material.

QED shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED's service personnel unless such repair by others is made with the written consent of QED. If any product covered hereby is actually defective within the terms of this warranty, Purchaser must contact QED for determination of warranty coverage. If the return of a component is determined to be necessary, QED will authorize the return of the component, at owner's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts and labor as authorized by owner hereunder shall be borne by the Purchaser.

The original Purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. You may secure performance of obligations hereunder by contacting the Customer Service Department of QED and:

1. Identify the product involved (by model or serial number or other sufficient description that will allow QED to determine which product is defective).
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.
4. Sending the malfunctioning component, after authorization by QED to:

QED Environmental Systems, Inc.
6155 Jackson Road
Ann Arbor, MI 48103

Telephone: 1-313-995-2547
1-800-624-2026
1-313-995-1170 FAX

Appendix B.3

Counter and Regulator Information

SOLO COUNTER OPERATING INSTRUCTIONS

1. TURN THE NEEDLE VALVE KNOB COUNTERCLOCKWISE SO IT IS FULLY OPEN.

2. INSTALL THE COUNTER IN DESIRED ORIENTATION PER INSTALLATION SHEET.

3. TURN THE AIR SUPPLY ON.

4. SLOWLY TURN THE NEEDLE VALVE IN A CLOCKWISE DIRECTION UNTIL THE COUNTER REGISTERS A HALF COUNT.

5. THE COUNTER WILL REGISTER A HALF COUNT WHEN THE PUMP IS IN THE DISCHARGE CYCLE AND WILL COMPLETE THE COUNT ON THE REFILL CYCLE.

6. THE COUNTER SHOULD COUNT ONE CYCLE FOR EVERY SOLO DISCHARGE AND REFILL CYCLE.

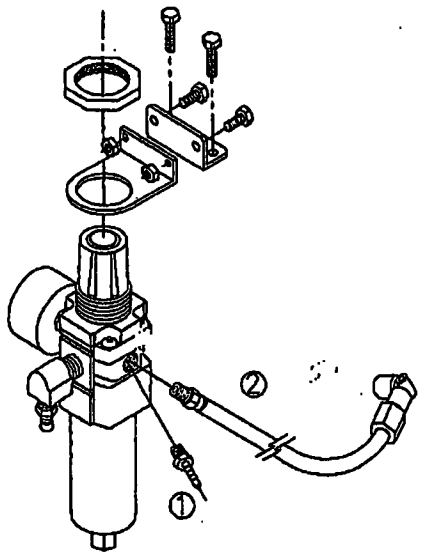
NOTE: DO NOT TURN THE NEEDLE VALVE IN FURTHER THAN IS REQUIRED. IF THE NEEDLE VALVE IS TURNED IN FURTHER THAN NECESSARY IT WILL PREVENT THE PUMP FROM PUMPING.

P/N 95060 REV. 2 8/13/93

SOLO COUNTER

P/N: 37000

INSTALLATION



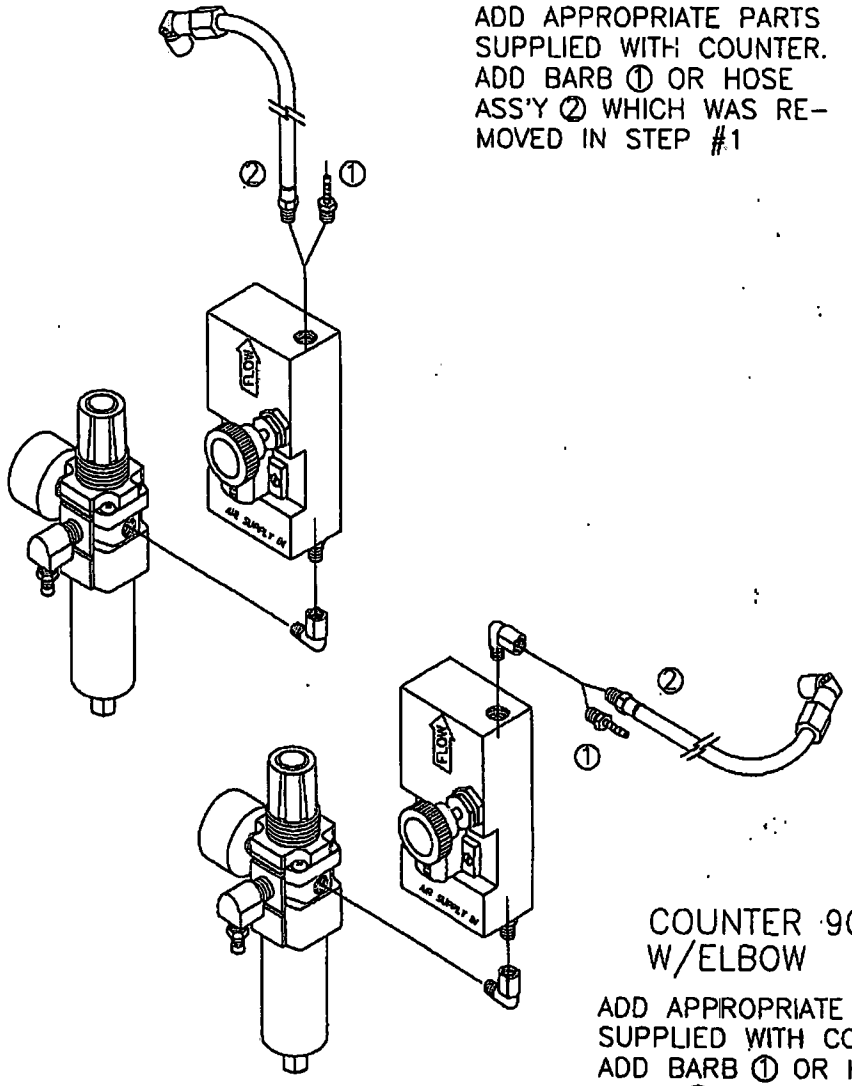
FILTER/REGULATOR
(AS SHIPPED FROM QED)

STEP #1
REMOVE BARB ①
OR HOSE ASS'Y ②

QED GroundWater Specialists
Ann Arbor, Michigan
1-800-624-2026

COUNTER 90°

ADD APPROPRIATE PARTS SUPPLIED WITH COUNTER. ADD BARB ① OR HOSE ASS'Y ② WHICH WAS RE-MOVED IN STEP #1



COUNTER 90° W/ELBOW

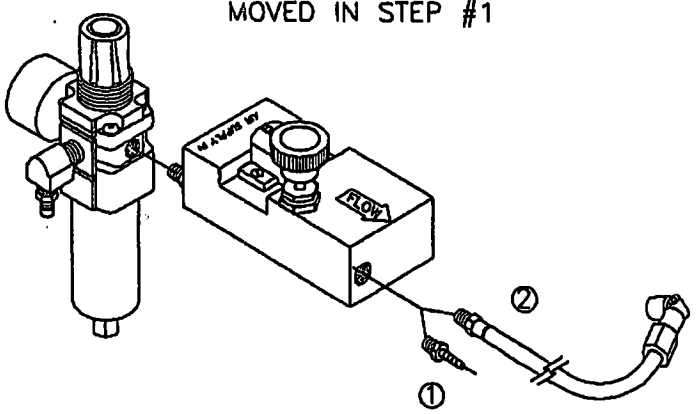
ADD APPROPRIATE PARTS SUPPLIED WITH COUNTER. ADD BARB ① OR HOSE ASS'Y ② WHICH WAS RE-MOVED IN STEP #1

8-1-92 95038 REV B

R 001904

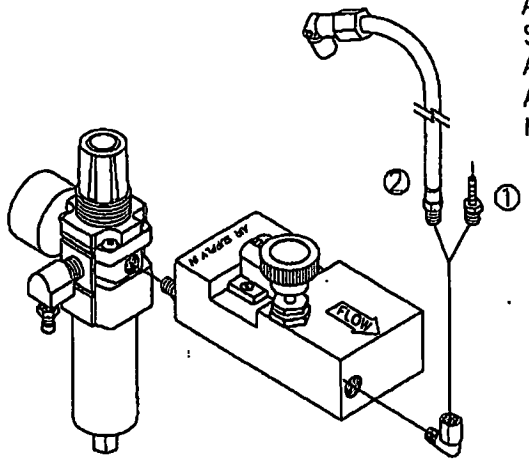
COUNTER INLINE

ADD APPROPRIATE PARTS SUPPLIED WITH COUNTER. ADD BARB ① OR HOSE ASS'Y ② WHICH WAS RE-MOVED IN STEP #1



COUNTER INLINE W/ELBOW

ADD APPROPRIATE PARTS SUPPLIED WITH COUNTER. ADD BARB ① OR HOSE ASS'Y ② WHICH WAS RE-MOVED IN STEP #1



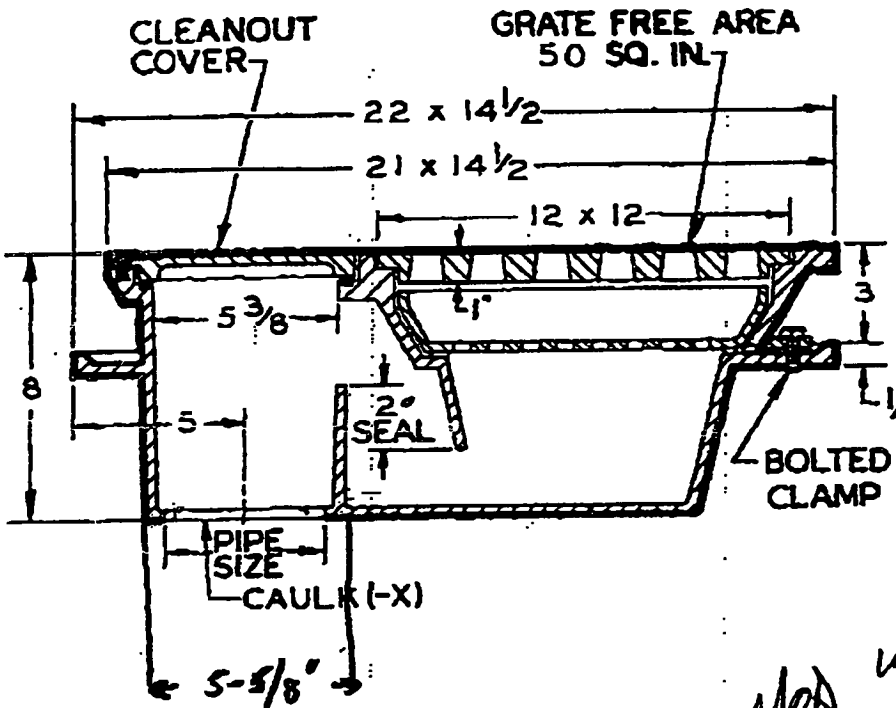
Appendix B.4

Josam Trap Information

SPECIFICATION: . JOSAM 38930 SERIES COATED CAST IRON COMBINATION FLOOR DRAIN AND INTEGRAL TRAP WITH DOUBLE DRAINAGE FLANGE, WEEPHOLES, BOTTOM OUTLET, 21" X 14-1/2" TOP, HEAVY-DUTY LOOSE-SET GRATE, REMOVABLE SHALLOW SEDIMENT BUCKET AND FLUSH-WITH-FLOOR CLEANOUT.

FLOOR DRAINS
TRAP, GRATE AND SEDIMENT BUCKET
SERIES 38930

FORMERLY 6190



38933-T Mod w/5"

† AT EXTRA COST

TYPE	PIPE SIZE	WGT. LBS.
38933	3	120
38934	4	120

OPTIONS †

- † (-7) DUCTILE IRON GRATE
- † (-17) SECURED TOP OR GRATE
- † (-42) BOLTED FLASHING CLAMP DEVICE
- † (-92) ALL GALVANIZED (IRON PARTS)
- (-X) CAULK OUTLET

DRAWING NO. A-2623-K

JOSAM COMPANY
MICHIGAN CITY, IN 46360

SERIES 38930

Appendix B.5

Fiberglass Sump Information

AK Industries, Inc.
P.O. Box 640
Plymouth, IN. 46563-0640
Phone (219)-936-6022
Fax (800)-936-5811

INSTALLATION INSTRUCTIONS FOR AK INDUSTRIES BASINS

These installation instructions are for AK Industries, Inc. FRP Tanks to be used as sewage pump stations. O.S.H.A. and engineered specifications are to be observed during installation.

1. Excavate hole and place tanks on a concrete pad or 6" thick gravel base. Check the base to insure that it is level and smooth.

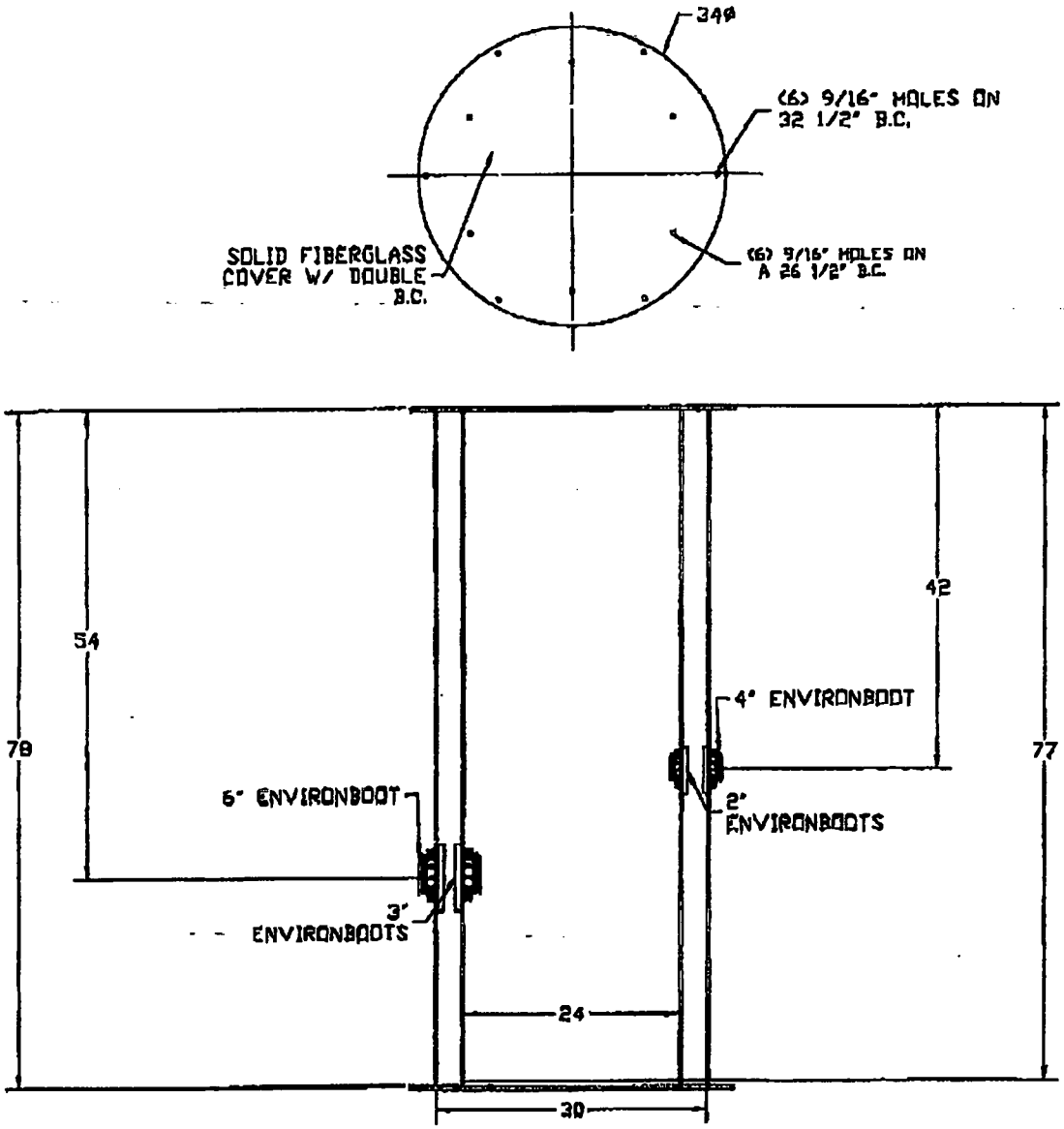
2. Basin may be anchored to the concrete base at the antiflotation flange when applicable. Concrete may be poured around basin bottom if required for ballast. Gravel or stone should be used as backfill material (Company recommendation is that basin be filled at least 1\2 full of water during backfill). Gravel to be free flowing, naturally-rounded aggregate with particular size of not less than 1 3" or more than 1\2" diameter. Material must meet ASTM C-33 requirements for quality and soundness. Backfill material is to be placed 4" to 6" around the entire periphery of the tank in the ground.

3. Backfill and compact in 12" lifts. Stop and connect piping as required.

CAUTION: IN FREEZING CONDITIONS, BACKFILL MUST BE DRY AND FREE OF ICE. DO NOT USE OTHER BACKFILL MATERIALS. IN AREAS WHERE THE SPECIFIED MATERIALS ARE NOT AVAILABLE, CONTACT AK INDUSTRIES, INC. WARRANTY IS AUTOMATICALLY VOIDED IF OTHER THAN APPROVED (ABOVE, BED AND BACKFILL MATERIALS ARE EMPLOYED WITHOUT WRITTEN APPROVAL BY AK INDUSTRIES, INC.).

NOTES:
1) BASIN DIAMETERS AND DEPTHS ARE INSIDE DIMENSIONS
2) BASIN COLOR IS GREEN
3) ALL DIMENSIONS ARE +/- 1/8"

AK INDUSTRIES, INC.
2085 PIDCO DR. BOX 640 PLYMOUTH, IN 46563



TO CUSTOMER:
EXAMINE THIS DRAWING CAREFULLY. VERIFY ALL DIMENSIONS, LOCATIONS, AND ELEVATIONS FOR ACCURACY. SIGN AND DATE AT LINE. ANY MODIFICATIONS OR CHANGES TO THIS DRAWING OR FINISHED PRODUCT, AFTER IT HAS BEEN SIGNED, MAY RESULT IN ADDITIONAL CHARGES AND SHIPPING DELAYS. NO JOB WILL BE STARTED UNTIL CONFORMATION THROUGH SIGNATURE.

Scott Endres 8-1-00
(REQUESTED SIGNATURE & DATE PER ABOVE)

CONFIRMATION THROUGH SIGNITURE RELEASES ORDER FOR PRODUCTION

DATE 8/1/00	JOB REF. QH2612	P.O.# --	DRAWN FOR COLUMBIA PIPE & SUPPLY
DRAWN A.DAVIS	SCALE NOT TO SCALE	SHEET 1 OF 1 ALL UNITS ARE IN INCHES	DESCRIPTION 30 X 78 & 24 X 77 BASIN / DISCONNECT DESIGN N/A

Appendix B.6

Air Compressor Information

SULLAIR®

INDUSTRIAL AIR COMPRESSOR LS–10

AIR–COOLED AND WATER–COOLED

25, 30 & 40 HP ←
18, 22 & 30 KW
STANDARD & 24 KT

OPERATOR'S MANUAL AND PARTS LIST

KEEP FOR FUTURE REFERENCE

Part Number 02250118–200
©Sullair Corporation

AIR CARE
SEMINAR TRAINING

Sullair Air Care Seminars are 3-day courses that provide hands-on instruction in the proper operation, maintenance and service of Sullair equipment. Individual seminars on Industrial compressors and compressor electrical systems are presented at regular intervals throughout the year at a dedicated training facility at Sullair's corporate headquarters in Michigan City, Indiana.

Instruction includes discussion of the function and installation of Sullair service parts, troubleshooting of the most common problems, and actual equipment operation. The seminars are recommended for maintenance and service personnel.

For detailed course outlines, schedule and cost information contact:

Sullair Corporate Training Department
1-888-SULLAIR or 219-879-5451 (ext. 5363)

- Or Write -

Sullair Corporation
3700 E. Michigan Blvd.
Michigan City, IN 46360
Attn: Service Training Department



OPERATOR IS REQUIRED TO READ ENTIRE INSTRUCTION MANUAL

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Section 1
SAFETY

1.1 GENERAL

Sullair Corporation and its subsidiaries design and manufacture all of their products so they can be operated safely. However, the responsibility for safe operation rests with those who use and maintain these products. The following safety precautions are offered as a guide which, if conscientiously followed, will minimize the possibility of accidents throughout the useful life of this equipment.

The compressor should be operated only by those who have been trained and delegated to do so, and who have read and understood this Operator's Manual. Failure to follow the instructions, procedures and safety precautions in this manual can result in accidents and injuries. Read this manual prior to startup.

NEVER start the compressor unless it is safe to do so. **DO NOT** attempt to operate the compressor with a known unsafe condition. Tag the compressor and render it inoperative by disconnecting and locking out all power at source or otherwise disabling its prime mover, so others who may not know of the unsafe condition, cannot attempt to operate it until the condition is corrected.

Install, use and operate the compressor only in full compliance with all pertinent regulations and all applicable Federal, State, and Local codes, standards and regulations.

DO NOT modify the compressor and/or controls in any way except with written factory approval.

While not specifically applicable to all types of compressors with all types of prime movers, most of the precautionary statements contained herein are applicable to most compressors and the concepts behind these statements are generally applicable to all compressors.

1.2 PERSONAL PROTECTIVE EQUIPMENT

Prior to installing or operating the compressor, owners, employers and users should become familiar with, and comply with, all applicable regulations and any applicable Federal, State and Local codes, standards, and regulations relative to personal protective equipment, such as eye and face protective equipment, respiratory protective equipment, equipment intended to protect the extremities, protective clothing, protective shields and barriers and electrical protective equipment, as well as noise exposure administrative and/or engineering controls and/or personal hearing protective equipment.

1.3 PRESSURE RELEASE

A. Install an appropriate flow-limiting valve between the service air outlet and the shut-off (throttle) valve, either at the compressor or at any other point along the air line, when an air hose exceeding 1/2" (13mm) inside diameter is to be connected to the shut-off (throttle) valve, to reduce pressure in case of hose failure, per all applicable Federal, State and Local codes, standards and regulations.

B. When the hose is to be used to supply a manifold, install an additional appropriate flow-limiting valve between the manifold and each air hose exceeding 1/2" (13mm) inside diameter that is to be connected to the manifold to reduce pressure in case of hose failure.

C. Provide an appropriate flow-limiting valve at the beginning of each additional 75 feet (23m) of hose in runs of air hose exceeding 1/2" (13mm) inside diameter to reduce pressure in case of hose failure.

D. Flow-limiting valves are listed by pipe size and rated CFM. Select appropriate valves accordingly, in accordance with their manufacturer's recommendations.

E. DO NOT use air tools that are rated below the maximum rating of the compressor. Select air tools, air hoses, pipes, valves, filters, and other fittings accordingly. **DO NOT** exceed manufacturer's rated safe operating pressures for these items.

F. Secure all hose connections by wire, chain or other suitable retaining devices to prevent tools or hose ends from being accidentally disconnected and expelled.

G. Open fluid filler cap only when compressor **is not running and is not pressurized.** Shut down the compressor and bleed the sump (receiver) to zero internal pressure before removing the cap.

H. Vent all internal pressure prior to opening any line, fitting, hose, valve, drain plug, connection or other component, such as filters and line oilers, and before attempting to refill optional air line anti-icer systems with antifreeze compound.

I. Keep personnel out of line with and away from the discharge opening of hoses or tools or other points of compressed air discharge.

J. Use air at pressures less than 30 psig (2.1 bar) for cleaning purposes, and then only with effective chip guarding and personal protective equipment.

K. DO NOT engage in horseplay with air hoses as death or serious injury may result.

L. DO NOT tamper with sump and unit (if provided) relief valves. Check the relief valve as recommended in the Maintenance Section of this manual or at a minimum of at least weekly to make sure it is not blocked, clogged, obstructed or otherwise disabled. **DO NOT** change the factory setting of the relief valve.

M. If the compressor is installed in an enclosed area, it is necessary to vent the relief valve to the outside of the structure or to an area of non-exposure.

Section 1
SAFETY

1.4 FIRE AND EXPLOSION

⚠WARNING

When installing a Base Load Transfer (BLT) System, remove jumpers between 16-17 & 18-19 (Dual Control Compressors) so the other compressor does not backfeed defeating the shutdown circuitry.

A. Clean up spills of lubricant or other combustible substances immediately, if such spills occur.

B. Shut off the compressor and allow it to cool. Then keep sparks, flames and other sources of ignition away and **DO NOT** permit smoking in the vicinity when checking or adding lubricant or when refilling air line anti-icer systems with antifreeze compound.

C. DO NOT permit fluids, including air line anti-icer system antifreeze compound or fluid film to accumulate on, under, or around acoustical material, or on any external surfaces of the air compressor or on internal surfaces of the enclosure. Wipe down using an aqueous industrial cleaner or steam-clean as required. If necessary, remove acoustical material, clean all surfaces and then replace acoustical material. Any acoustical material with a protective covering that has been torn or punctured should be replaced immediately to prevent accumulation of liquids or fluid film within the material. **DO NOT** use flammable solvents for cleaning purposes.

D. Disconnect and lock out all power at source prior to attempting any repairs or cleaning of the compressor or of the inside of the enclosure, if any.

E. Keep electrical wiring, including all terminals and pressure connectors in good condition. Replace any wiring that has cracked, cut abraded or otherwise degraded insulation, or terminals that are worn, discolored or corroded. Keep all terminals and pressure connectors clean and tight.

F. Keep grounded and/or conductive objects such as tools away from exposed live electrical parts such as terminals to avoid arcing which might serve as a source of ignition.

G. Remove any acoustical material or other material that may be damaged by heat or that may support combustion and is in close proximity, prior to attempting weld repairs.

H. Keep suitable fully charged fire extinguisher or extinguishers nearby when servicing and operating the compressor.

I. Keep oily rags, trash, leaves, litter or other combustibles out of and away from the compressor.

J. DO NOT operate the compressor without proper flow of cooling air or water or with inadequate flow of lubricant or with degraded lubricant.

K. DO NOT attempt to operate the compressor in any classification of hazardous environment unless the compressor has been specially designed and manufactured for that duty.

1.5 MOVING PARTS

A. Keep hands, arms and other parts of the body and also clothing away from couplings, fans and other moving parts.

B. DO NOT attempt to operate the compressor with the fan, coupling or other guards removed.

C. Wear snug-fitting clothing and confine long hair when working around this compressor, especially when exposed to hot or moving parts.

D. Keep access doors, if any, closed except when making repairs or adjustments.

E. Make sure all personnel are out of and/or clear of the compressor prior to attempting to start or operate it.

F. Disconnect and lock out all power at source and verify at the compressor that all circuits are de-energized to minimize the possibility of accidental start-up or operation, prior to attempting repairs or adjustments. This is especially important when compressors are remotely controlled.

G. Keep hands, feet, floors, controls and walking surfaces clean and free of fluid, water, or other liquids to minimize the possibility of slips and falls.

1.6 HOT SURFACES, SHARP EDGES AND SHARP CORNERS

A. Avoid bodily contact with hot fluid, hot coolant, hot surfaces and sharp edges and corners.

B. Keep all parts of the body away from all points of air discharge.

C. Wear personal protective equipment including gloves and head covering when working in, on or around the compressor.

D. Keep a first aid kit handy. Seek medical assistance promptly in case of injury. **DO NOT** ignore small cuts and burns as they may lead to infection.

1.7 TOXIC AND IRRITATING SUBSTANCES

A. DO NOT use air from this compressor for respiration (breathing) except in full compliance with any Federal, State or Local Codes or regulations.

⚠DANGER

Death or serious injury can result from inhaling compressed air without using proper safety equipment.

B. DO NOT use air line anti-icer systems in air lines supplying respirators or other breathing air utilization equipment and **DO NOT** discharge air from these systems in unventilated or other confined areas.

Section 1
SAFETY

C. Operate the compressor only in open or adequately ventilated areas.

D. Locate the compressor or provide a remote inlet so that it is not likely to ingest exhaust fumes or other toxic, noxious or corrosive fumes or substances.

E. Coolants and lubricants used in this compressor are typical of the industry. Care should be taken to avoid accidental ingestion and/or skin contact. In the event of ingestion, seek medical treatment promptly. Wash with soap and water in the event of skin contact. Consult the compressor operator's manual lubrication section for information pertaining to compressor fluid fill.

F. Wear goggles or a full face shield when adding antifreeze compound to air line anti-icer systems.

G. If air line anti-icer system antifreeze compound enters the eyes or if fumes irritate the eyes, they should be washed with large quantities of clean water for 15 minutes. A physician, preferably an eye specialist, should be contacted immediately.

H. **DO NOT** store air line anti-icer system antifreeze compound in confined areas.

I. The antifreeze compound used in air line antifreeze systems contains methanol and is toxic, harmful, or fatal if swallowed. Avoid contact with the skin or eyes and avoid breathing the fumes. If swallowed, induce vomiting by administering a tablespoon of salt, in each glass of clean, warm water until vomit is clear, then administer two teaspoons of baking soda in a glass of clean water. Have patient lay down and cover eyes to exclude light. Call a physician immediately.

1.8 ELECTRICAL SHOCK

A. This compressor should be installed and maintained in full compliance with all applicable Federal, State and Local codes, standards and regulations, including those of the National Electrical Code, and also including those relative to equipment grounding conductors, and only by personnel that are trained, qualified and delegated to do so.

B. Keep all parts of the body and any hand-held tools or other conductive objects away from exposed live parts of electrical system. Maintain dry footing, stand on insulating surfaces and **DO NOT** contact any other portion of the compressor when making adjustments or repairs to exposed live parts of the electrical system. Make all such adjustments or repairs with one hand only, so as to minimize the possibility of creating a current path through the heart.

C. Attempt repairs in clean, dry and well lighted and ventilated areas only.

D. **DO NOT** leave the compressor unattended with open electrical enclosures. If necessary to do so, then disconnect, lock out and tag all power at source so others will not inadvertently restore power.

E. Disconnect, lock out, and tag all power at source prior to attempting repairs or adjustments to rotating machinery and prior to handling any ungrounded conductors.

F. Dry test all shutdown circuits prior to starting the compressor after installation.

1.9 LIFTING

A. If the compressor is provided with a lifting bail, then lift by the bail provided. If no bail is provided, then lift by sling. Compressors to be air lifted by helicopter must not be supported by the lifting bail but by slings instead. In any event, lift and/or handle only in full compliance with Federal, State and Local codes.

B. Inspect points of attachment for cracked welds and for cracked, bent, corroded or otherwise degraded members and for loose bolts or nuts prior to lifting.

C. Make sure entire lifting, rigging and supporting structure has been inspected, is in good condition and has a rated capacity of at least the weight of the compressor. If you are unsure of the weight, then weigh compressor before lifting.

D. Make sure lifting hook has a functional safety latch or equivalent, and is fully engaged and latched on the bail or slings.

E. Use guide ropes or equivalent to prevent twisting or swinging of the compressor once it has been lifted clear of the ground.

F. **DO NOT** attempt to lift in high winds.

G. Keep all personnel out from under and away from the compressor whenever it is suspended.

H. Lift compressor no higher than necessary.

I. Keep lift operator in constant attendance whenever compressor is suspended.

J. Set compressor down only on a level surface capable of safely supporting at least its weight and its loading unit.

K. When moving compressors by forklift truck, utilize fork pockets if provided. Otherwise, utilize pallet if provided. If neither fork pockets or pallet are provided, then make sure compressor is secure and well balanced on forks before attempting to raise or transport it any significant distance.

L. Make sure forklift truck forks are fully engaged and tipped back prior to lifting or transporting the compressor.

M. Forklift no higher than necessary to clear obstacles at floor level and transport and corner at minimum practical speeds.

N. Make sure pallet-mounted compressors are firmly bolted or otherwise secured to the pallet prior to attempting to forklift or transport them. **NEVER** attempt to forklift a compressor that is not secured to its pallet, as uneven floors or sudden stops may cause the compressor to tumble off, possibly causing serious injury or property damage in the process.

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SAFETY

O. DO NOT use the lifting eye bolt on the compressor motor, if supplied, to lift the entire compressor package.

1.10 ENTRAPMENT

A. If the compressor enclosure is large enough to hold a person and if it is necessary to enter it to perform service adjustments, inform other personnel before doing so, or else secure and tag the acc door in the open position to avoid the possibility others closing and possibly latching the door with personnel inside.

B. Make sure all personnel are out of compressor before closing and latching enclosure doors.

Section 2
DESCRIPTION

2.1 INTRODUCTION

Your new Sullair flood-lubricated rotary screw air compressor will provide you with a unique experience in improved reliability and greatly reduced maintenance.

Compared to other types of compressors, the Sullair rotary screw is unique in mechanical reliability, with "no wear" and "no inspection" required of the working parts within the compressor unit.

Read Section 7 (Maintenance) to see how surprisingly easy it is to keep your air compressor in top operating condition.

2.2 DESCRIPTION OF COMPONENTS

Refer to Figures 2-1 and 2-2. The components and assemblies of the air compressor are clearly shown. The complete package includes **compressor, electric motor, starter, compressor inlet system, compressor discharge system, compressor lubrication and cooling system, capacity control system, instrument panel, aftercooler,** a **combination separator** and **trap,** all mounted on a heavy gauge steel frame.

On air-cooled models, a fan draws air over the motor and forces it out through the combined aftercooler and fluid cooler thereby removing the compression heat from the compressed air and the cooling fluid.

On water-cooled models, a shell and tube heat exchanger is mounted on the compressor frame. Fluid is piped into the heat exchanger where compression heat is removed from the fluid. Another similar heat exchanger cools the compressed air.

Both air-cooled and water-cooled versions have easily accessible items such as the fluid filters and control valves. The inlet air filter is also easily accessible for servicing.

2.3 SULLAIR COMPRESSOR UNIT, FUNCTIONAL DESCRIPTION

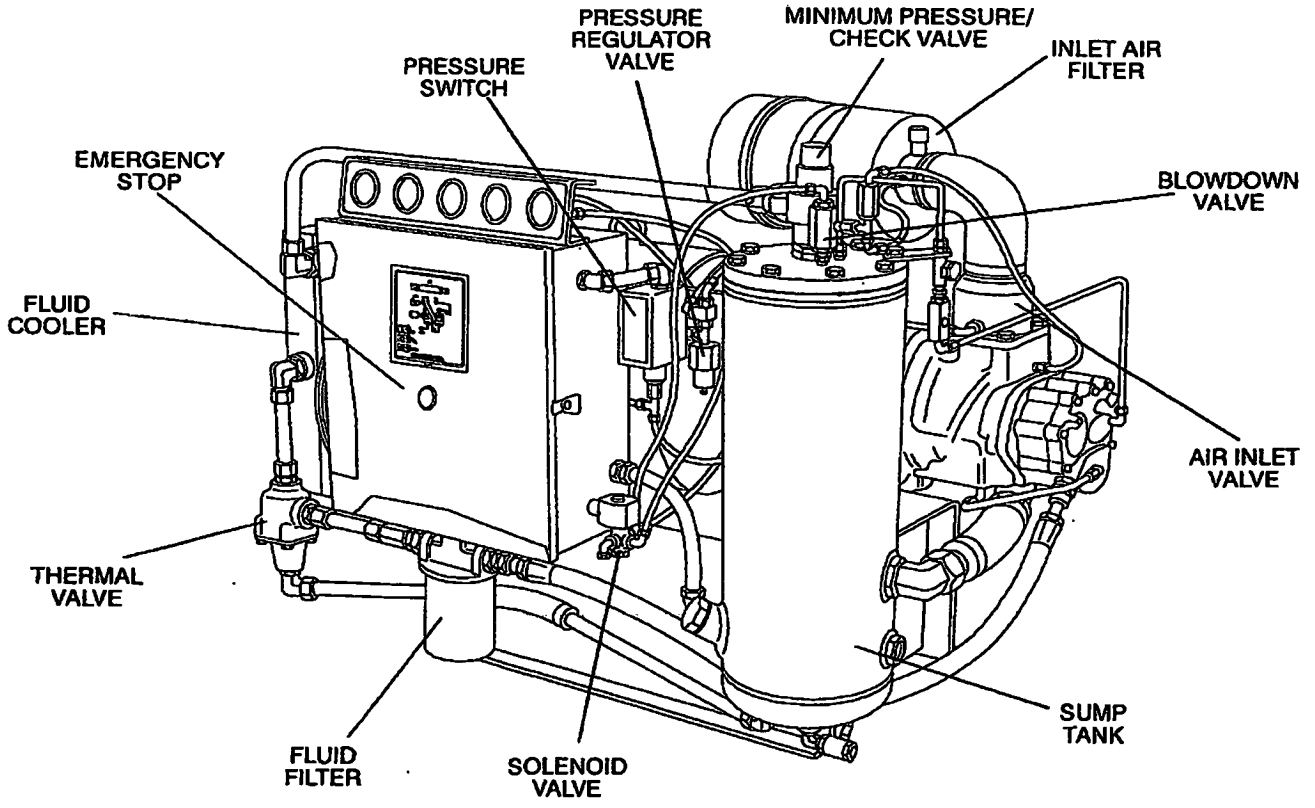
Sullair air compressors feature the Sullair compressor unit, a single-stage, positive displacement, flood lubricated-type compressor. This unit provides continuous compression to meet your needs.

NOTE

With a Sullair compressor, there is no maintenance or inspection of the internal parts of the compressor unit permitted in accordance with the terms of the warranty.

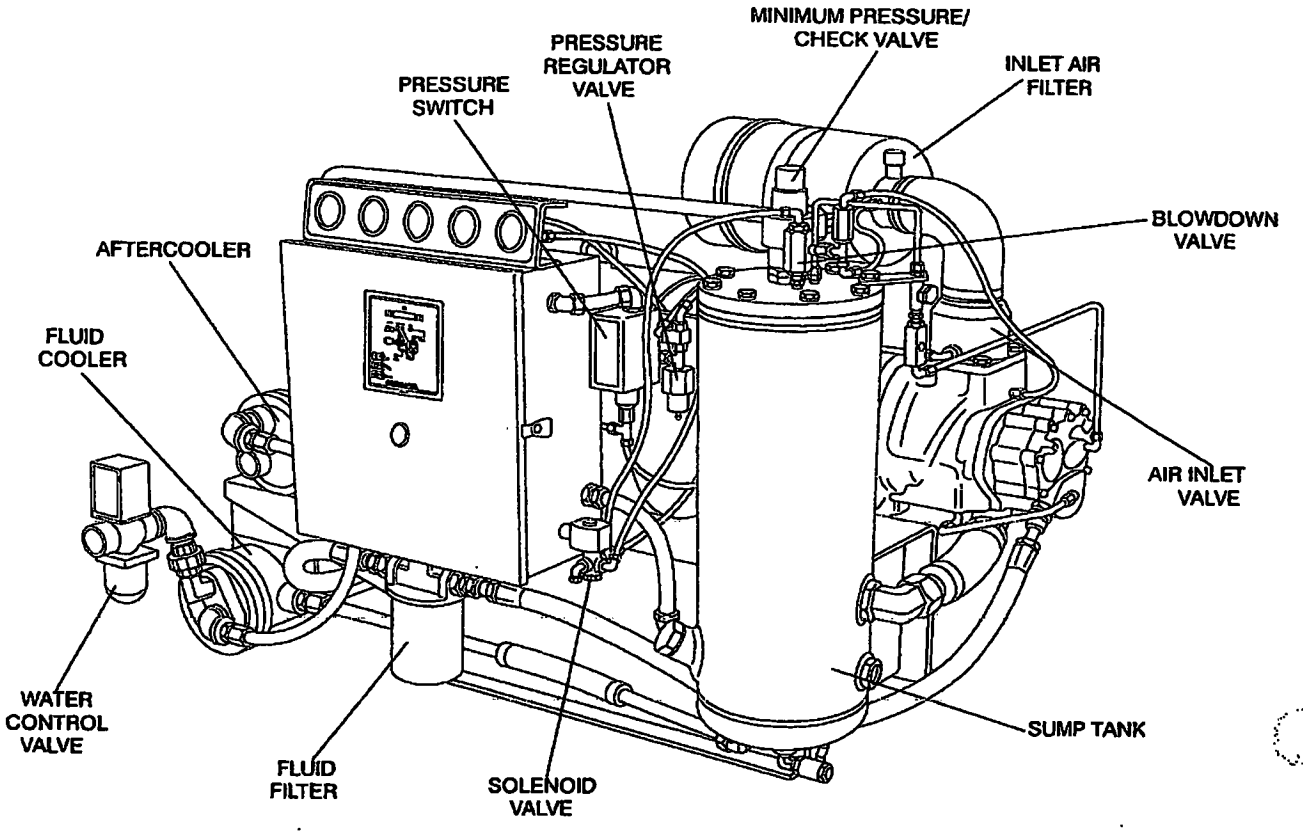
Sullair 24KT compressors are filled with a fluid which rarely needs to be changed. In the event a

Figure 2-1 Sullair Rotary Screw Air Compressor- Air-cooled Model



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DESCRIPTION

Figure 2-2 Sullair Rotary Screw Air Compressor- Water-cooled Model



change of fluid is required, use only Sullair 24KT fluid.

⚠ WARNING

Mixing of other lubricants within the compressor unit will void all warranties!

Sullair recommends that a 24KT sample be taken at the first filter change and sent to the factory for analysis. This is a free service. The sample kit with instructions and self-addressed container is to be supplied by your Sullair dealer at start-up. The user will receive an analysis report with recommendations.

Fluid is injected into the compressor unit in large quantities and mixes directly with the air as the rotors turn, compressing the air. The fluid flow has three basic functions:

1. As coolant, it controls the rise of air temperature normally associated with the heat of compression.
2. Seals the leakage paths between the rotors and the stator and also between the rotors themselves.
3. Acts as a lubricating film between the rotors allowing one rotor to directly drive the other, which is an idler.

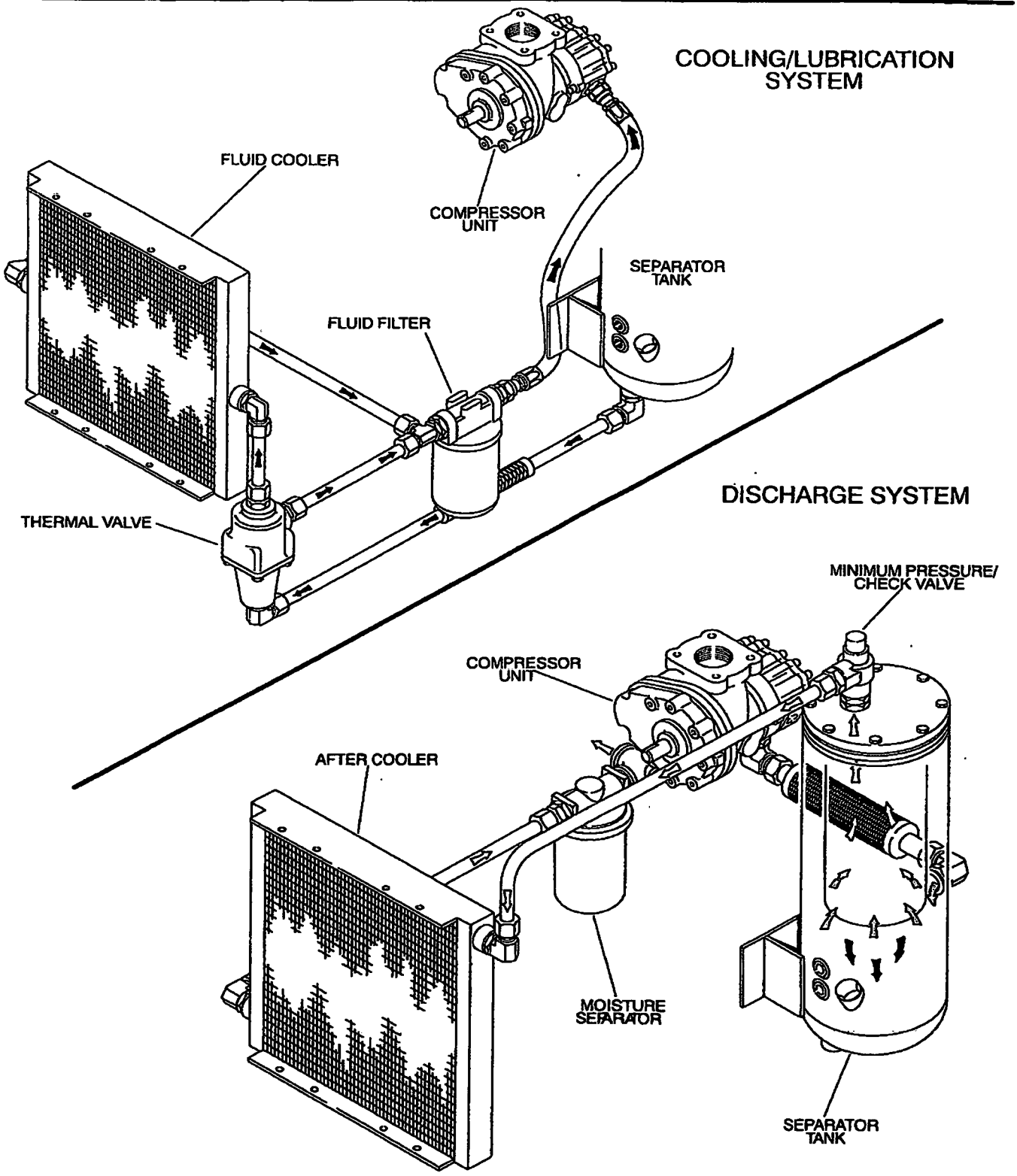
After the air/fluid mixture is discharged from the compressor unit, the fluid is separated from the air. At this time, the air flows through an aftercooler and separator then to your service line while the fluid is being cooled in preparation for reinjection.

2.4 COMPRESSOR COOLING AND LUBRICATION SYSTEM, FUNCTIONAL DESCRIPTION

Refer to Figures 2-3A and 2-3B. The Cooling and Lubrication System (air-cooled version) consists of a **fan, double shaft drive motor, radiator-type aftercooler** and **fluid cooler, full flow fluid filter, thermal valve,** and **interconnecting piping** and **tubing.** For water-cooled models, two **shell and tube heat exchangers** and a **water-flow regulating valve** are substituted for the radiator-type cooler listed above.

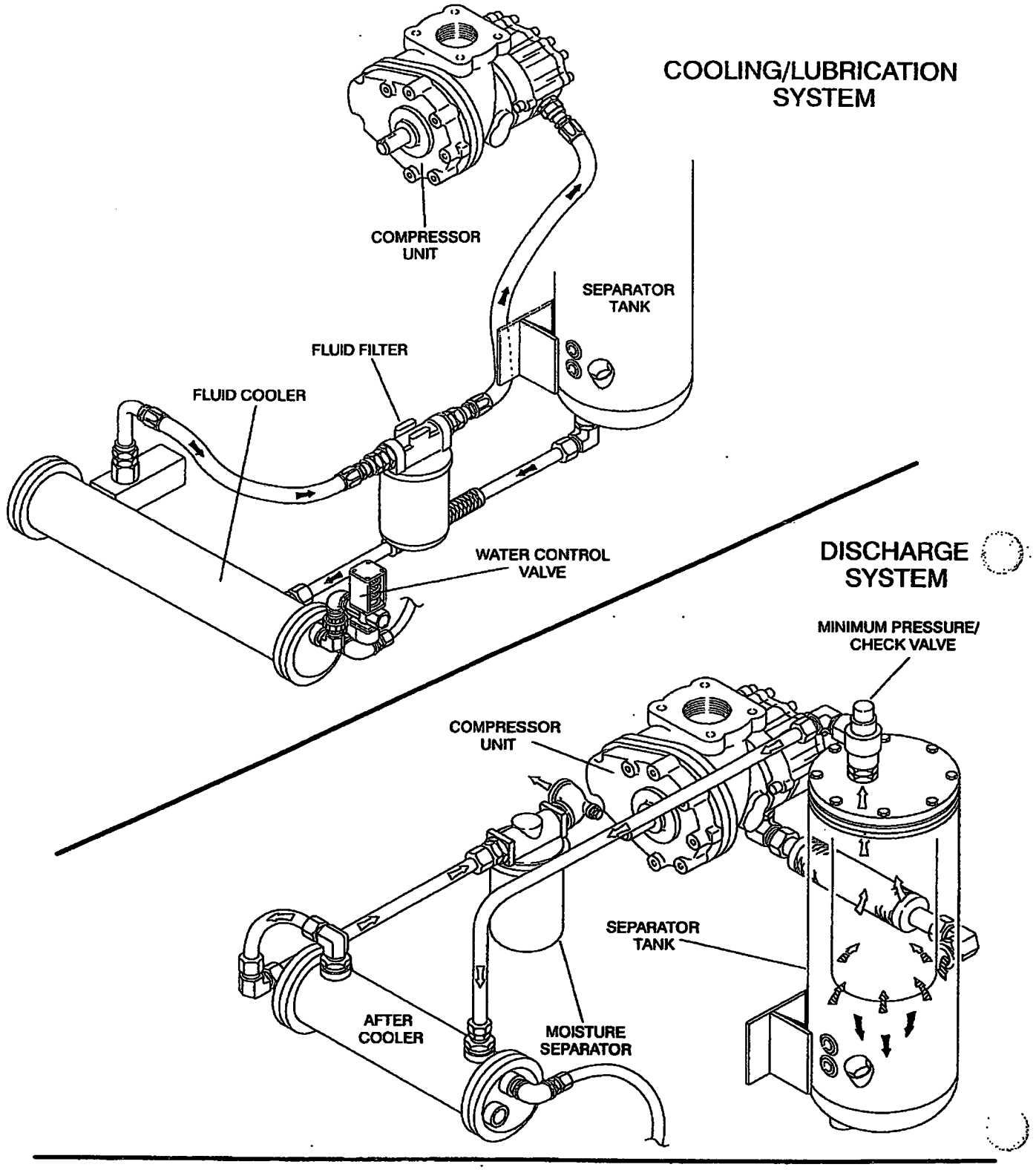
The pressure in the receiver/sump causes fluid flow by forcing the fluid from the high pressure area of the sump to an area of lower pressure in the compressor unit.

Figure 2-3A Compressor Fluid Cooling/Lubrication and Discharge System- Air-cooled Model



Section 2
DESCRIPTION

Figure 2-3B Compressor Fluid Cooling/Lubrication and Discharge System- Water-cooled Model



Section 2
DESCRIPTION

Fluid flows from the bottom of the receiver/sump to the thermal valve. The thermal valve is fully open when the fluid temperature is below 170°F (77°C). The fluid passes through the thermal valve, the main filter and directly to the compressor unit where it lubricates, cools and seals the rotors and the compression chamber.

As the discharge temperature rises above 170°F (77°C), due to the heat of compression, the thermal valve begins to close and a portion of the fluid then flows through the cooler. From the cooler the fluid flows to the main filter and then on to the compressor unit.

A portion of the fluid flowing to the compressor is routed to the anti-friction bearings which support the rotors inside the compressor unit. Prior to entering the compressor unit, this fluid is taken through the fluid filter, thus assuring properly filtered lubricant for bearing supply.

The fluid filter has a replacement element and an integral pressure bypass valve. A gauge on the instrument panel shows red when the filter needs servicing. This gauge has a pressure setting lower than that of the bypass valve. The gauge should be checked with compressor running at full system pressure.

Water-cooled versions of the compressor have a water-flow regulating valve (not shown) which operates to conserve water during periods of varying load on the compressor. This same valve automatically shuts off the water supply when the compressor is shut down. In addition, water-cooled models have a water pressure switch to prevent operation with inadequate water pressure.

2.5 COMPRESSOR DISCHARGE SYSTEM, FUNCTIONAL DESCRIPTION

Refer to Figures 2-3A and 2-3B. The compressor unit discharges the compressed air/fluid mixture into the combination receiver/sump.

The receiver has three basic functions:

1. It acts as a primary fluid separator.
2. Serves as the compressor fluid sump.
3. Houses the final fluid separator.

The compressed air/fluid mixture enters the receiver and is directed against the internal baffle. The direction of movement is changed and its velocity significantly reduced, thus causing large droplets of fluid to form and fall to the bottom of the receiver/sump. The fractional percentage of fluid remaining in the compressed air collects on the surface of the separator element as the compressed air flows through the separator. A return line (or scavenge tube) leads from the bottom of the separator element to the inlet region of the compressor unit. Fluid collecting on the bottom of the separator is returned to the compressor by a pressure differential between the receiver and the compressor inlet. A visual sight glass is located on the return line to observe this fluid flow. There is also an orifice in this return line (protected by a strainer) to assure proper flow. This separation will reduce the fluid carry-over to less than 2 ppm (parts per million). A gauge, located on the instrument panel, shows red if abnormal pressure drop through the separator develops. At this time, separator element replacement is necessary. This gauge must be checked with the compressor running fully loaded.

A minimum pressure/check valve, located downstream from the separator, assures a minimum receiver pressure of 55 psig (3.8 bar) during loaded conditions. This pressure is necessary for proper air/fluid separation and proper fluid circulation.

A terminal check valve is incorporated into the minimum pressure/check valve to prevent compressed air in the service line from bleeding back into the receiver on shutdown and during operation of the compressor in an unloaded condition.

A pressure relief valve (located on the wet side of the separator) is set to open if the sump pressure exceeds the sump tank rating. A temperature switch will shut down the compressor if the discharge temperature reaches 235°F (113°C).

⚠ WARNING

DO NOT remove caps, plugs, and/or other components when compressor is running or pressurized.

Stop compressor and relieve all internal pressure before doing so.

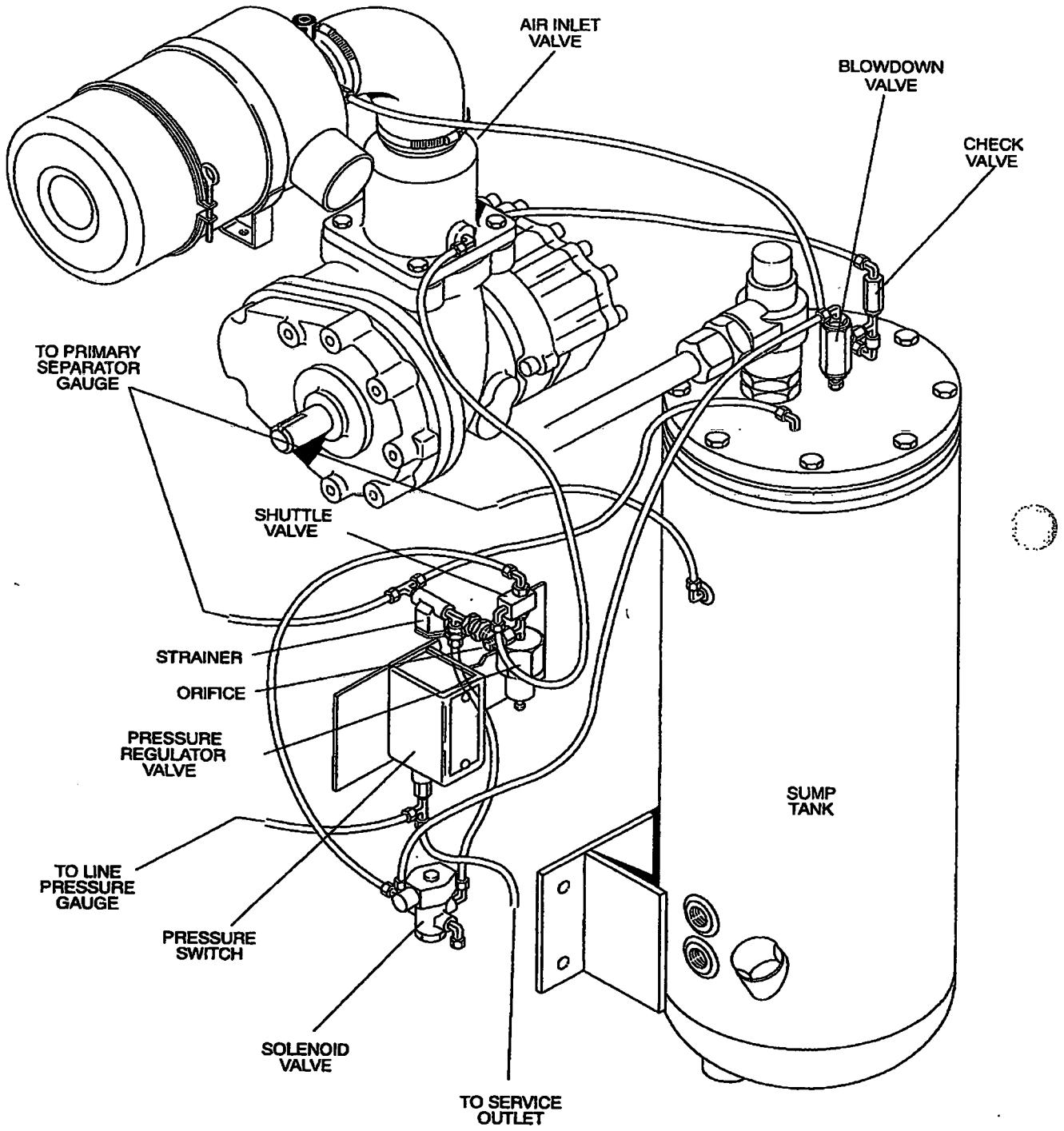
Fluid is added to the sump via a capped fluid filler opening, placed low on the tank to prevent overfilling of the sump. A sight glass enables the operator to visually monitor the sump fluid level.

2.6 CONTROL SYSTEM, FUNCTIONAL DESCRIPTION- STANDARD ELECTRO-MECHANICAL

Refer to Figure 2-4. The purpose of the compressor Control System is to regulate the compressor air intake to match the amount of compressed air being used. At approximately 10 psig (0.7 bar) air line over-pressure, the control system will automatically blow down the compressor and greatly reduce the unload power consumption. The Control System consists of an **inlet valve**, (located on the compressor air inlet), **blowdown valve, solenoid valve, pressure switch**, and a **pressure regulator**. The functional descriptions of the Control System are given below in four distinct phases of compressor operation. The following guidelines apply to all LS-10 Series compressors. For explanatory purposes this description will apply to a compressor with an operating pressure range of 115 to 125 psig (7.9 to 8.6 bar). A compressor with any other pressure range would operate in the same manner ex-

Section 2
DESCRIPTION

Figure 2-4 Control System



cepting stated pressures.

START - 0 TO 50 PSIG (0 TO 3.5 BAR)
When the compressor START button is depressed, the sump pressure will quickly rise from 0 to 50 psig (0 to 3.5 bar). During this period both the pressure regulator and the solenoid valve are closed, the inlet valve is fully open due to inlet air flow, and the compressor pumps at full rated capacity. The rising compressor air pressure is isolated from the service line in this phase by the minimum pressure valve, set at approximately 50 psig (3.5 bar).

NORMAL OPERATING MODE - 50 TO 115 PSIG (3.5 TO 7.9 BAR)
When the pressure air rises above 50 psig (3.5 bar), the minimum pressure/check valve opens and delivers compressed air to the service line. From this point on, the line air pressure is continually monitored by a line pressure gauge and a pressure switch usually set at 125 psig (8.6 bar). The pressure regulator and the solenoid valve remain closed during this phase. The inlet valve remains fully open for maximum capacity.

MODULATING MODE - 115 TO 125 PSIG (7.9 TO 8.6 BAR)
If less than the rated capacity of compressed air is being used, the service line pressure will rise above 115 psig (7.9 bar). The pressure regulator valve gradually opens, applying air pressure through the control line to the inlet valve piston. This causes the inlet valve to partially close reducing the amount of air entering the compressor until it matches the amount of air being used. The control system functions continually in this manner, between the limits of 115 to 125 psig (7.9 to 8.6 bar), in response to varying demands from the service line.

The pressure regulator has an orifice which vents a small amount of air to the atmosphere when the pressure regulator controls the inlet valve. The orifice also bleeds any accumulated moisture from the control lines.

UNLOAD - IN EXCESS OF 125 PSIG (8.6 BAR) LINE PRESSURE
When no air is being used,the service line pressure rises to the setting (cut-out pressure) of the pressure switch. the pressure switch opens, interrupting the electrical power to the solenoid valve. At this time, the solenoid valve allows dry sump tank air pressure or service air pressure through a shuttle valve to be applied directly to the inlet valve piston and keep it closed. Simultaneously, the solenoid valve sends a pneumatic signal to the blowdown valve. The blowdown valve opens the sump to the compressor intake reducing the sump pressure to approximately 25 to 27 psig (1.7to 1.9 bar). The check valve in the air service line pressure prevents line pressure from returning to the sump.

When the line pressure drops to the low setting (cut-in pressure) of the pressure switch (usually 115 psig [7.9 bar]), the pressure switch closes, re-energizing the 3-way solenoid valve and allowing the blowdown valve to close. The re-energized solenoid valve again prevents pressure from reaching the inlet valve. The inlet valve is fully open and the compressor delivers full rated capacity. Should the pressure begin to rise, the pressure regulator will resume its normal function as previously described.

To accommodate varied periods of time when there are not any air requirements, "Dual-Control" is utilized. This feature allows you to set the compressor in an automatic position whereby the compressor will shut down when no compressed air requirement is present and restart as compressed air is needed.

2.7 CONTROL SYSTEM, FUNCTIONAL DESCRIPTION- SUPERVISOR II

Refer to Figure 2-4. The purpose of the compressor Control System is to regulate the amount of air being compressed to match the amount of compressed air being used. The Capacity control system consists of a **solenoid valve, regulator valve** and an **inlet valve**. The functional description of the Control System is described below in four distinct phases of operation. The following description text applies to all LS-10 Series compressors with optional Supervisor II. For explanatory purposes, this description will apply to a compressor with an operating range of 100 to 110 psig (6.9 to 7.6 bar). A compressor with any other pressure range would operate in the same manner except stated pressures.

START MODE - 0 TO 50 PSIG (0 TO 3.5 BAR)
When the compressor **"I" (START)** pad is depressed, the sump pressure will quickly rise from 0 to 50 psig (0 - 3.4 bar). The compressor initially starts unloaded, then switches to full load when full rpm has been achieved. During this period, both the pressure regulator and the solenoid valve are closed, the inlet valve is fully open and the compressor pumps at full rated capacity. The rising compressor air pressure is isolated from the service line in this phase by the minimum pressure valve set at approximately 50 psig (3.4 bar).

FULL LOAD MODE - 50 TO 100 PSIG (3.4 TO 6.9 BAR)
When the compressed air pressure rises above 50 psig (3.4 bar), the minimum pressure valve opens allowing compressed air to flow into the service line. From this point on, the line air pressure is continually monitored by the Supervisor. The pressure regulator and the solenoid valve remain closed during this phase. The inlet valve is in the fully open position as long as the compressor is running at 100 psig (6.9 bar) or below.

MODULATING MODE - 100 TO 110 PSIG (6.9 TO 7.6 BAR)
If less than the rated capacity of compressed air is being used, the service line pressure will rise above 100 psig (6.9 bar). The pressure regulator valve gradually opens, directing air pressure to the inlet

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DESCRIPTION

control valve, reducing air entering the compressor until it matches the amount of air being used. The control system functions continually in this manner between the limits of 100 to 110 psig (6.9 to 7.6 bar) in response to varying demands from the service line.

The pressure regulator has an orifice which vents a small amount of air to the atmosphere when the pressure regulator controls the inlet control valve. The orifice also bleeds any accumulated moisture from the pressure regulator.

UNLOAD MODE - IN EXCESS OF 110 PSIG (7.6 BAR)

When a relatively small amount or no air is being used, the service line pressure continues to rise. When it exceeds 110 psig (7.6 bar), the Supervisor Control System de-energizes the solenoid valve allowing sump air pressure to be supplied directly to close the inlet valve. Simultaneously, the solenoid valve sends a pneumatic signal to the blowdown valve. The blowdown valve opens to the atmosphere, reducing the sump pressure to approximately 25 to 27 psig (1.7 to 1.9 bar). The check valve in the air service line prevents line pressure from returning to the sump.

When the line pressure drops to the low setting (cut-in pressure; usually 100 psig [6.9 bar] on low pressure ["L"] compressors and 115 psig [8.0 bar] on high pressure ["H"] compressors, 140 psig [9.7 bar] on ["HH"] compressors, 175 psig [12.0 bar] ["XH"]. Supervisor energizes the solenoid valve and allows the blowdown valve to close. The re-energized solenoid valve again prevents line pressure from reaching the inlet control valve. Should the pressure begin to rise, the pressure regulator will resume its normal function as previously described.

AUTOMATIC OPERATION

For applications with varied periods of time when there are no air requirements, Supervisor's AUTOMATIC mode allows the compressor to shutdown (time delayed) when no compressed air requirement is present and restart as compressed air is needed.

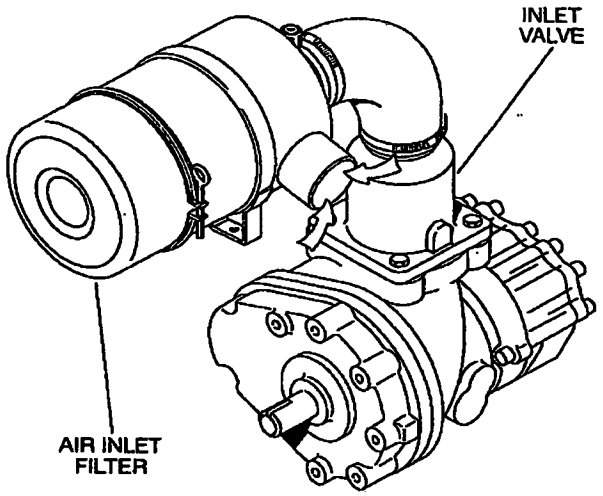
2.8 AIR INLET SYSTEM, FUNCTIONAL DESCRIPTION

Refer to Figure 2-5. The Compressor Inlet System consists of a **dry-type air filter**, a **restriction gauge** and an **air inlet valve**.

The restriction gauge (located on the instrument panel), indicates the condition of the air filter by showing red when filter maintenance is required.

The poppet-type modulating air inlet valve directly controls the amount of air intake to the compressor in response to the operation of the pressure regulator (see Modulating Mode, Section 2.6 [Standard Elector/Mechanical] or Section 2.7 [Optional Supervisor II]). The inlet valve also acts as a check valve, thus preventing reverse rotation when the compressor is shut down.

Figure 2-5 Air Inlet System



⚠ WARNING

"The Plastic Pipe Institute recommends against the use of thermoplastic pipe to transport compressed air or other compressed gases in exposed above ground locations, e.g. in exposed plant piping." (I)

Sullube should not be used with PVC piping systems. It may affect the bond at cemented joints. Certain other plastic materials may also be affected.

(I) Plastic Pipe Institute, Recommendation B, Adopted January 19, 1972.

2.9 INSTRUMENT PANEL GROUP, FUNCTIONAL DESCRIPTION- STANDARD ELECTRO-MECHANICAL CONTROLLER

The electro-mechanical controller responds to signals from traditional pressure switch sensors and provides **stop/start, common fault indication, sensor bypass timing, wye-delta transition timing,** and facilitates selectable **automatic restart** after power failure. Two-wire remote Stop/Start input is provided.

Refer to Figure 2-6 for specific location of parts described.

- The **sump pressure gauge** continually monitors the sump pressure at the various load and/or unload conditions.
- The **discharge temperature gauge** monitors the temperature of the air leaving the compressor unit. For both air-cooled and water-cooled compressors the normal reading is approximately 180°F to 205°F (82°C to 96°C).
- The **separator maintenance gauge** monitors condition of the separator element and shows in the

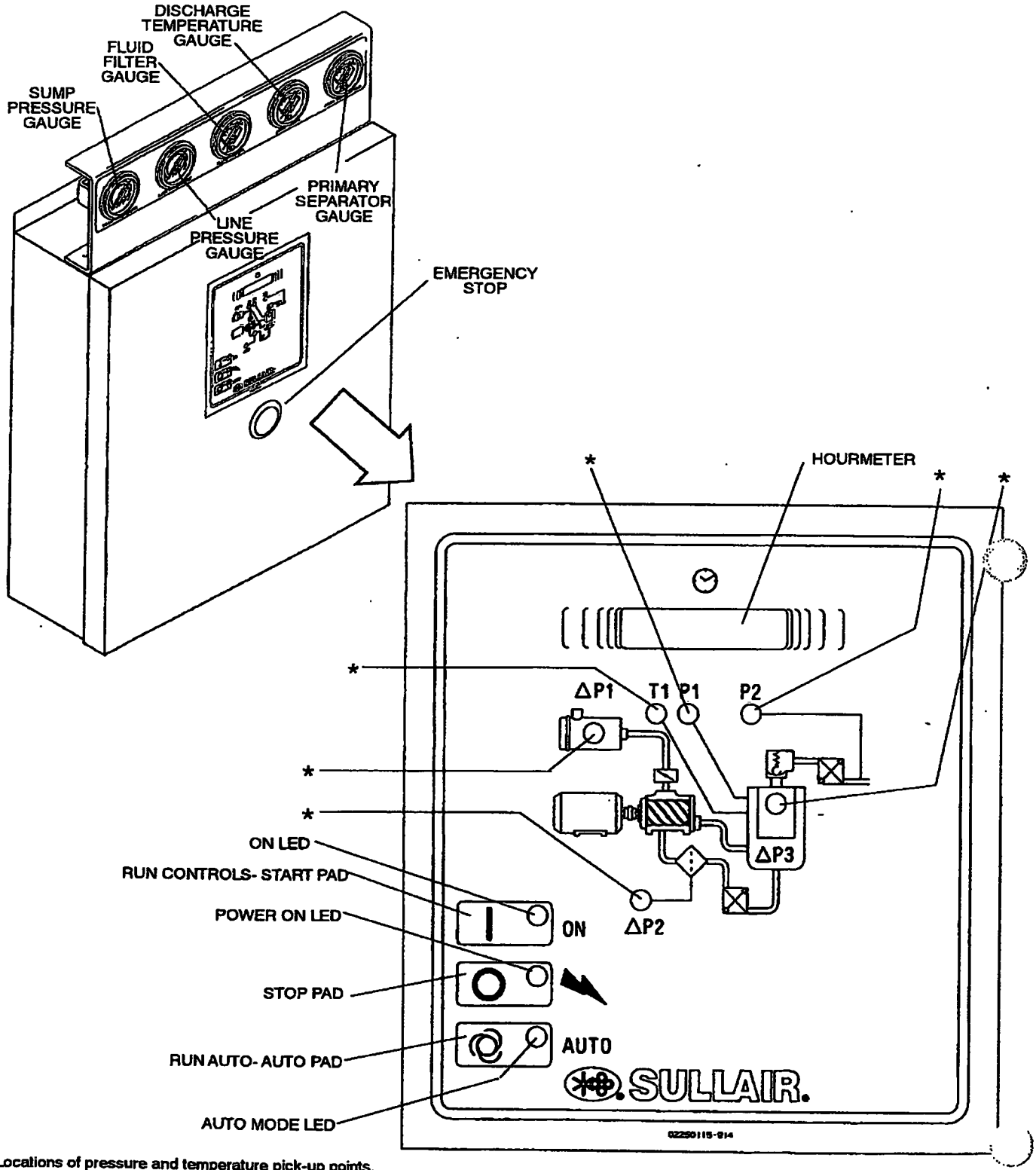
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DESCRIPTION

red zone when the element restriction is excessive.

- The **fluid filter maintenance gauge** monitors the condition of the bearing lube filter element and shows in the red zone when the element should be changed.
- The **START (I)** pad turns the compressor on.
- The **STOP (O)** pad turns the compressor off.
- The **hourmeter** records accumulative hours of operation for the compressor and is useful for planning and logging service operations.
- The **POWER ON** ( ) LED on the instrument panel indicates when power to the compressor is supplied.
- The **ON** LED indicates when the compressor is running.
- The **AUTO** ( ) pad is used to enable automatic control.

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DESCRIPTION

Figure 2-6 Instrument Panel Group and Controller Panel (Electro-Mechanical)



*Locations of pressure and temperature pick-up points.

Section 3
SPECIFICATIONS

1 TABLE OF SPECIFICATIONS

LS-10 SERIES 60 Hz MODEL	HP/KW	CAPACITY (ACFM/M³/MIN)	LENGTH (I) (IN/MM)	WIDTH (IN/MM)	HEIGHT(II) (IN/MM)	WEIGHT (LB/KG)	MOTOR ENCLOSURE
H	25/18	102/2.89	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
(115 psig/	30/22	113/3.20	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
8 bar)	40/30	152/4.30	57.0/1448	33.3/846	39.0/991	1140/2513	ODP
	40/30	151/4.28	62.5/1588	33.3/846	39.0/991	1165/2568	TEFC
HH	25/18	83/2.35	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
(140 psig/	30/22	100/2.83	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
19.7 bar)	40/30	142/4.02	57.0/1448	33.3/846	39.0/991	1140/2513	ODP
	40/30	142/4.02	62.5/1588	33.3/846	39.0/991	1165/2568	TEFC
XH	25/18	76/2.15	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
(175 psig/	30/22	90/2.55	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
12 bar)	40/30	119/3.37	57.0/1448	33.3/846	39.0/991	1140/2513	ODP
	40/30	119/3.37	62.5/1588	33.3/846	39.0/991	1165/2568	TEFC

LS-10 SERIES 50 Hz MODEL	HP/KW	CAPACITY (ACFM/M³/MIN)	LENGTH (I) (IN/MM)	WIDTH (IN/MM)	HEIGHT(II) (IN/MM)	WEIGHT (LB/KG)	MOTOR ENCLOSURE
H	25/18	93/2.63	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
(115 psig/	30/22	118/3.34	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
8 bar)	40/30	160/4.53	57.0/1448	33.3/846	39.0/991	1140/2513	ODP
	40/30	160/4.53	62.5/1588	33.3/846	39.0/991	1165/2568	TEFC
HH	25/18	82/2.32	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
(140 psig/	30/22	99/2.80	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
19.7 bar)	40/30	137/3.88	57.0/1448	33.3/846	39.0/991	1140/2513	ODP
	40/30	137/3.88	62.5/1588	33.3/846	39.0/991	1165/2568	TEFC
XH	25/18	73/2.07	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
(175 psig/	30/22	90/2.55	57.0/1448	33.3/846	39.0/991	1015/2238	ODP/TEFC
12 bar)	40/30	115/3.26	57.0/1448	33.3/846	39.0/991	1140/2513	ODP
	40/30	115/3.26	62.5/1588	33.3/846	39.0/991	1165/2568	TEFC

ENCLOSURE						
25-30 HP/ 18-22 KW	-	60.0/1524	36.0/914	42.0/1067	(III)	ODP/TEFC
40 HP/30 KW (ODP)	-	60.0/1524	36.0/914	42.0/1067	(III)	ODP
40 HP/30 KW (TEFC)	-	64.5/1638	36.0/914	42.0/1067	(III)	TEFC

(I) For water-cooled (open) model, add 1.5 in/ 38mm to length, and 1 in/ 25 mm to height.
(II) An additional length of 4 in./102mm is needed for servicing the separator; 9 in./229mm for enclosure models.
(III) Add 250 lbs/ 113.4 kgs for the enclosure to the total package weight.

Section 3
SPECIFICATIONS

COMPRESSOR:	**STANDARD MODELS**
Type:	Rotary Screw
Standard Operating Pressure (IV):	100 psig (6.9bar) (L) 140 psig (9.7 bar) (HH) 115 psig (7.9bar) (H) (XH) 175 psig (12 bar) (XH)
Bearing Type:	Anti-Friction
Ambient Temperature (Max.) (V):	105°F (41°C)
Cooling:	Pressurized Fluid
Compressor Fluid:	Sullair Sullube
Sump Capacity:	3.5 U.S. gallons (14.8 liters)
Control:	Electro-Pneumatic Supervisor II (optional)
MOTOR (VI):	**STANDARD MODELS**
Size:	25, 30 and 40HP
Type:	C-Flanged, Open Dripproof, Premium Efficiency Three Phase, 230/460 60 Hz, 380/415 50 Hz 40°C Maximum Ambient Temperature Options Available: 200V and 575V T.E.F.C. Also Available: IP54
Starter:	Full Voltage Magnetic or Wye Delta Options Available: 200V and 575V
Speed:	60 Hz: 1770 RPM 50 Hz: 1475 RPM 40HP: 3000 RPM

(IV) Special compressors are available for operation at higher pressures.
(V) Special compressors are available for operation in higher ambient temperature.
(VI) Multi-frequency and voltage motors are used. The compressors must be used only with the specified electrical frequency and voltage.

3.2 LUBRICATION GUIDE

For best value and longest uninterrupted service, the LS-10 Series compressors are factory filled and tested with a long life lubricant.

⚠ WARNING

Mixing of other lubricants within the compressor unit will void all warranties!

If, due to availability or other reasons, other fluids are required, follow Lubrication Guide 3.4 below.

⚠ WARNING

"The Plastic Pipe Institute recommends against the use of thermoplastic pipe to transport compressed air or other compressed gases in exposed above ground locations, e.g. in exposed plant piping." (I)

Sullube should not be used with PVC piping systems. It may affect the bond at cemented joints. Certain other plastic materials may also be affected.

(I) Plastic Pipe Institute, Recommendation B, Adopted January 19, 1972.

Maintenance of all other components is still recommended as indicated in the Operator's Manual.

For light-duty high-humidity service where condensed moisture and emulsification (mayonnaise) may occur, the fluid change interval must be reduced to 300 hours maximum. A non-detergent fluid with rust, oxidation and foam inhibitors and good water separation characteristics should be used.

DO NOT MIX DIFFERENT TYPES OF FLUIDS. Contamination of non-detergent mineral fluids with traces of detergent motor fluids may lead to operational problems such as foaming, filter plugging, orifice or line plugging.

NOTE

Flush system when switching lubricant brands.

When ambient conditions exceed those noted or if conditions warrant use of "extended" life lubricants contact Sullair for recommendation.

3.3 APPLICATION GUIDE

Sullair encourages the user to participate in a fluid analysis program with the fluid suppliers. This could result in a fluid change interval differing from that stated in the manual. Contact your Sullair dealer for details.

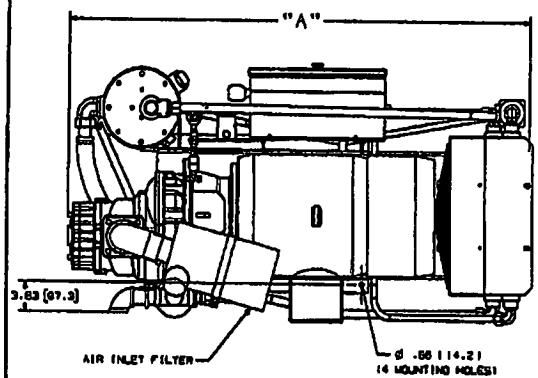
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SPECIFICATIONS

3.4 LUBRICATION CHANGE RECOMMENDATIONS AND MAINTENANCE

LUBRICANT	FLUID CHANGE	FLUID FILTER CHANGE	SEPARATOR CHANGE
Sullube	A, E	G, C	A, D
Sullair LLL-4-F	A, E	G, C	A, D
SRF 1/4000	B, E	G, C	B, D
24KT	F, E	G, C	A, D
Sullair CP-4600-32-F	B, E	G, C	B, D

A - 8,000 Hours or once a year.
B - 4,000 Hours or more frequently if conditions so require.
C - When measured pressure loss exceeds 20 psig (1.3 bar).
D - When measured pressure loss exceeds 10 psig (0.7 bar).
E - When required by fluid analysis or known contamination.
F - Does not require replacement during normal service conditions.
G - Every 1000 hours.

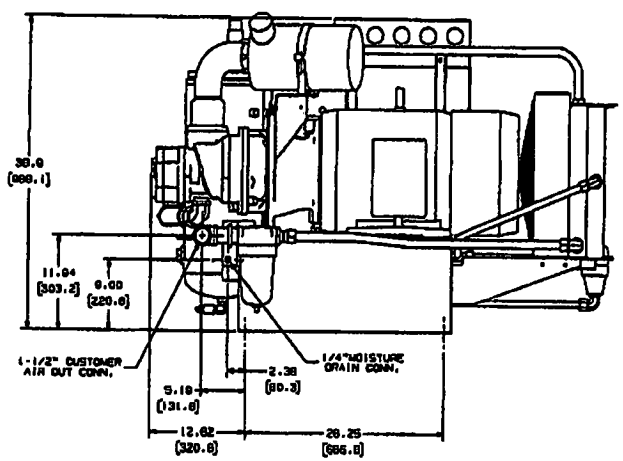
Figure 3-1 Identification- Air-cooled Models

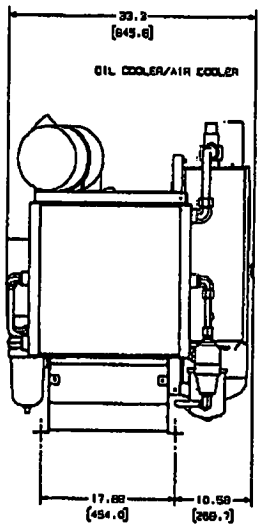


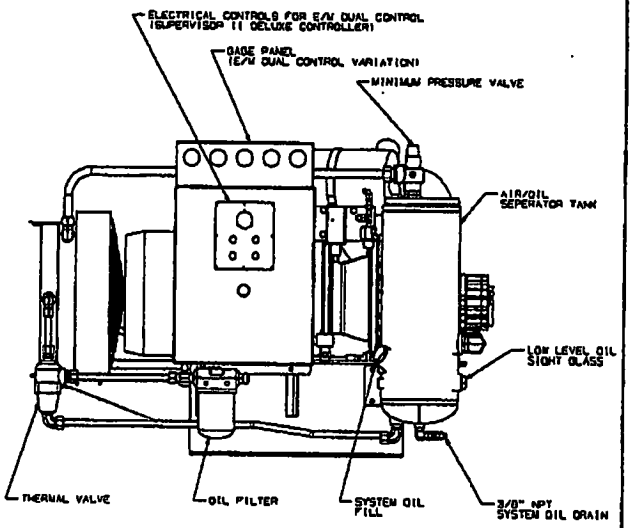
NOTES:

1. PHYSICAL DIMENSIONS ARE IN INCHES [MILLIMETERS].
2. ALL DIMENSION TOLERANCES: ±0.50" [13mm].
3. ALLOW 36" [915mm] MINIMUM CLEARANCE ALL AROUND MACHINE FOR ACCESS AND FREE CIRCULATION OF AIR.
4. A FOUNDATION CAPABLE OF SUPPORTING THE WEIGHT OF THE PACKAGE, AND RIGID ENOUGH TO MAINTAIN THE COMPRESSOR FRAME LEVEL IS REQUIRED. THE COMPRESSOR FRAME MUST BE LEVELED AND SECURED WITH FOUNDATION BOLTS, AND FULL UNIFORM CONTACT MUST BE MAINTAINED BETWEEN FRAME AND FOUNDATION. NO PIPING LOADS SHALL BE TRANSMITTED AT THE EXTERNAL CONNECTIONS.

MODEL	"A"	* COOLING FAN AIR FLOW	O/C+AC *sc
LS-10-25	57.0 [1448.0]	60HZ 2400 CFM [4248 M3/H] 50HZ 2082 CFM [3540 M3/H]	75 °C 90 °C
LS-10-30	57.0 [1448.0]	60HZ 2500 CFM [4250 M3/H] 50HZ 2800 CFM [4800 M3/H]	75 °C 70 °C
LS-10-40 (TDP MTR ENCL)	57.0 [1448.0]	60HZ 2500 CFM [5950 M3/H] 50HZ 3500 CFM [5950 M3/H]	75 °C 90 °C
LS-10-40 (TEFC MTR ENCL)	62.6 [1587.5]	60HZ 2500 CFM [5950 M3/H] 50HZ 3500 CFM [5950 M3/H]	75 °C 90 °C

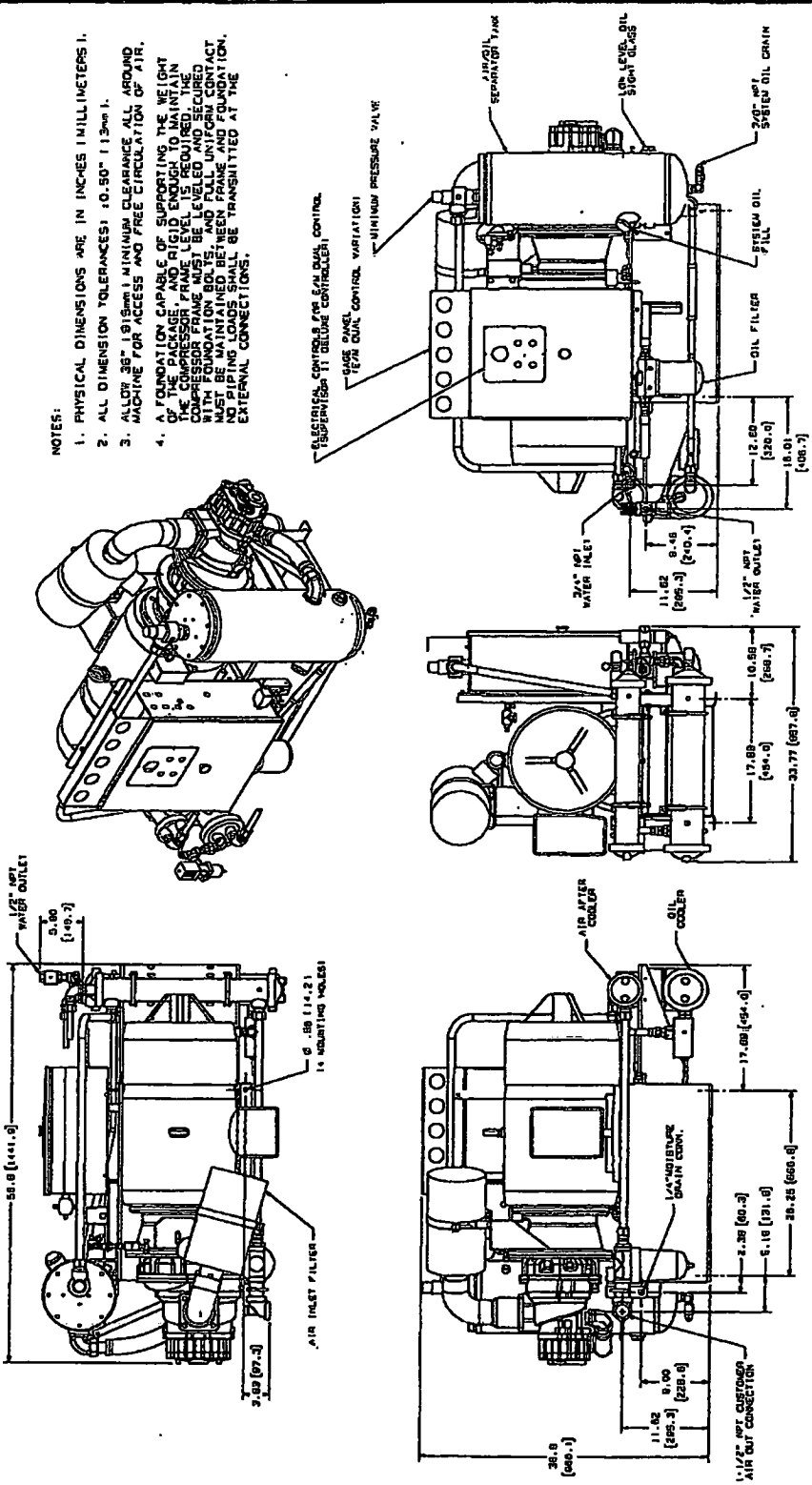






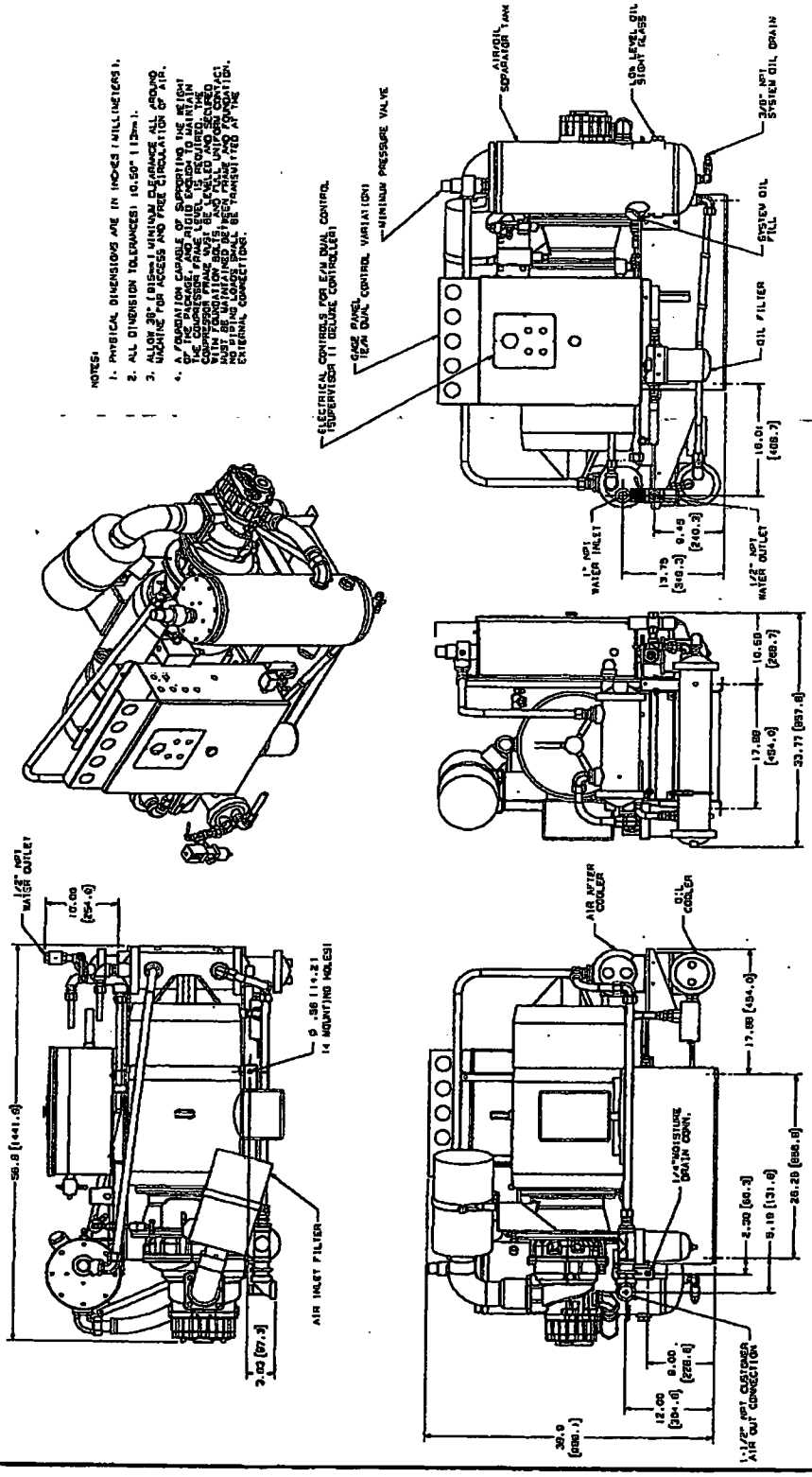
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Figure 3-2A Identification- Water-cooled 25-30HP/ 18-22KW Models



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SPECIFICATIONS

Figure 3-2B Identification- Water-cooled 40HP/ 30KW Model



Section 4
INSTALLATION

4.1 MOUNTING OF COMPRESSOR

A foundation or mounting capable of supporting the weight of the compressor, and rigid enough to maintain the compressor frame level and the compressor in alignment is required. The compressor frame must be leveled and secured with foundation bolts, and full uniform contact must be maintained between the frame and foundation. No piping loads shall be transmitted to the compressor at the external connections.

4.2 VENTILATION AND COOLING

For air-cooled compressors, select a location to permit sufficient unobstructed air flowing in and out to the compressor to keep the operating temperature stable. The minimum distance that the compressor should be from surrounding walls is three (3) feet (1m). To prevent excessive ambient temperature rise, it is imperative to provide adequate ventilation.

For water-cooled compressors, it is necessary to check the cooling water supply. The water system must be capable of supplying the flows shown in Table 1-Water Supply Requirements (Water-cooled), and must be maintained at all times. These figures apply to a compressor running at full load with an aftercooler. For cooler water or a partially loaded compressor, slightly less water is required. However, for hotter water the flow requirements are significantly greater.

Table 2-Ventilation Requirements indicates the ventilation requirements necessary to keep the compressor running at a normal operating temperature. The fan air requirement is the volume of air which must flow through the compressor for proper ventilation. The specified heat rejection requirement is the amount of heat that is radiated by the compressor. This heat must be removed to assure a normal operating temperature. With air-cooled compressors it is possible to use this heat for space heating, providing no additional pressure drop is created across the fan. Consult a Sullair office for assistance in utilizing this heat.

DO NOT install a water-cooled or an air-cooled/aftercooled compressor where it will be exposed to temperatures less than 32°F(0°C).

4.3 SERVICE AIR PIPING

Service air piping should be installed as shown in Figure 4-1. A shut-off valve should be installed to isolate the compressor from the service line if required. Also notice that the service line should be equipped with water legs and condensate drains throughout the system.

⚠ WARNING

"The Plastic Pipe Institute recommends against the use of thermoplastic pipe to transport compressed air or other compressed gases in exposed above ground locations, e.g. in exposed plant piping." (I)

Sullube should not be used with PVC piping systems. It may affect the bond at cemented joints. Certain other plastic materials may also be affected.

(I) Plastic Pipe Institute, Recommendation B, Adopted January 19, 1972.

TABLE 1-WATER SUPPLY REQUIREMENTS (WATER-COOLED)

WATER TEMP.	WATER FLOW (I) GPM/ LPM		
0°F/ °C	25HP/ 18KW	30HP/ 22KW	40HP/ 30KW
70/ 21	3.75/ 14.2	4.50 /17.0	5.75/ 21.8
80/ 26.6	5.00/ 18.9	6.00/ 22.7	7.50 /28.4

(I) Water pressure should be between 25 and 75 psig/ 1.7 and 5.2 bar.

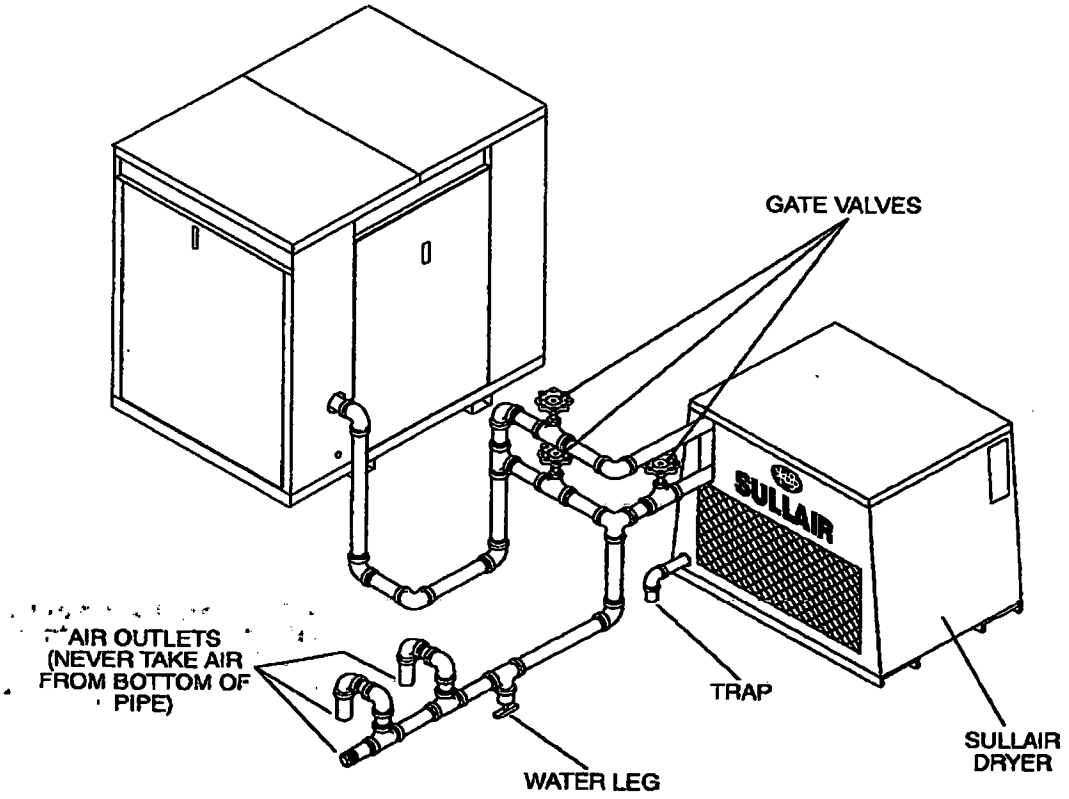
TABLE 2-VENTILATION REQUIREMENTS (I)

Cooling Type	*Air-cooled with Aftercooler*			*Water-cooled*		
Motor HP/KW	25/18	30/22	40/30	25/18	30/22	30/40
Fan Air CFM M^3/Hr (II)	2500/4250	2500/4250	3500/5950	720/1220	720/1220	720/1220
Ventilating Air/ Heat Rejection BTU/Hour KCal/Hour	76980/ 19500	88800/ 22500	118320/ 29900	8500/ 2150	10000/ 2550	13000 3300
Cooling Water/ Heat Rejection BTU/Hour Kcal/Hour				76980/ 19500	88800/ 22500	118320/ 29900

(I) Values based on: 100% RH, 85°F/ 29°C Ambient
(II) Applies to compressor with canopy only (vent fan).

Section 4
INSTALLATION

Figure 4-1 Service Air Piping with Aftercooler and Optional Air Dryer (Typical)



4.4 COUPLING ALIGNMENT CHECK
No coupling alignment is required.

4.5 FLUID LEVEL CHECK
The air compressor is also supplied with the proper amount of fluid. However, it is necessary to check the fluid level at installation. The level is checked by looking at the sight glass located near the sump. If the sump is properly filled, fluid should be visible in the sight glass. The maximum fluid level is the level of the filler port.

4.6 ELECTRICAL PREPARATION- STANDARD ELECTRO-MECHANICAL
Interior electrical wiring is performed at the factory. Required customer wiring is minimal, but should be done by a qualified electrician in compliance with OSHA, National Electrical Code, and/or any other applicable State, Federal and local electrical codes concerning isolation switches, fused disconnects, etc. Sullair provides a wiring diagram for use by the installer.

NOTE

Customer must provide electrical supply power disconnect within sight of machine.

A few electrical checks should be made to help assure that the first start-up will be trouble-free.

⚠ WARNING

Lethal shock hazard inside. Disconnect all power at source before opening or servicing.

1. Check incoming voltage. Be sure that compressor is wired for the correct incoming voltage.
2. Check starter for correct size, proper overload relay, and heaters.
3. Check all electrical connections for tightness.
4. "DRY RUN" the electrical controls by disconnecting the three (3) motor leads from the starter. Energize the control circuits by pressing the "I" pad, and check all protective devices to be sure tha' they will de-energize the starter coil whe tripped.

Section 4
INSTALLATION

5. Reconnect the motor leads and jog the motor for a direction of rotation check as explained in Section 4.8.

NOTE

Wiring diagram for standard compressors is supplied on the inside cover of the Control Center. Optional compressor wiring diagrams will vary.

4.7 ELECTRICAL PREPARATION- SUPERVISOR II

Interior electrical wiring is performed at the factory. Required customer wiring is minimal, but should be done by a qualified electrician in compliance with OSHA, National Electric Code and/or any applicable local electrical code concerning isolation switches, fused disconnects, etc. Sullair provides a wiring diagram for use by the installer.

An electrical check should be made to help assure that the first start-up will be trouble-free.

⚠ DANGER

Lethal shock hazard inside. Disconnect all power at source, before opening or servicing.

1. Check incoming voltage. Be sure that the incoming voltage is the same voltage that the compressor was wired for.
2. Check starter and overload heater sizes.
3. Check all electrical connections for tightness.
4. "DRY RUN" the electrical controls by disconnecting the three (3) motor leads from the starter. Energize the control circuits by pushing the **"I" (START) pad** and check all protective devices to be sure that they will de-energize the starter coil when tripped.
5. Reconnect the three (3) motor leads and jog the motor for a direction of rotation check, as explained in Section 4.9.

4.8 MOTOR ROTATION DIRECTION CHECK

NOTE

Motor rotation check must be made at compressor start-up. Remove compressor panel as needed to view motor rotation.

After the electrical wiring has been done, it is necessary to check the direction of the motor rotation.

Pull out the **EMERGENCY STOP** button and press once, quickly and in succession, the **"I" (START)** and **"O" (STOP)** pads. This action will bump start the motor for a very short time. When looking at the motor from the end opposite the compressor unit, the shaft should be turning clockwise. If the reversed rotation is noted, disconnect the power to the starter and exchange any two of the three power input leads, then re-check rotation. A "Direction of Rotation" decal is located on the motor to show proper motor/compressor rotation.

An alternative to this procedure is to set the Supervisor to display P1. Pull out the **EMERGENCY STOP** button and press once, quickly and in succession, the **"I" (START)** and **"O" (STOP)** pads. This action will bump start the motor for a very short time. If motor rotation is correct there will be immediate pressure shown. If no pressure is present, reverse rotation is occurring. Disconnect the power to the starter and exchange any two of the three power input leads. Recheck rotation as outlined above.

NOTES

Section 5

OPERATION- ELECTRO-MECHANICAL

5.1 GENERAL

While Sullair has built into this compressor a comprehensive array of controls and indicators to assure you that it is operating properly, you will want to recognize and interpret the reading which will call for service or indicate the beginning of a malfunction. Before starting your Sullair compressor, read this section thoroughly and familiarize yourself with the controls and indicators – their purpose, location and use.

5.2 PURPOSE OF CONTROLS-STANDARD ELECTRO-MECHANICAL

CONTROL OR INDICATOR	PURPOSE
EMERGENCY STOP SWITCH	Pushing in this switch, found adjacent to the controller, cuts all AC outputs from the latter and de-energizes the starter. A fault message (E STOP) is displayed by the Supervisor until the button is pulled out and the "O" pad is depressed.
START "I" PAD	Depress to turn the compressor ON.
STOP "O" PAD	Depress to turn the compressor OFF and reset the common fault circuit.
AUTO " ⟲ " PAD	To select between continuos (HAND) operation and automatic stop/start (AUTO) operation. Shuts off compressor automatically after the compressor runs unloaded for a specified time (ranging from 3-60 minutes [T1]). Restarts compressor when the pressure switch trips to the reload setting. Dual control is enabled by pressing the "AUTO" pad.
HOURMETER	Records cumulative hours of compressor operation; useful for planning and logging service schedules.
LINE PRESSURE GAUGE	Continually monitors service line air pressure. It is located on dry side of receiver downstream from check valve.
SUMP PRESSURE GAUGE	Continually monitors receiver/sump pressure at various load and/or unloaded conditions.
DISCHARGE TEMPERATURE GAUGE	Monitors temperature of the air leaving the compressor unit. For both air and water-cooled compressors, the normal reading should be approximately 180°F to 205°F (82°C to 96°C).
AIR FILTER RESTRICTION GAUGE	Indicates when the air filter element change is required. The gauge shows the red zone when drop through the filter is excessive. The compressor must be running full load for an accurate indication.
FLUID FILTER MAINTENANCE GAUGE	Indicates when a fluid filter element change is required. It shows red when the pressure drop through the filter is excessive.
SEPARATOR MAINTENANCE GAUGE	Indicates when separator element change is required. Shows red when the pressure drop through the filter is excessive. The compressor must be running full load for an accurate indication.
POWER ON (↖) LED	Indicates when the starter is receiving power.
ON LED	Indicates when compressor is in operation.
AUTO LED	Indicates when compressor is in auto mode.

Section 5

OPERATION- ELECTRO-MECHANICAL

5.2 PURPOSE OF CONTROLS-STANDARD ELECTRO-MECHANICAL (CONTINUED)

CONTROL OR INDICATOR	PURPOSE
FLUID LEVEL SIGHT GLASS	Monitors fluid level in the sump. The fluid must be visible in the glass. Check the level when the compressor is shut down. Maximum fill level is the level of the fill port, minimizing the risk of overfilling.
SEPARATOR RETURN LINE SIGHT GLASS	Used to indicate fluid flow in the return line. When the compressor is running at full load, fluid flow should be visible in this sight glass. There may be little or no flow when the compressor is running unloaded, but a sluggish flow at full load indicates a need to clean the return line strainer.
THERMAL VALVE	Regulates flow of fluid to and around the cooler. It is designed to maintain a minimum operating temperature of 180°F (82°C); use for fast warm-up on start-up.
MINIMUM PRESSURE/CHECK VALVE	Maintains minimum of 55 psig (3.8 bar) in the compressor sump. Valve piston restricts receiver air discharge from receiver/sump when pressure falls to 55 psig (3.8 bar). Also prevents backflow into the sump during unload conditions and after shutdown.
COMPRESSOR DISCHARGE TEMPERATURE SWITCH	Designed to shut the compressor down when the discharge temperature reaches 235°F (113°C).
WATER PRESSURE SWITCH (water-cooled compressors only)	It prevents operation when water pressure of compressor is inadequate.
PRESSURE RELIEF VALVE	Opens sump pressure to the atmosphere should pressure inside the sump become too high. Operation of this valve indicates that the high pressure switch is either faulty or out of adjustment.
MODULATING INLET VALVE	Regulates the amount of air allowed to enter the air compressor. This regulation is determined by the amount of air being used at the service line. Also acts as a check valve to prevent reverse compressor rotation at shut down.
PRESSURE REGULATOR	Allows a pressure signal to reach the air inlet valve to control air delivery according to demand.
SOLENOID VALVE	Bypasses the pressure regulator valve causing the inlet valve to close when the compressor reaches maximum operating pressure. Also activates blow-down valve.
PRESSURE SWITCH	Senses service line pressure. When line pressure reaches maximum setting the pressure switch signals the pilot valves to unload the compressor.
BLOWDOWN VALVE	Vents sump pressure to the atmosphere during unload conditions and shutdown.
WATER REGULATING VALVE (water-cooled only)	Regulates the amount of cooling water used to keep the compressor running at a normal operating temperature.
T1 (AUTOMATIC STOP TIMER)	Adjustable from three (3) to 60 minutes. Located on rear of the controller.

Section 5
OPERATION- ELECTRO-MECHANICAL

5.2 PURPOSE OF CONTROLS-STANDARD ELECTRO-MECHANICAL (CONTINUED)

CONTROL OR INDICATOR	PURPOSE
T2 (BYPASS TIMER)	Adjustable from zero (0) to 16 seconds. Used to bypass the water pressure switch on startup. Set to zero (0) for no function. Located on rear of controller.
T3 (STAR-DELTA TIMER)	Adjustable from zero (0) to 16 seconds. Transition timer for Wye-delta start. Located on rear of controller.
SW1 (POWER FAILURE RESTART ON/OFF CONTROL	With switch set to ON, machine will start after power recovery in the run mode selected prior to power failure as long as start permissives allow. Located on rear of controller.

5.3 INITIAL START-UP PROCEDURE- STANDARD ELECTRO-MECHANICAL

The following procedure should be used to make the initial start-up of the compressor:

1. Read the preceding pages of this manual thoroughly.
2. Be sure that all preparations and checks described in the Installation Section have been made.
3. Crack open the shut off valve to the service line.
4. Start the compressor by pressing the START "I" pad.
5. Check for possible leaks in piping.
6. Slowly close the shut-off valve and check that the setting on the pressure switch is set correctly. If set correctly, the compressor will unload at the desired unload pressure. If adjustments are necessary, see Control System Adjustment in the Maintenance Section 7.7 of this manual.
7. Observe the operating temperature. If the operating temperature exceeds 205°F (96°C), the cooling system or installation environment should be checked.
8. Observe return line sight glass and maintenance indicators.
9. Open shut-off valve to service line.
10. Reinspect the compressor for temperature and leaks the following day.

5.4 SUBSEQUENT START-UP PROCEDURE- STANDARD ELECTRO-MECHANICAL

On subsequent start-ups, check that fluid level is visible in the fluid sight glass and simply press the START pad. When the compressor is running, observe the instrument panel and maintenance indicators.

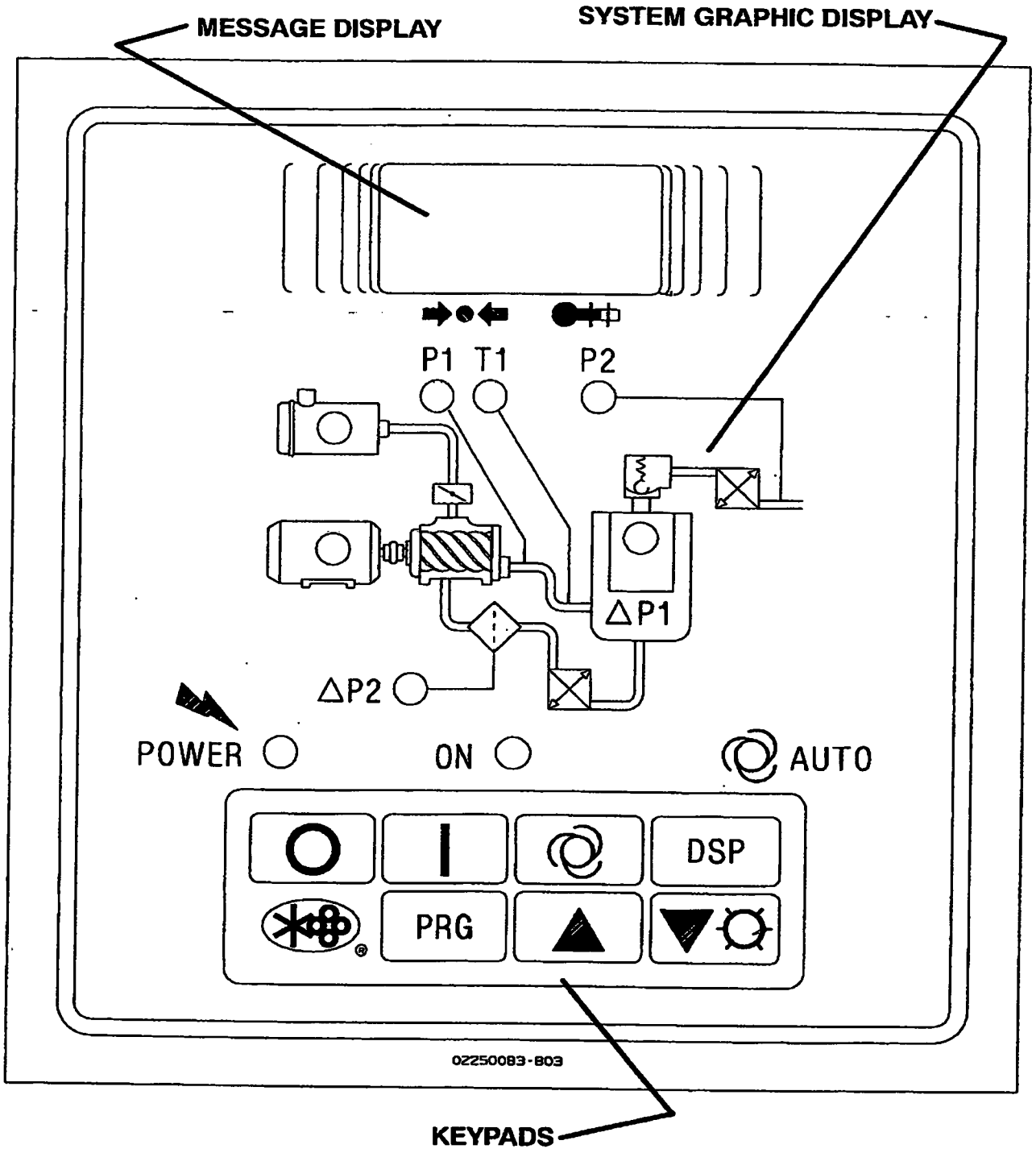
5.5 SHUTDOWN PROCEDURE- STANDARD ELECTRO-MECHANICAL

To shut the compressor down, simply press the STOP "O" pad.

Section 6

OPERATION- SUPERVISOR II

Figure 6-1 Supervisor II Panel



Section 6
OPERATION- SUPERVISOR II

6.1 INTRODUCTION

Refer to Figure 6-1 for information regarding your compressor with Supervisor II. The Supervisor II has a two line display to show temperature, pressure and status. It has a keypad for operating the compressor, programming the control points and selecting displays. There is a graphic illustration with lamps that light to show the item being displayed. The lamps flash if that component is in an alarm condition.

6.2 KEYPAD

The keypad is used to control the machine as well as display status and change setpoints. Refer to figure 6-1 for following key descriptions.

- **Stop** - Used to put the machine into manual stop. It is also used to clear alarm conditions.



- **Continuous** - Starts machine if no alarm conditions are present. Also used to clear alarm conditions while machine is running.



- **Auto** - Starts machine and selects auto mode if no alarm conditions are present. Also used to clear alarm conditions while machine is running.



- **Display** - Used to display pressures, temperatures and other status information (See section on STATUS DISPLAYS).



- **Logo** - Used for various functions described in later sections.



- **Program** - Used to enter the parameter change mode where control parameters may be displayed and changed (See PARAMETER SETUP).



- **Up arrow** - Used in status displays to change displays and in parameter setup mode to increment a value.



- **Down arrow, lamp test** - Used in status displays to change displays and in parameter setup mode to increment a value. When in the default display the key will light all the lamps for three seconds.



6.3 STATUS DISPLAYS

By default the line pressure (P2) and discharge temperature (T1) are shown on the bottom line of the display, and machine status on the top line.
The following are the various machine status messages that indicate the state of the compressor with LCD graphics listed below:

- **STOP** - Compressor is off.
- **STANDBY** - Compressor is off but armed to start. This state may be entered because of a power up, or the unload timer had expired and stopped the machine. NOTE : The machine may start at any time.
- **STARTING** - Machine is trying to start.
- **OFF LOAD** - Machine is running and off loaded.
- **ON LOAD** - Machine is running and loaded.
- **FULL LD** - Machine is running and fully loaded. This state is only displayed if the machine has a full load valve and under sequence control.
- **RMT STOP** - Compressor is off but armed to start. The machine will start when the remote start contact is closed. NOTE : the machine may start at any time.
- **SEQ STOP** - Compressor is off but armed to start. The machine will start when the sequencing conditions meet the criteria to start. NOTE : the machine may start at any time.

This default display appears as follows:

If there are alarms active they will alternately be shown with the default display. The machine status will be displayed for two seconds, then the alarms

Section 6
OPERATION- SUPERVISOR II

STOP 110 180

for two seconds each. For example:

T1 HI 110 180

To view other status press the DSP key. All temperatures and pressures may be displayed as well as other status information. To scroll through the displays press the up arrow or down arrow keys. Up arrow moves to the next display, down arrow the previous display. To return to the default display press the display key.

- Separator differential pressure and the maximum limit. If the limit is exceeded, a separator maintenance warning will be displayed.

ΔP1 4 MAX 10

- Sump pressure and line pressure.

P1 113 P2 108

- Pressure after (P3) oil filter.

P3 108

- Oil differential pressure and the minimum limit. If the pressure goes below the limit a P3 LOW shutdown will occur. Oil differential (dP3) is defined as P3-P1/2

dP3 40 MIN 1

- Unit discharge temperature and the maximum limit. If the temperature exceeds the limit a T1 HI shutdown will occur.

T1 210 MAX 235

- Total hours that the compressor has been running.

HRS RUN 001234.0

- Total hours that the compressor has been loaded.

HRS LOAD 000987.0

- Last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @1 234

- Next to last fault log. This shows the fault on the first line and the run hours when the fault occurred.

T1 HI @2 204

6.4 LAMP INDICATORS

Embedded into the front panel schematic of the compressor are several lamps. Pressing the lamp test key will light all the lamps for three seconds. Each LED lamp has the following purpose.

P1 - If lit steady, signifies that P1 is being displayed; if flashing denotes the presence of an alarm.

P2 - If lit steady, signifies that P2 is being displayed; if flashing denotes the presence of an alarm.

ΔP1 - If lit steady, signifies that ΔP1 is being displayed; if flashing denotes replacement of separator is needed.

ΔP2 - If lit, indicates replacement of fluid filter is needed.

T1 - If lit steady, signifies that T1 is being displayed; if flashing denotes the presence of an alarm.

INLET FILTER - Same as ΔP2.

MOTOR - If flashing, indicates the motor overload contact has opened.

POWER ON - Lit if 120VAC power is applied to the Supervisor II.

ON - If lit steady, the compressor is running. If flashing, indicates that the compressor is armed but stopped because of restart timer not expired, remote stop or sequence stop. The compressor may start at any time.

AUTO - If lit steady, the compressor is running and in auto mode. If flashing, indicates that the compressor is armed but stopped because of restart time not expired, remote stop or sequence stop. The compressor may start at any time.

Section 6
OPERATION- SUPERVISOR II

6.5 OPERATION INTRODUCTION

While Sullair has built into this compressor a comprehensive array of controls and indicators to assure you that it is operating properly, you will want to recognize and interpret the readings which will call for service or indicate the beginning of a malfunction. Before starting your Sullair compressor, read this section thoroughly and familiarize yourself with the controls and indicators - their purpose, location and use.

6.6 SUPERVISOR II PARAMETER SETUP

Pressing the program key enters parameter display and edit mode. To move to the next parameter press the program key. To increment a parameter press the up arrow key or logo key. The logo key will increment by 10. To decrement the value press the down arrow key.

The parameters are displayed in the following order:

- **Unload pressure** - The pressure where the machine is unloaded. For example if this parameter is set to 110 psi (7.6 bar) the machine will unload when the line pressure is above 110 psi (7.6 bar).

UNLOAD 100 PSI

- **Load differential** - The pressure differential below the unload pressure where the machine is loaded. For example, if the unload pressure is set to 110 psi (7.6 bar) and the load differential is set to 10 psi (0.7 bar), the machine will load when the line pressure goes below 100 psi (6.9 bar).

LOAD 10 PSI

- **P1 Max** - Maximum sump pressure. An alarm and shut down will occur when the sump pressure rises above this pressure.

P1 MAX 135 PSI

- **Wye to delta transition timer** - For full voltage starters this parameter is set to 0.

WYE DELT 10 SEC

- **Restart time** - Time to wait after power up before starting machine. This parameter is used to keep several machines from starting at the same time after power up, or to delay start until other equipment is started. If disabled the machine will not automatically start after power up.

RST TIME 10 SEC

- **Unload Stop Timer** - If the machine is running in AUTO mode, this parameter specifies the amount of time that the machine will run unloaded before shutting off. If the time is set less than 15 minutes (for example five minutes), there may be times when the machine will run unloaded for more than five minutes. This is because there is another timer that keeps the machine from being started more than four times an hour.

UNLD TIM 15 MIN

- **Language select** - English, German, Spanish, Italian and French may be selected for display language.

LANGUAGE ENGLISH

- **Units** - English or metric units may be selected.

UNITS ENGLISH

- **Communications ID #** - This is the network address of a machine. If there is more than one machine connected to the network, each machine must have a unique number.

COM ID # 1

- **Communications baud rate** - This should always be selected to 9600 baud for all sequencing modes. It may be lower for slave or monitoring modes.

BAUDRATE 9600

- **Sequence method** - This parameter sets the method used for optional sequencing. The choices are DISABLED, REMOTE, SLAVE, HOURS, COM ID#. See the Sequencing & Protocol Manual (See Recommended Spare Parts List) for details about

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these modes.

SEQUENCE HOURS

- **Drain interval** – The time between actuation of the drain valve.

DRN INTV 10 MIN

- **Drain time** – The amount of time that the drain valve is actuated.

DRN TIM 1 SEC

- **Last Communication Number** – Used only for sequencing, see Sequencing & Protocol Manual for details.

LAST COM 3

- **Lowest Allowable Pressure** – Used only for sequencing, see Sequencing & Protocol Manual for details.

LOWEST 90 PSI

- **Recovery Time** – Used only for sequencing, see Sequencing & Protocol Manual for details.

RECOVER 10 SEC

- **Rotate Time** – Used only for sequencing – units in HOURS, see Sequencing & Protocol Manual for details.

ROTATE 50 HOURS

- **Machine Capacity** – Used only for sequencing – units in CFM (M^3/min), see Sequencing & Protocol Manual for details.

CAPACITY 100

- **Sequence Hours** – Used only for sequencing, see Sequencing & Protocol Manual for details.

SEQ HRS 1000

6.7 OPERATING THE COMPRESSOR

Before operating the compressor the operating parameters must be setup. See the previous section on operating parameter setup.

MANUAL OPERATION MODE

In this mode the compressor will run indefinitely, as long as temperatures and pressure remain within the valid operating ranges, and the motor overload or emergency stop contacts are not tripped. Pressing the "I" will turn on the compressor and put it in manual mode. If the compressor is already running, but in automatic mode, pressing "I" will switch operation to manual. Pressing "I" while already running in manual mode will cause the Supervisor to turn off the common fault relay, if engaged, and clear any maintenance indicators.

To stop the compressor, press "O" If the compressor is already off when "O" is pressed, the common fault relay will be turned off, if engaged, and it will try to clear the alarm and maintenance indicators. Regardless of what the compressor is doing, pressing "O" puts the Supervisor in manual stop mode.

AUTOMATIC OPERATION MODE

In this mode the compressor will start if line pressure (P2) is less than the **LOAD** parameter. It will stop if the compressor runs unloaded for the number of minutes indicated by the **UNLD TIM** parameter. To put the compressor in automatic mode press "⟲". If P2 is already less than **LOAD** the compressor will start immediately, otherwise the system status will indicate **STANDBY** and the LED marked **AUTO** will flash.

If the compressor is already running, but in continuous mode, pressing "⟲" will switch operation to automatic. Pressing "⟲" while already running in automatic mode will cause the Supervisor to turn off the common fault relay, if engaged, and clear any maintenance indicators.

In automatic mode the compressor can be stopped manually by pressing "O". Stopping the compressor using "O" will put the Supervisor in manual stop mode.

Regardless of whether in "automatic" or "manual" mode, control of the load solenoid will be based on the parameters **UNLD** and **LOAD.** This operation is as follows:

P2 > UNLD --> load solenoid turned off
P2 < LOAD --> load solenoid turned on

POWER FAILURE RESTART

If the restart timer (RST TIME parameter) is dis-

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abled the compressor will not try to start after a power up. If this time is set to a value, the machine will go into standby after power up. When the line pressure drops below the load setpoint, the restart timer will start timing. When the timer expires the machine will start.

SEQUENCING MODES
The following is a brief description of sequencing modes. For details see the Supervisor II Sequencing & Protocol Manual (See Recommended Spare Parts List).

- **DISABLED** - Responds to status and parameter change messages via the RS485 network but will not respond to start, stop, load or unload messages.
- **REMOTE** - Responds to status and parameter change messages but will not respond to start, stop, load or unload messages. The remote inputs and outputs are enabled (start/stop, load/unload, master/local).
- **SLAVE** - Will respond to all messages, but will not start or load unless commanded to do so by a message. This mode is used to control the machine from a master computer.
- **HOURS** - Sends status message about once a second; starts, loads and unloads machines based on sequencing hours.
- **COM ID #** - Sends status message about once a second; starts, loads and unloads machines based on machine COM ID#.

6.8 PURPOSE OF CONTROLS - SUPERVISOR II

CONTROL OR INDICATOR	PURPOSE
EMERGENCY STOP SWITCH	Pushing in this switch, found adjacent to the Supervisor, cuts all AC outputs from the latter and de-energizes the starter. A fault message (E STOP) is displayed by the Supervisor until the button is pulled out and the "O" pad is depressed.
DISCHARGE TEMPERATURE PROBE-T1	Shuts the compressor down when the compressor discharge temperature exceeds 240°F (116°C). Continually monitors air/fluid mixture discharged from the compressor unit.
AIR END DISCHARGE PRESSURE-P1	Shuts the compressor down when the compressor discharge pressure exceeds P1 MAX. Continually monitors the discharge pressure of the compressor unit. Indicates pressure in compressor sump upon start-up to verify rotor motor rotation.
PACKAGE OUTLET PRESSURE-P2 (Service Line Pressure)	Continually monitors service line pressure. When line pressure reaches the UNLOAD setting, the Supervisor control signals the solenoid valve to unload the compressor.
FLUID PRESSURE-P3	Continually monitors injection fluid pressure and shuts down the compressor in the event of low fluid pressure.
FLUID FILTER DIFFERENTIAL SWITCH	Continually monitors fluid filter differential and generates an alarm when the fluid filter needs replacement.
INLET FILTER MAINTENANCE SWITCH	Monitors condition of compressor inlet air filter and indicates when replacement is required.
FLUID LEVEL SIGHT GLASS	Indicates fluid level in the sump. Proper level is not to fall below the center of the sight glass. Check level when compressor is shut down. **DO NOT OVERFILL.**
COOLER BYPASS VALVE	Regulates flow of fluid to and around the cooler. Designed to maintain a minimum operating temperature of 180°F (82°C); used for fast warm-up on start-up.

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6.8 PURPOSE OF CONTROLS - SUPERVISOR II (CONTINUED)

CONTROL OR INDICATOR	PURPOSE
MINIMUM PRESSURE/CHECK VALVE	Maintains minimum of 50 psig (3.4 bar) in the compressor sump. Valve piston restricts receiver air discharge from receiver/sump when pressure falls to 50 psig (3.4 bar). Also incorporated in this valve is a terminal check valve which prevents line pressure backflow into the sump during unload conditions and after shutdown.
PRESSURE RELIEF VALVE	Protects compressor by venting compressed air in excess of 200 psig (13.8 bar) to atmosphere.
MODULATING INLET VALVE	Regulates the amount of air allowed to enter the air compressor. This regulation is determined by the amount of air being used at the service line. Also acts as a check valve to prevent reverse compressor rotation at shut down.
SOLENOID VALVE	Bypasses the pressure regulator valve causing the inlet valve to close when the compressor reaches maximum operating pressure. Also activates blowdown valve.
WATER REGULATING VALVE (water-cooled only)	Regulates the amount of cooling water used in the cooler to keep the compressor running at a normal operating temperature of 170°F (77°C).

6.9 SUPERVISOR II OUTPUT RELAYS

RELAY	OPERATION
RUN RELAY (K1)	Contact closure energizes the compressor starter.
*-DELTA (K2)	A timed contact used to provide wye-delta transition time.
UNLOAD/LOAD (K3)	Controls ON LOAD/OFF LOAD operation of the load control solenoid valve.
COMMON FAULT (K4)	May be used to provide remote indication of any prealarm, maintenance or fault shutdown condition.
DRAIN VALVE (K5)	Controls optional solenoid valve to provide automatic condensate removal.
FULL LOAD/MODULATE (K6)	Used with optional sequencing feature.

NOTE: All output relays will handle eight (8) amps at 120/240 VAC.

6.10 INITIAL START-UP PROCEDURE- SUPERVISOR II

The following procedure should be used to make the initial start-up of the compressor.

1. Read the preceding pages of this manual thoroughly.
2. Jog motor to check for correct rotation of motor (refer to Section 4.8).
3. Be sure that all preparations and checks described in the Installation Section have been made.
4. Open the shut-off valve to the service line.
5. Check for possible leaks in piping.
6. Slowly close the shut-off valve to assure proper nameplate pressure unload setting is correct. The compressor will unload at nameplate pres-

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sure. If adjustments are necessary, see Control System Adjustments.
7. Observe the operating temperature. If the operating temperature exceeds 200°F (93°C), the cooling system and installation environment should be checked.
8. Open shut-off valve to the service line.
9. Reinspect the compressor for temperature and leaks the following day.

6.11 SUBSEQUENT START-UP PROCEDURE- SUPERVISOR II

On subsequent start-ups, check that the proper level is visible in the fluid level sight glass and simply press "I" for manual or "⟲" for automatic operation. When the compressor is running, observe the various parameter displays.

6.12 SHUTDOWN PROCEDURE- SUPERVISOR II

To shut the compressor down, push "O" pad.

NOTES

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7.1 GENERAL
As you proceed in reading this section, it will be easy to see that the Maintenance Program for the air compressor is quite minimal. The use of the service indicators provided for the bearing filter, air filter and fluid separator, will alert you when service maintenance is required. When the maintenance gauge shows red, maintenance for that specific item is required. See instructions for each item in Section 7.8, Parts Replacement and Adjustment procedures.

7.2 DAILY OPERATION
Prior to starting the compressor, it is necessary to check the fluid level in the sump. Should the level be low, simply add the necessary amount. If the addition of fluid becomes too frequent, a simple problem has developed which is causing this excessive loss. See the Troubleshooting Section under Excessive Fluid Consumption for a probable cause and remedy.

After a routine start has been made, observe the instrument panel gauges and be sure they monitor the correct readings for their particular phase of operation. After the compressor has warmed up, it is recommended that a general check on the overall compressor and instrument panel be made to assure that the compressor is running properly.

⚠ WARNING

DO NOT remove caps, plugs, and/or other components when compressor is running or pressurized.

Stop compressor and relieve all internal pressure before doing so.

7.3 MAINTENANCE AFTER INITIAL 50 HOURS OF OPERATION
After the initial 50 hours of operation, a few maintenance requirements are needed to clean the system of any foreign materials. Perform the following maintenance operations to prevent unnecessary problems.

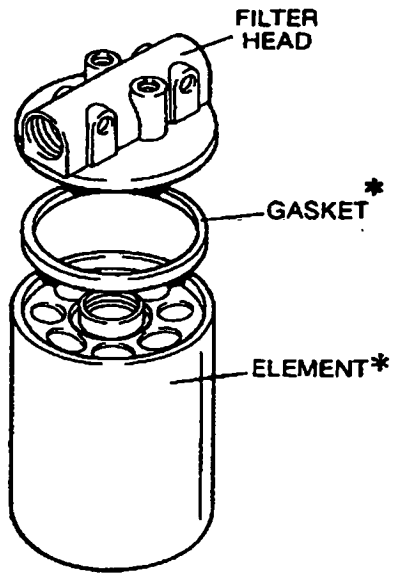
1. Clean the return line strainer.
2. Clean the return line orifice.

7.4 MAINTENANCE EVERY 1000 HOURS
After 1000 hours of operation, it will be necessary to perform the following:

1. Clean the return line strainer.
2. Replace the fluid filter element and gasket.

7.5 FLUID MAINTENANCE
Drain the sump and change the compressor fluid using instructions shown in sections 3.2, 3.3, and 3.4.

Figure 7-1 Fluid Filter (P/N 02250096-783)



* Repair Kit P/N 250025-525

7.6 FILTER MAINTENANCE
Replace your fluid filter element and the gasket under any of the following conditions, whichever occurs first:

1. As indicated by the maintenance gauge.
2. Every 1000 hours.
3. Every 6 months.

7.7 SEPARATOR MAINTENANCE
Replace the separator elements when your separator maintenance gauges show red or after one (1) year, whichever comes first. The separator elements must be replaced. **DO NOT** clean the separator elements.

7.8 PARTS REPLACEMENT AND ADJUSTMENT PROCEDURES

FLUID FILTER ELEMENT REPLACEMENT
Refer to Figure 7-1.

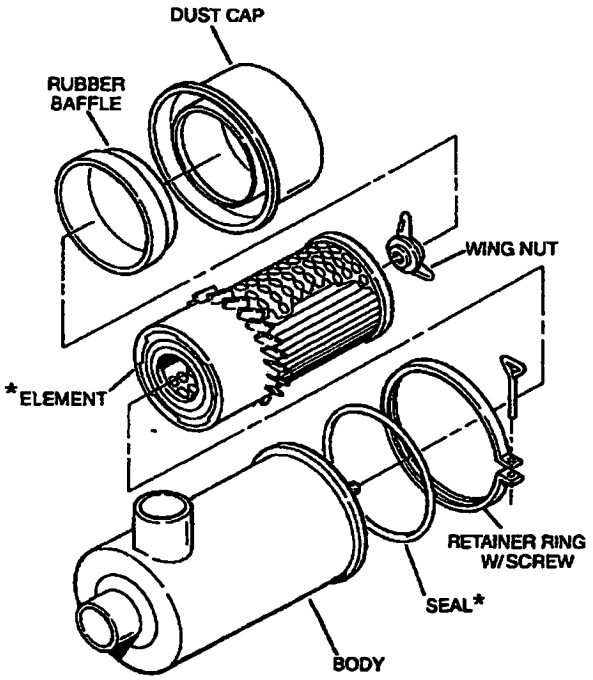
1. Using a strap wrench, remove the old element and gasket.
2. Clean gasket seating surface.
3. Apply a light film of fluid to the new gasket.
4. Hand tighten new element until new gasket is seated in the gasket groove. Avoid any nicks, cuts or pinches to the gasket.
5. Continue tightening element by hand an additional 1/2 to 3/4 turn.
6. Restart compressor and check for leaks.

⚠ CAUTION

To minimize the possibility of filter element rupture, it is important that ONLY replacement elements identified with the Sullair name, logo and

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Figure 7-2 Airl Filter Replacement
(P/N 02250107-327)- 25-30HP/ 18-22KW
(P/N 040595)- 40HP/ 30KW



* Replacement Element P/N 043334 (25-30HP/18-22KW)
Replacement Element P/N 040596 (40HP/30KW)

appropriate part number be used and that substituted elements not be used, due to the fact that such filters may have inadequate or questionable working pressure ratings.

AIR FILTER MAINTENANCE

Refer to Figure 7-2. Air filter maintenance should be performed when the maintenance gauge shows red with the compressor running full load, or once a year, whichever comes first. If the filter needs to be replaced, order replacement elements. Below you will find procedures on how to replace the air filter elements.

AIR FILTER ELEMENT REPLACEMENT

1. Clean exterior of air filter housing.
2. Release tension on cover retaining ring.
3. Remove the rubber baffle from the inside dust cup and empty the dirt from the dust cap.
4. Remove air filter element by loosening the wingnut securing the element.
5. Remove element and clean interior of housing using a damp cloth. **DO NOT** blow dirt out with compressed air.
6. At this time replace the element.
7. Reassemble in the reverse order of the disassembly.
8. Reset the air filter restriction indicator if equipp (electro-mechanical models only).

ELEMENT INSPECTION

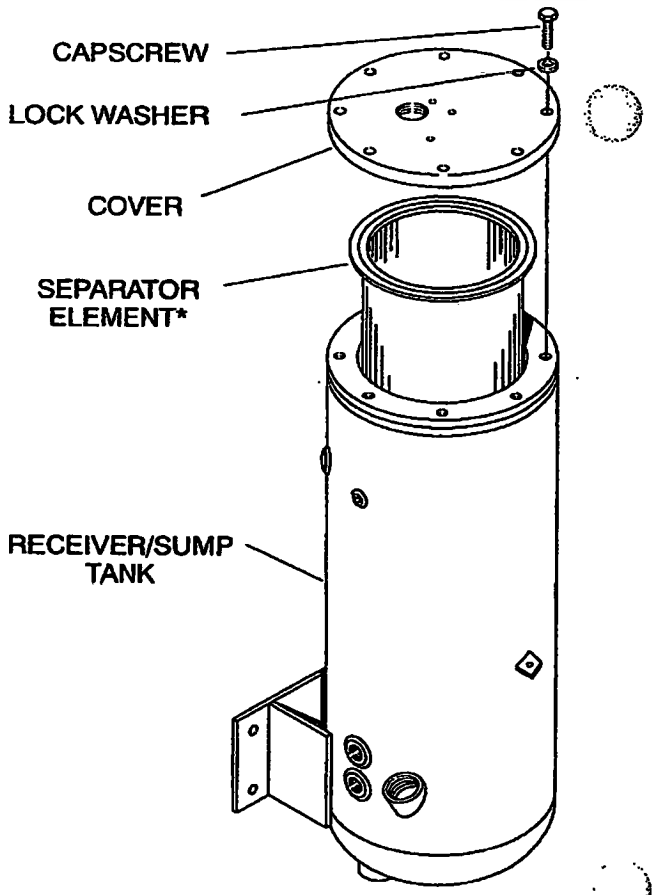
1. Place a bright light inside the element to inspect for damage or leak holes. Concentrated light will shine through the element and disclose any holes.
2. Inspect all gaskets and gasket contact surfaces of the housing. Should faulty gaskets be evident, correct the condition immediately.
3. If the clean element is to be stored for later use, it must be stored in a clean container.
4. After the element has been installed, inspect and tighten all air inlet connections prior to resuming operation.

SEPARATOR ELEMENT REPLACEMENT

Refer to Figure 7-3. The separator elements must be changed when the maintenance gauge shows red with the compressor running full load, or once a year, whichever occurs first. Follow the procedure explained below for separator element replacement.

1. Relieve all pressure from the sump tank and all compressor lines.

Figure 7-3 Separator Element Replacement
(P/N 250034-113)



* Replacement Kit for Primary Element P/N 250034-114

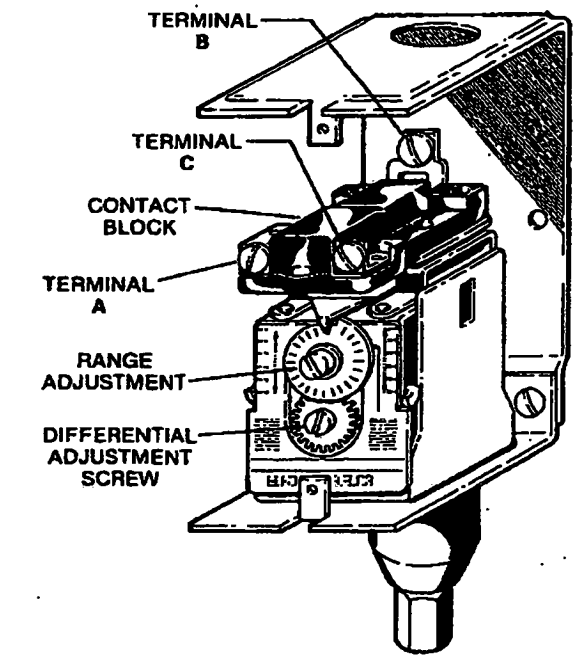
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2. Disconnect all piping connected to the sump cover to allow removal (return lines, service lines, etc.).
3. Loosen and remove the eight (8) hex head capscrews (1/2-13 x 1 1/2") from the cover plate.
4. Lift the cover plate from the sump.
5. Remove the separator element.
6. Inspect the receiver/sump tank for rust, dirt, etc.
7. Scrape the old gasket material from the cover and flange on the sump. Be careful not to let the scraps fall in the sump.
8. Reinsert the separator element into the sump taking care not to dent the element against the tank opening.
9. Clean the underside of the receiver/sump tank cover and remove any rust.
10. Replace the cover plate, washers and capscrews. Torque to 55 ft-lbs. (75 Nm).
11. Reconnect all piping making sure return line tubes extend to the bottom or 1/4" (6mm) above the bottom of the separator element. This will assure proper fluid return flow to the compressor.
12. Clean the return line strainers before restarting the compressor.

CONTROL SYSTEM ADJUSTMENT

Refer to Figure 7-4. Prior to adjusting the Control System, it is necessary to determine the desired operating pressure range and also the maximum pressure at which your compressor is to operate. The pressure must not exceed the maximum operating pressure which is stamped on the compressor serial number nameplate. The following explanation applies to a typical installation with a desired operating range of 115 to 125 psig (7.9 to 8.6 bar). This information will apply to a compressor with any other operating range excepting the stated pressures.

Figure 7-4 Pressure Switch
P/N 040694- Standard
P/N 407778- High Pressure



Remove the cover of the pressure switch. With the shut-off valve closed (or slightly cracked open) start the compressor. Observe the line pressure gauge and pressure switch contacts. When the line pressure reaches 125 psig (8.6 bar), the pressure switch contacts should open. If the pressure switch contacts do not open or they open prior to the desired pressure, the pressure switch setting will require adjustment (refer to Figure 7-4).

FOR PRESSURE RANGE ADJUSTMENT:

1. Remove cover to pressure switch.
2. Turn the range adjusting screw to the high pressure setting. Turning the screw counterclockwise lowers both the high and low pressure equally.

FOR DIFFERENTIAL ADJUSTMENT:

Differential is the difference between the high and low pressure settings. 10 psig (0.7 bar) is typical.

1. Turn the differential adjusting screw to the lower (reset) setting. Turning the screw counterclockwise widens the differential by lowering the reset (lower) setting only.
2. When the pressure switch adjustment is complete, the pressure regulator should be adjusted for the pressure at which modulation of air delivery should begin. In this case that pressure will be 118 psig (8.2 bar). The regulator is adjusted by loosening the jam nut on the end of the cone shaped cover of the pressure regulator. When the jam nut is loose, turn the adjusting screw clockwise to increase or counterclockwise to decrease the setting.
3. To set the regulator, continue closing the service valve until the line pressure is 118 psig (8.2 bar). At this point regulator should pass a signal to the inlet valve to start closing it. If the line pressure keeps on rising or if the modulation does not begin, adjust the regulator valve as described above. After adjustment, line pressure should be approximately 118 psig (8.2 bar) and 1.00 in. Hg (2.54 cm Hg.) vacuum below the inlet.
4. Next, close the service valve; line pressure will start rising. When line pressure reaches 125 psig (8.6 bar), the inlet valve will be closed to its maximum position. The inlet vacuum at this point will be around 25 in. Hg (63.5 cm Hg.). The machine should unload at this point.
5. Open the service valve so the line pressure is 115 psig (7.9 bar). Machine is now set for operation. Recheck the unload pressure by closing of the service valve. Machine should unload via the pressure switch at 125 psig (8.6 bar).

After the control pressures have been adjusted, the "unloaded" sump pressure should be checked. It will

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be necessary to shut the compressor down, remove the pressure switch cover, and disconnect one of the two lead wires that are connected to the micro-switch (contact block). After disconnecting the lead, tape the exposed wire with electrician's tape to make sure that it does not come in contact with any metallic surface.

⚠ DANGER

DO NOT touch the electrical contacts, terminal or leads with any metallic object. Severe electrical shock may occur.

With the lead taped, you may start the compressor again. Allow the sump pressure to stabilize.

The sump pressure should read 30 to 35 psig (2.1 to 2.8 bar).

Once this is checked, shut the compressor down once again and reconnect the taped lead and replace the pressure switch cover. At this time, start the compressor and cycle the Control System several times and re-check all pressure settings and adjustments.

⚠ DANGER

DO NOT touch the pressure switch, electrical contacts, terminal board or leads with any part of the body or any un-insulated metallic object. Severe electrical shock may occur.

PRESSURE REGULATOR ADJUSTMENT

Start the compressor and adjust the service valve to maintain service air pressure at rated pressure (115 psig for example). Turn the adjusting screw on the regulator until air just begins to escape from the control air orifice. The regulator is now properly set.

DRIVE COUPLING INSTALLATION AND MAINTENANCE

Refer to Figures 7-5 and 7-6. For coupling installation and maintenance the tools required will be a measuring scale, one set of standard Allen wrenches, and one set of standard socket wrenches.

For installation and maintenance of the drive coupling, follow the steps explained below.

⚠ DANGER

Disconnect all power at source, before attempting maintenance or adjustments.

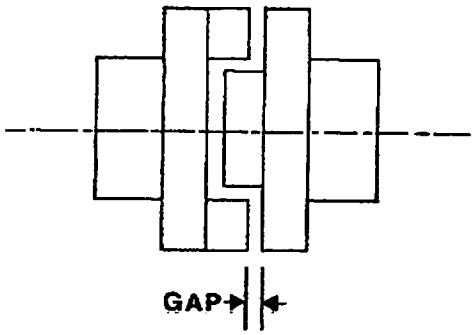
STEP 1 - COUPLING GUARDS

There are three 5/16" screws from each of the wire guards located on each side of the unit/motor adaptor for the 25/30 HP (18/22 KW) packages, or the two 3/8" bolt/nut/washer assemblies from the plate guard and adaptor located on the top side.

TABLE 1 INSTALLATION DATA
SERIES 10 (25-40HP/ 18-30KW)

Horsepower	Coupling Element	Coupling Hub Gap	Tightening Torque (Wet)
25 & 30 HP/ 18 & 22 KW	045672	.09-.125 in 2.4-3.2 mm	55 ft.-lbs (75Nm)
60, 75, 100 (45, 55, 75 KW)	250004-638	.09-.125 in 2.4-3.2 mm	110 ft.-lbs (149Nm)

Figure 7-5 Drive Coupling "Hub" Gap Check



STEP 2 - MOUNTING HUBS/ELEMENT

The coupling halves have a unique bore for the motor and the air-end. The air-end half is to be located so that the hub is positioned against the shaft shoulder and secured in place by two set-screws. The motor half should remain free floating until the element is in its proper location. The motor half is then positioned within assembly maintaining an axial coupling gap as listed in Figure 7-5. There are two set-screws located on the motor coupling half also. Prior to starting of package, assure the set-screws are secure to eliminate potential movement of the hub.

7.9 TROUBLESHOOTING- STANDARD ELECTRO-MECHANICAL

The information contained in the Standard Electro-Mechanical Troubleshooting chart has been compiled from field report data and factory experience. It contains symptoms and usual causes for the described problems. However, **DO NOT** assume that these are the only problems that may occur. All available data concerning a problem should be systematically analyzed before undertaking any repairs or component replacement procedures.

A detailed visual inspection is worth performing for almost all problems and may avoid unnecessary additional damage to the compressor. Always remember to:

1. Check for loose wiring.
2. Check for damaged piping.

3. Check for parts damaged by heat or an electrical short circuit, usually apparent by discoloration or a burnt odor.

Should your problem persist after making the recommended check, consult your nearest Sullair representative.

TROUBLESHOOTING- STANDARD ELECTRO-MECHANICAL

SYMPTOM	PROBABLE CAUSE	REMEDY
COMPRESSOR WILL NOT START	Main Disconnect Switch Open	Close switch.
	Line Fuse Blown	Replace fuse.
	Control Transformer Fuse Blown	Replace fuse.
	Motor Starter Overloads Tripped	Reset. Should trouble persist, check whether motor starter contacts are functioning properly.
	Low Incoming Line Voltage	Check voltage. Should voltage check low, consult power company.
COMPRESSOR SHUTS DOWN WITH AIR DEMAND PRESENT	Loss of Control Voltage	Reset. If trouble persists, check that line pressure does not exceed maximum operating pressure of the compressor (specified on nameplate).
	Low Incoming Voltage	Consult power company.
	Excessive Operating Pressure	Defect in line pressure switch; check pressure at which contact points open.
		Separator requires maintenance; check maintenance indicator under full load conditions.
		High pressure shutdown switch is defective; replace.
		Defective valve; regulator valve should cause inlet valve to close when the pressure switch contacts open. Repair if defective.
		Defective blowdown valve; blowdown valve should exhaust sump pressure to 10 to 15 psig (0.7 to 1.0 bar) when maximum operating pressure is reached. Repair if defective.
	Discharge Temperature Switch Open	Cooling water temperature too high; increase water flow (water-cooled only).
		Cooling water flow insufficient; check water lines and valves (water-cooled only).
		Cooler plugged; clean tubes. If plugging persists, install water conditioner (water-cooled only).
		Cooling air flow restricted; clean cooler and check for proper ventilation.
		Ambient temperature is too high; provide sufficient ventilation.
		Low fluid level; add fluid.
		Clogged filter; change the fluid filter element and change the bearing filter element if maintenance indicator shows red.
		Thermal valve not functioning properly; replace element.
		Water flow regulating valve not functioning properly; change (water-cooled only).
		Defective discharge temperature switch; check for a short or open circuit to probe and correct wiring.

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TROUBLESHOOTING- STANDARD ELECTRO-MECHANICAL (CONTINUED)

SYMPTOM	PROBABLE CAUSE	REMEDY
COMPRESSOR WILL NOT BUILD FULL DISCHARGE PRESSURE.	Air Demand is Too Great	Check service lines for leaks or open valves up
	Dirty Air Filter	Check the filter indicator and inspect and/or change element if required.
	Pressure Regulator Out of Adjustment	Adjust regulator according to control adjustment instructions in the Maintenance section.
	Defective Pressure Regulator	Check diaphragm and replace if necessary (kit available).
LINE PRESSURE RISES ABOVE CUT-OUT PRESSURE SETTING ON PRESSURE SWITCH	Leak in Control System Causing Loss of Pressure Signals	Check for leaks.
	Defective Pressure Switch	Check that diaphragm and contacts are not damaged. Replace if necessary.
	Defective Regulator Valve	Check that air bleeds from control orifice when the pressure switch contacts open. Readjust; Repair or replace it if necessary (kit avail able).
	Plugged Control Line Strainer	Clean strainer (screen and o-ring replacement kit available).
	Defective Blowdown Valve	Check that sump pressure is exhausted to the atmosphere when the pressure switch contacts open. Repair or replace if necessary (kit available).
	High Pressure Shutdown Switch is Defective or Incorrectly Adjusted	Readjust or replace.
EXCESSIVE COMPRESSOR FLUID CONSUMPTION	Clogged Return Line or Orifice	Clean strainer (screen and o-ring replacement kit available). Clean orifice.
	Separator Element Damaged or Not Functioning Properly	Change separator.
	Leak in the Lubrication System	Check all pipes, connections and components.
	Excess Fluid Foaming	Drain and change.
	Fluid Level Too High	Drain and change.
PRESSURE RELIEF VALVE OPEN REPEATEDLY	Defective Pressure Relief Valve	Replace.
	Plugged Separator	Check separator differential.
LIQUID WATER IN COMPRESSED AIR LINES	Water Vapor Condensation from Cooling and Compression Occurs Naturally	Remove the water vapor from compressed air prior to distribution through the air system. Check operation of aftercooler and moisture separator. Install a compressed air dryer sized for the flow and dryness level required. (Note: Filters may also be required to remove particulates, liquid oil aerosols or for oil vapor removal. Change cartridges as recommended by the filter manufacturer). Check all drain traps routinely to insure their proper operation. Maintain them regularly.

7.10 TROUBLESHOOTING- SUPERVISOR II

The information contained in the Supervisor II Troubleshooting chart is based upon both the actual applied situations and extensive testing at the factory. It contains symptoms and usual causes for the described problems. However, **DO NOT** assume that these are the only problems that may occur. All available data concerning a problem should be systemati-

cally analyzed before undertaking any repair or component replacement procedures.

A detailed visual inspection is worth performing for almost any problems which may prevent unnecessary damage to the compressor. Always remember to:

a. Check for loose wiring.
b. Check for damaged piping.
c. Check for parts damaged by heat or an electrical short circuit, usually apparent by discoloration or a burnt odor.

Should your problem persist after making the recommended check, consult your nearest Sullair representative or the Sullair Corporation factory.

TROUBLESHOOTING – SUPERVISOR II

SYMPTOM (DISPLAY)	PROBABLE CAUSE	REMEDY
T1 HI Message	Discharge Temperature Exceeded 225°F (107°C) for Pre-Alarm	
	Discharge Temperature Exceeded 235°F (113°C) for Shutdown	
	Ambient Temperature Exceeded 105°F (41°C)	Improve local ventilation (i.e., remote intake of process and/or cooling air).
	Fluid Level in Sump is Too Low	Check/correct fluid level.
	Thermal Valve Malfunctioned	Check/replace thermal valve.
	Cooler Fins are Dirty (Air-cooled only)	Clean cooler fins.
	Water Flow is Low (Water-cooled Packages Only)	Check cooling water supply (i.e., closed valves).
	Water Temperature is High (Water-Cooled Packages Only)	Increase water flow, lower water temperature.
	Cooler is Plugged (Water-Cooled Packages Only)	Clean tubes and/or shell – if tube plugging persists, provide cleaner water.
T1 FAIL	Temperature RTD Malfunction	Check connections from RTD. If connection is good, replace RTD.
P1 HI Message	Discharge Pressure Exceeded Shutdown Level Because:	
	P1 MAX-3psi (0.2 Bar) Exceeded for Pre-Alarm	
	P1 MAX Exceeded for Shutdown	
	Unloading Device (i.e., Blowdown Valve) Failed to Operate	Check operation of unloading device.
	Pressure Regulator Adjusted Incorrectly	Check operation of pressure regulator.
	Solenoid Valve Failed to Operate	Check operation of solenoid valve.
	Control Air Signal Leaks	Check tubework feeding control signal for leaks.
	Control Air Signal Filter Clogged	Service filter assembly.
P1, P2, P3 FAIL	Pressure Transducer Malfunction	Check connections from transducer. If connections are good, replace transducer.
P3 LOW	Oil Pressure Falls Below 10 psig (0.7 bar) or Less than 1/2 of P1 while Compressor is Running Because:	
	Oil Filter Clogged	Replace filter element.
	Sump Oil Level Too Low	Replenish oil level.
SEP MNTN Message	Plugged Separator	Replace separator element.
	ΔP1 > 10 psi (0.7 Bar)	Check P1 & P2 pressure transducers.

Section 7
MAINTENANCE

TROUBLESHOOTING - SUPERVISOR II (CONTINUED)

SYMPTOM (DISPLAY)	PROBABLE CAUSE	REMEDY
COMPRESSOR DOES NOT BUILD FULL DISCHARGE PRESSURE	Air Demand Exceeds Supply	Check air service lines for open valves or leaks.
	Inlet Air Filter Clogged	Check for maintenance message on Supervisor display. Inspect and/or change element.
	Inlet Valve Not Fully Open	Check actuation and position.
	Pressure Sensor and/or Connections at Fault	Check connections from transducer. If adequate, replace transducer.
LINE PRESSURE RISES ABOVE UNLOAD SETTING	Pressure Sensor P2 at Fault	Check connections from transducer. If adequate, replace transducer.
	Unloading Device (i.e., Blowdown Valve) Failed to Operate	Check operation of unloading device.
	Solenoid Valve Failed to Operate	Check operation of solenoid valve.
	Control Air Signal Leaks	Check tubework feeding control signal for leaks.
	Control Air Signal Filter Clogged	Service filter assembly.
EXCESSIVE FLUID CONSUMPTION	Damaged or Improperly Gasketed Separator Element	Inspect separator element and gasket. Replace if damaged.
	Fluid System Leaks	Check tube/pipework for leaks.
	Fluid Level Too High	Drain excess fluid.
	Excessive Fluid Foaming	Drain and change fluid.
LIQUID WATER IN COMPRESSED AIR LINES	Water Vapor Condensation From Cooling and Compression Occurs Naturally	Remove the water vapor from compressed air prior to distribution through the air system. Check operation of aftercooler and moisture separator. Install a compressed air dryer sized for the flow and dryness level required. (Note: Filters may also be required to remove particulates, liquid oil aerosols or for oil vapor removal. Change cartridges as recommended by the filter manufacturer). Check all drain traps routinely to insure their proper operation. Maintain them regularly.

NOTE ON TRANSDUCERS:

Whenever a sensor is suspected of fault, the recommended cause of action is to measure the signal (pressure, temperature, etc.) with an alternate calibrated instrument and compare readings. If readings conflict, the electrical and/or tubing connections should be inspected, and if no faults are evident, then replace the sensor and re-evaluate against the calibrated instrument.

7.11 CALIBRATION

The Supervisor II has software calibration of the pressure and temperature probes. This calibration affects the offset but not the slope of the pressure and temperature calculations. Because of this, the most accurate method is to heat or pressurize the transducer to its operating value. If this is too difficult, room temperature/open atmosphere calibration is adequate. Calibration may only be done while machine is stopped and unarmed.

To enter calibration mode, you must press the following keys in sequence while in the default status display mode: "⏎", "▲", **DSP**, "▼ ☼", **PRG**. Once in calibration mode, you will see a screen like the following:

CAL	P1
0	97

In the above example, "0" refers to the amount of adjustment (in psi or °F, "97" refers to the current value of P1).

To make adjustments, Press the "▲" (UP ARROW) key to increase the value, press the "▼ ☼" (DOWN ARROW / LAMP TEST) key to decrease the value. The number on the left will increase or decrease al-

ways showing the total amount of adjustment. Maximum adjustment is ± 7.

The **DSP** key exits, wiping out changes to the current item, while saving changes to any previous items. The **PRG** key saves the current item and advances to the next. All temperatures and pressures may be calibrated individually.

Section 7
MAINTENANCE

Figure 7-6 Piping and Instrumentation Diagram- Standard

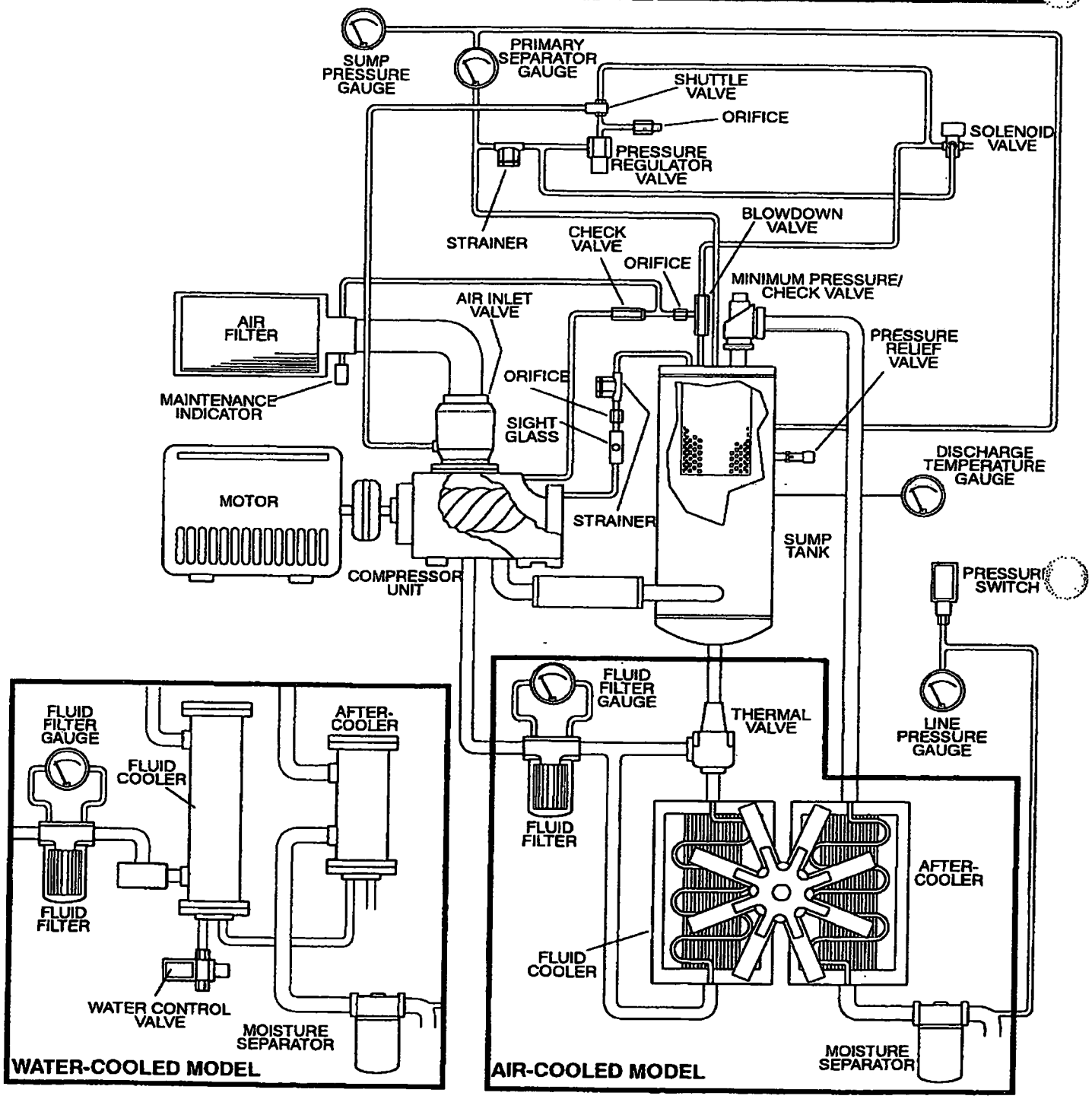
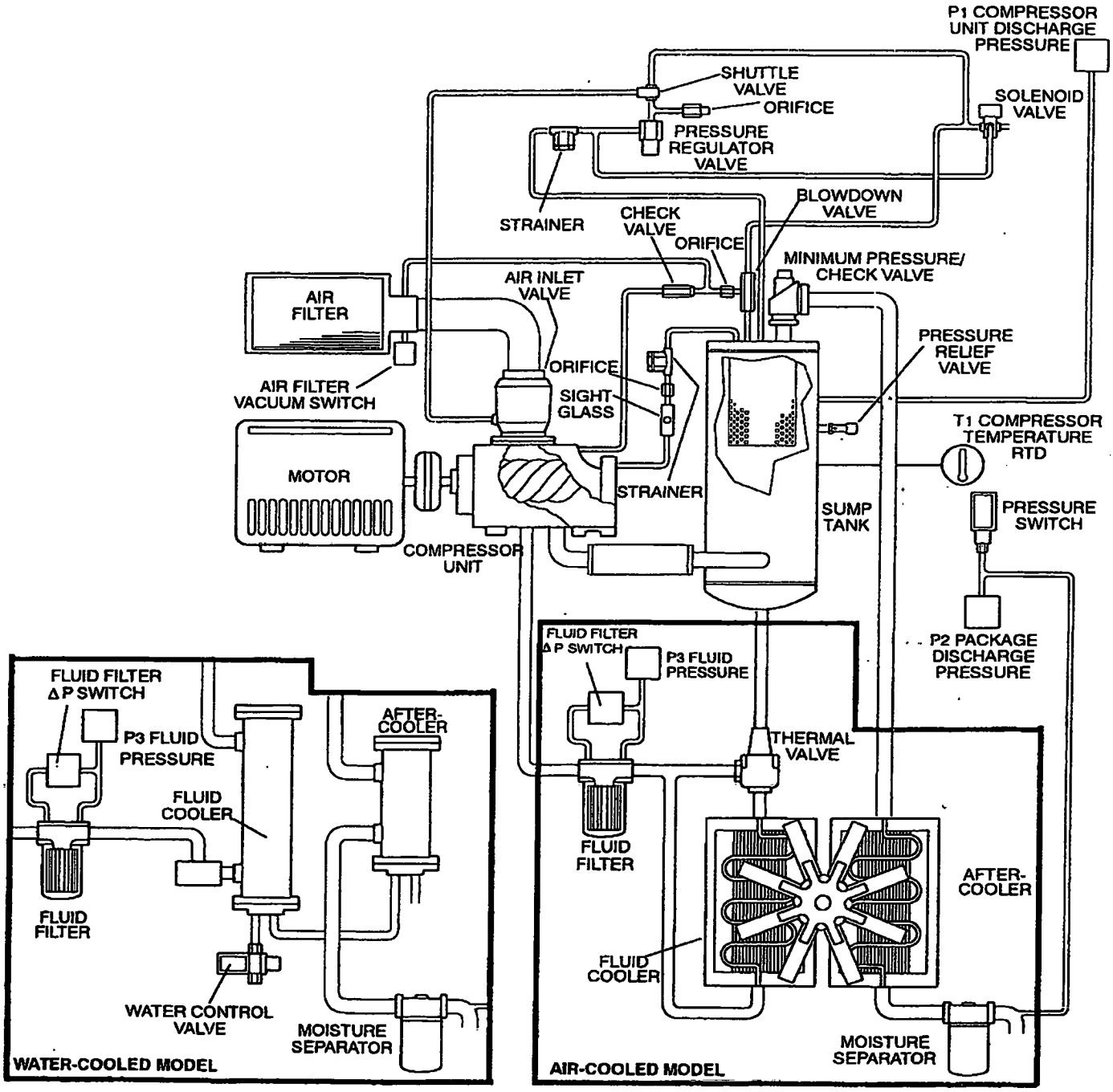


Figure 7-7 Piping and Instrumentation Diagram- Supervisor II



NOTES

Section 8
ILLUSTRATIONS AND PARTS LIST

8.1 PROCEDURE FOR ORDERING PARTS

Parts should be ordered from the nearest Sullair Representative or the Representative from whom the compressor was purchased. If for any reason parts cannot be obtained in this manner, contact the factory directly at the addresses, phone or fax numbers listed below.

When ordering parts always indicate the **Serial Number** of the compressor. This can be obtained from the Bill of Lading for the compressor or from the Serial Number Plate located on the compressor.

SULLAIR ASIA, LTD.
Sullair Road, No. 1
Chiwan, Shekou
Shenzhen, Guangdong PRV.
PRC POST CODE 518068
Telephone: 755-6851686
Fax: 755-6853473

SULLAIR EUROPE, S.A.
Zone Des Granges BP 82
42602 Montbrison Cedex, France
Telephone: 33-477968470
Fax: 33-477968499

SULLAIR CORPORATION
3700 East Michigan Boulevard
Michigan City, Indiana 46360 U.S.A.
Telephone: 1-219-879-5451
Fax: (219) 874-1273
Fax: (219) 874-1835 (Parts)
Fax: (219) 874-1288 (Service)

8.2 RECOMMENDED SPARE PARTS LIST

DESCRIPTION	KIT NUMBER	QTY
element, compressor fluid filter 02250096-783	250025-525	1
element, heavy duty air filter 02250107-327 (25-30HP/ 19-22KW)	043334	1
element, heavy duty air filter 040595 (40HP/ 30 KW)	040596	1
element, primary replacement for separator 250034-113	250034-114	1
kit, repair for air inlet valve 02250088-348	250019-451	1
kit, repair springs for air inlet valve 02250088-348	250029-315	1
kit, repair for minimum pressure/check valve 02250097-609	02250110-988	1
kit, repair cap for minimum pressure/check valve 02250097-609	02250046-397	1
kit, repair o-ring for minimum pressure/check valve 02250097-609	02250048-362	1
kit, repair piston for minimum pressure/check valve 02250097-609	02250051-338	1
kit, repair thermal valve 02250096-738 (170°F)	250025-621	1
kit, repair thermal valve 02250103-509 (190°F)	02250103-562	1
kit, repair for pressure regulator 250017-280	250019-453	1
kit, repair for blowdown valve 250025-655	250031-772	1
kit, repair for solenoid valve 250038-674 (<= 140 psi/ 9.7 bar)	250038-673	1
kit, replacement for solenoid valve coil 250038-674 (<= 140 psi/ 9.7 bar)	250031-738	1
kit, repair for solenoid valve 250038-675 (>140 psi/ 9.7 bar)	02250055-939	1
kit, replacement for solenoid valve coil 250038-675 (>140 psi/ 9.7 bar)	250038-730	1
kit, repair inlet valve 02250088-348	250019-451	1
kit, repair for v-type strainer 241771	241772	1
kit, repair for shaft seal	001836-007	1
element, replacement for combination separator/trap 02250078-841	02250081-108	1
kit, repair automatic drain for combination separator/trap 02250078-841	02250087-422	1
manual, Sequencing & Protocol (I)	02250057-696	1
fluid, SRF 1/4000 (5 gallons)	250019-662	(II)
lubricant, Sullube (std.) (5 gallons)	250022-669	(II)
lubricant, 24 KT (5 gallons)	046850-001	(II)

(I) This document is required to program your personal computer to communicate with the Supervisor II panel.

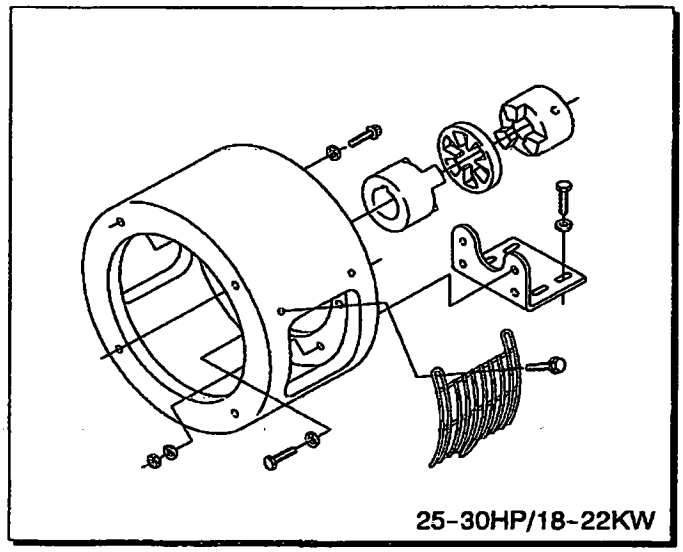
(II) For proper amount of fluid fill, please consult Lubrication Guide in Section 3, Specifications.

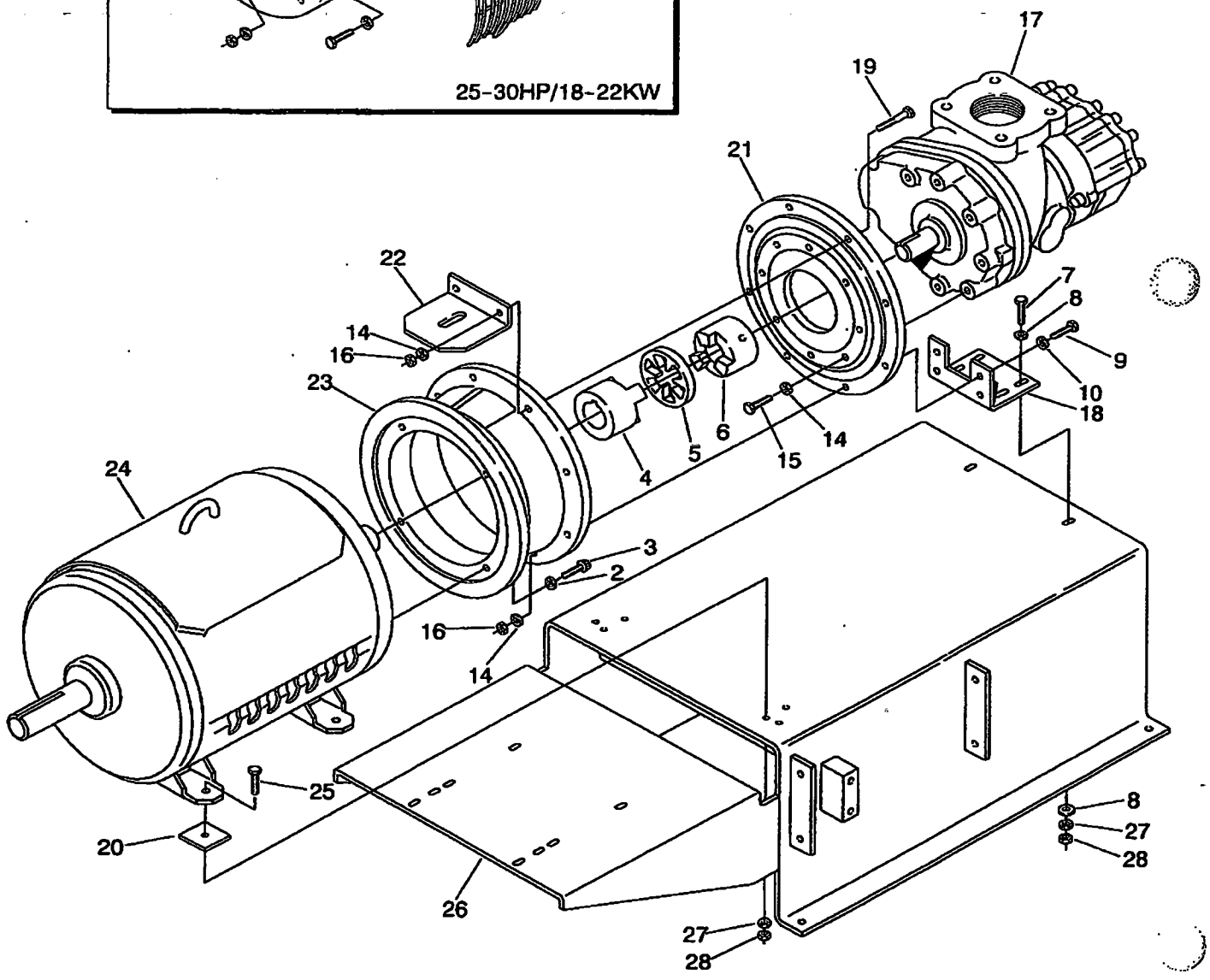
PLEASE NOTE: WHEN ORDERING PARTS, ALWAYS INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.3 MOTOR, COMPRESSOR, FRAME AND PARTS





8.3 MOTOR, COMPRESSOR, FRAME AND PARTS

key number	*description*	*part number*	*quantity*
1	adapter, motor (25, 30HP)	250038-448	1
2	washer, springlock reg pltd 1/2" (25, 30HP)	837808-125	4
	•washer, springlock reg pltd 5/8"(40HP)	837810-156	4
3	capscrew, ferry head 1/2"-13 x 1-1/4" (25, 30HP)	867308-125	4
	capscrew, ferry head 5/8"-11 x 1-1/4" (40HP)	867310-150	4
4	hub, motor (25, 30HP)	045671	1
	•hub, motor (40HP)	250004-640	1
5	element, drive coupling (25, 30HP)	045672	1
	•element, drive coupling (40HP)	250004-638	1
6	coupling, hub (25, 30HP)	045673	1
	•coupling, hub (40HP)	250004-639	1
7	capscrew, hex gr5 1/2-13 x 1-1/2"	829108-150	2
8	washer, pl-b reg plated 1/2"	838208-112	4
9	capscrew, hex gr5 3/8"-16 x 2"	829106-200	2
10	washer, pl-b reg plated 3/8"	838206-112	2
11	angle, compressor mounting	02250103-594	1
12	screw, ser washer 5/16" x 3/4"	829705-075	6
13	grille, coupling guard	250038-863	2
14	washer, springlock reg plated 3/8" (25, 30HP)	837806-094	9
	•washer, springlock reg plated 3/8" (40HP)	837806-094	12
15	capscrew, hex gr5 3/8"-16 x 1-1/4"	829106-125	7
16	nut, hex plated 3/8"-16 (25, 30HP)	825206-337	2
	wnut, hex plated 3/8"-16 (40HP)	825206-337	5
17	compressor unit	consult factory	1
18	angle, compressor mounting	02250107-610	1
19	capscrew, hex gr5 3/8"-16 x 1-3/4"	829106-175	3

(Continued on page 53)

(I) There is an exchange program whereby a remanufactured compressor unit can be obtained from Sullair distributors or the factory at less cost than the owner could repair the unit. For information regarding the unit exchange program, contact your nearest Sullair representative or the Sullair Corporation.

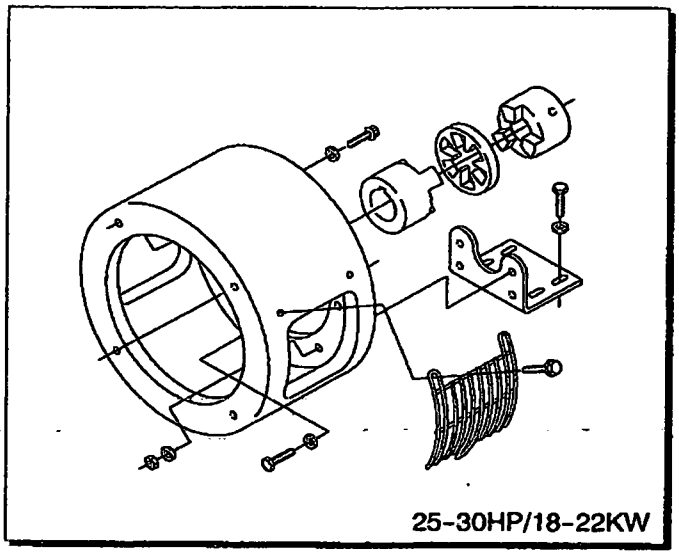
The shaft seal is not considered part of the compressor unit in regard to the two year warranty. The normal Sullair parts warranty applies. For shaft seal repairs, order shaft seal repair kit no. 001836-007.

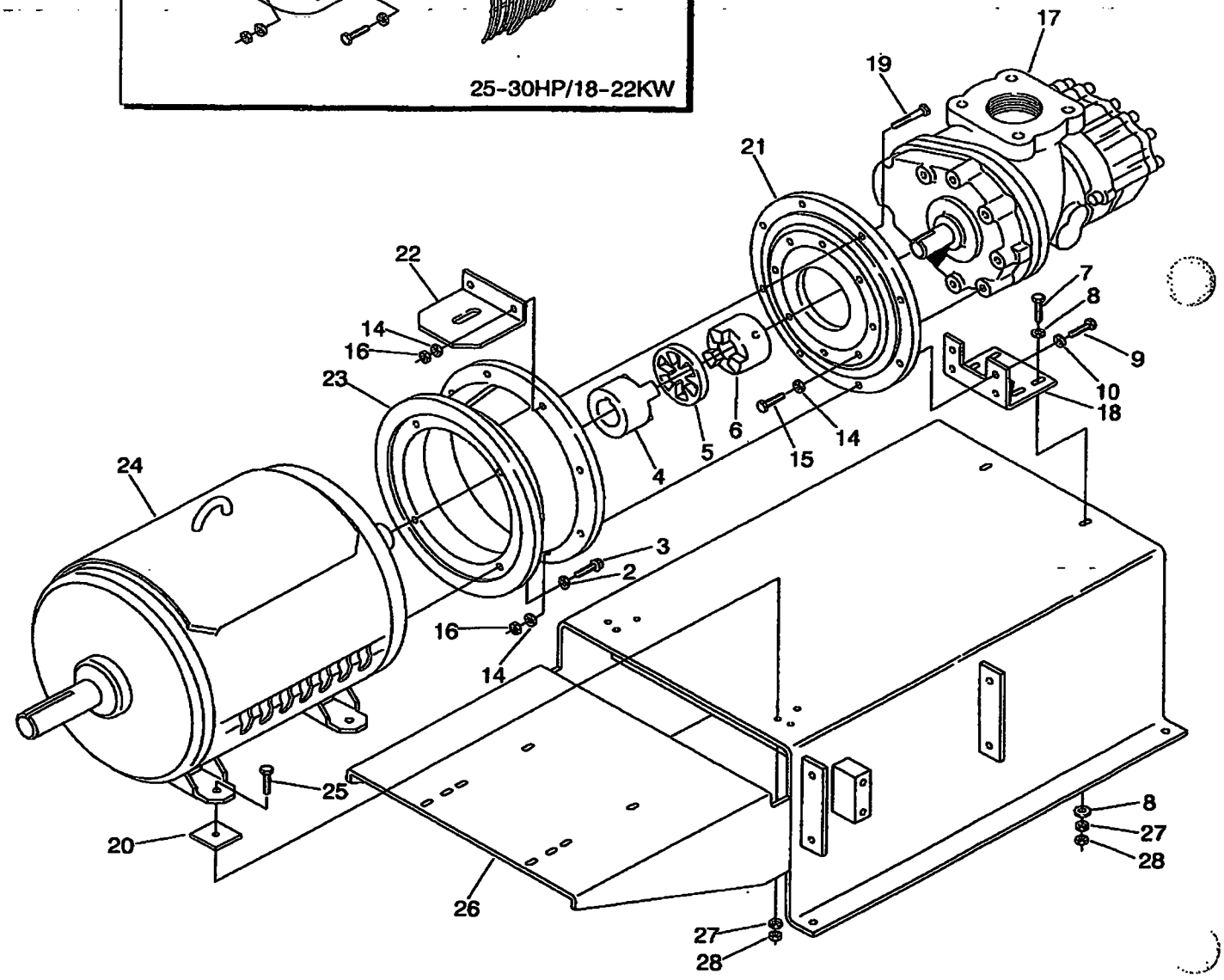
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.3 MOTOR, COMPRESSOR, FRAME AND PARTS





8.3 MOTOR, COMPRESSOR, FRAME AND PARTS (CONTINUED)

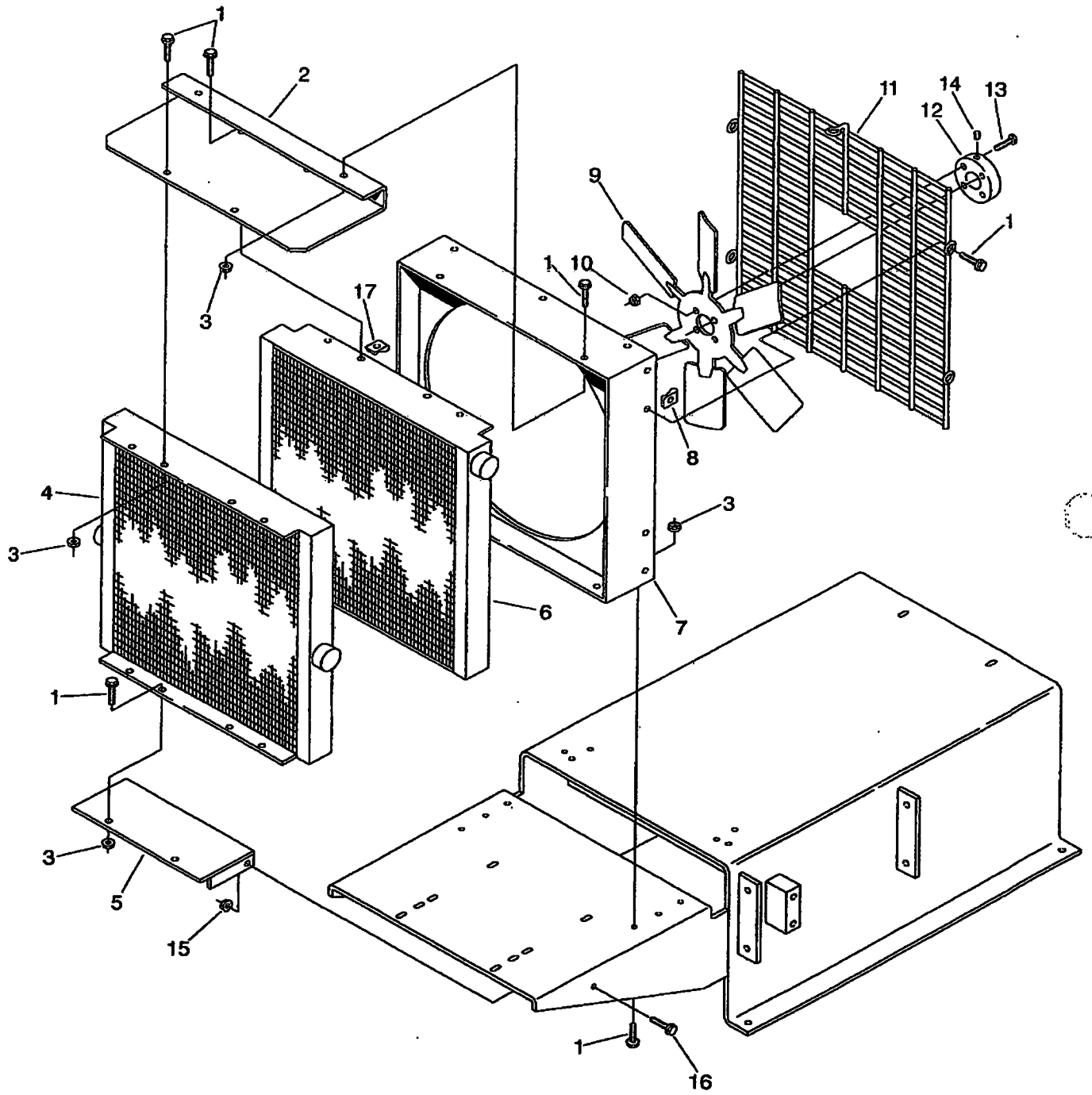
key number	*description*	*part number*	*quantity*
20	block, spacer 1 x 2 x 3 (25,30HP)	250001-798	2
21	adapter, compressor (40HP)	250009-542	1
22	plate, motor/compressor	225980	1
23	adapter, motor (40HP)	231977	1
24	motor	consult factory	1
25	capscrew, hex gr5 1/2"-13 x 2-3/4" (25, 30HP)	829108-275	2
	•capscrew, hex gr5 1/2"-13 x 1-3/4" (40HP)	829108-175	2
26	frame	02250097-328	1
27	washer, springlock reg plated 1/2"	837808-125	4
28	nut, hex plated 1/2"-13	825208-448	4
29	sign, warning sever fan	049855	2

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.4 COOLER ASSEMBLY



8.4 COOLER ASSEMBLY

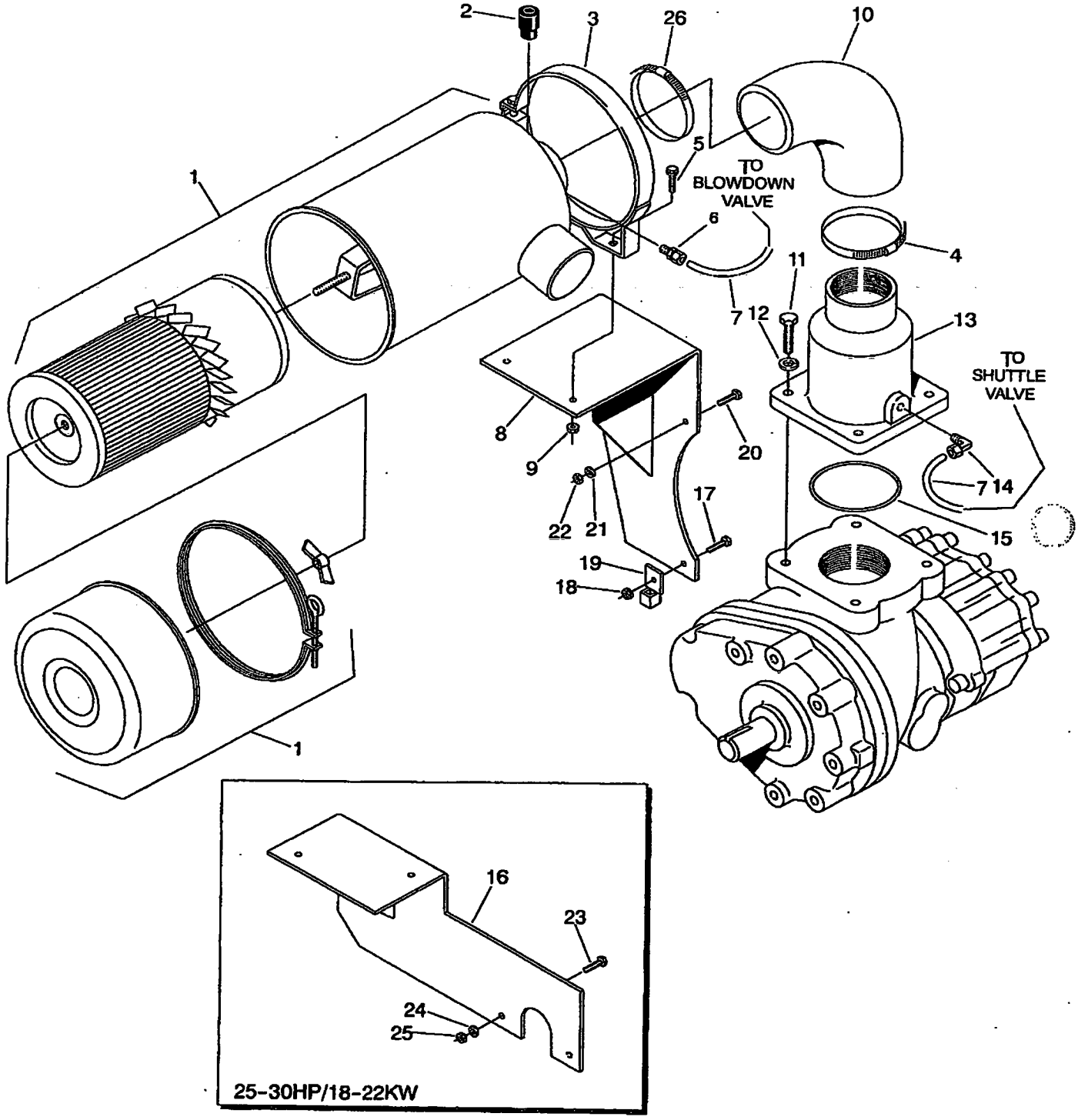
key number	*description*	*part number*	*quantity*
1	screw, ser washer 5/16"-18 x 3/4"	829705-075	17
2	panel, cooler adapter (25, 30HP)	02250107-473	1
	•panel, cooler adapter (40HP)	02250107-548	1
3	nut, hex flanged plated 5/16"-18	825305-283	8
4	cooler, fluid ls-10 1-1/16" SAE	02250096-704	1
5	plate, cooler mtg frame extension	02250105-536	1
6	cooler, air/aftercooler (25, 30HP)	407106	1
	•cooler, air/aftercooler (40HP)	250006-931	1
7	shroud, fan-17" (25, 30HP)	011994	1
	wshroud, fan-18" (40HP)	013315	1
8	nut, retainer-u 5/16"-18 .140	861505-140	5
9	fan, 18"dia rh blower (25, 30HP)	042492	1
	wfan, 17"dia rh blower (40HP)	249012	1
10	nut, hex locking plated 5/16"-18 (25, 30HP)	825505-166	4
	•nut, hex locking plated 3/8"-16 (40HP)	825506-198	4
11	guard, fan shroud	225962	1
12	hub, fan mounting (25, 30HP)	023350	1
	•hub, fan mounting (40HP)	231981	1
13	capscrew, ferry head 5/16"-18 x 1-1/2" (25, 30HP)	828405-150	4
	•capscrew, ferry head 3/8"-16 x 1-3/4" (40HP)	828406-175	4
14	screw, set 5/16"-18 x 1/2"	250010-322	2
15	nut, hex flanged plated 5/16"-18	825305-283	2
16	screw. ser washer 5/16"-18 x 3/4"	829705-075	2
17	nut, retainer-u 5/16"-18	861505-140	4

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.5 AIR INLET SYSTEM



8.5 AIR INLET SYSTEM

key number	description	part number	quantity
1	filter, air inlet heavy duty (25, 30HP) (I)	02250107–327	1
	•filter, air inlet heavy duty (40HP) (II)	040595	1
2	indicator, maintenance	250003–869	1
3	band, mounting–inlet filter (25, 30HP)	043370	1
	•band, mounting–inlet filter (40HP)	040598	1
4	clamp, inlet elbow	250018–550	1
5	screw, ser washer 5/16"–18 x 3/4"	829705–075	2
6	connector, 1/4"tube x 1/8"npt	250018–427	1
7	tubing, nylon 1/4" black	02250054–861	–
8	support, filter heavy duty	02250100–529	1
9	nut, hex flanged plated 5/16"–18	825305–283	2
10	elbow, rubber 90° red 2–1/2" x 3" (25, 30HP)	250032–462	1
	•elbow, rubber 90° 3" (40HP)	040599	1
11	capscrew, hex gr5 5/8"–11 x 1–1/2"	829110–150	4
12	washer, springlock reg plated 5/8"	837810–156	4
13	valve, inlet control (III)	02250088–348	1
14	elbow, 1/4"tube x 1/4"npt	250018–430	1
15	o–ring, viton	826502–238	1
16	support, filter heavy duty	02250100–528	1
17	capscrew, hex gr5 5/16"–18 x 1–3/4"	829105–175	1
18	nut, hex flanged plated 5/16"–18	825305–283	1
19	lug, scrulug–ground	849215–025	1
20	capscrew, hex gr5 3/8"–16 x 1–3/4"	829106–175	1
21	washer, springlock reg plated 3/8"	837806–094	1
22	nut, hex plated 3/8"–16	825206–337	1
23	capscrew, hex gr5 3/8"–16 x 1–1/2"	829106–150	2
24	washer, springlock reg plated 3/8"	837806–094	2
25	nut, hex plated 3/8"–16	825206–337	2
26	clamp, inlet elbow (25, 30HP)	040083	1
	•clamp, inlet elbow (40HP)	250018–550	1

(I) For maintenance on air filter no. 02250107–327, order replacement element no. 043334.

(II) For maintenance on air filter no. 040595, order replacement element no. 040596.

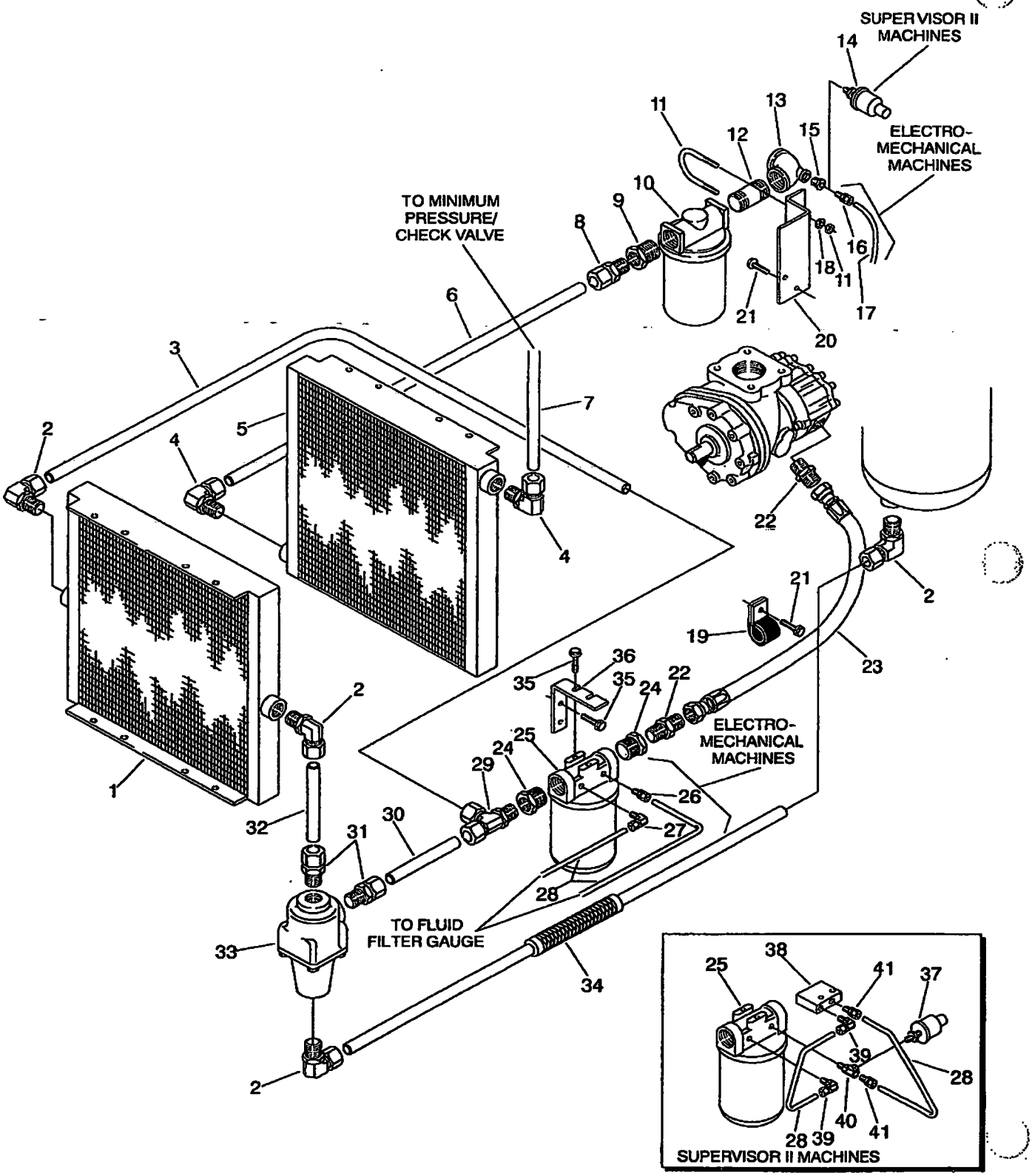
(III) For maintenance on air inlet valve no. 02250088–348, order repair kit no. 250019–451, and/or repair kit for springs no. 250029–315.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.6 COOLING AND LUBRICATION SYSTEM- AIR-COOLED



8.6 COOLING AND LUBRICATION SYSTEM- AIR-COOLED

key number	description	part number	quantity
1	cooler, fluid ls-10 1-1/16" SAE	02250096-704	1
2	elbow, tube straight thread 3/4" x 1-1/16"	811612-106	4
3	tube, 3/4" cooler/fluid filter	02250099-370	1
4	elbow, tube-m 1" x 3/4" (25, 30HP)	810516-075	2
	•elbow, tube-m 1" x 1" (40HP)	810516-100	2
5	cooler, air/aftercooler (25, 30HP)	407106	1
	•cooler, air/aftercooler (40HP)	250006-931	1
6	tube, aftercooler/moisture separator	02250100-730	1
7	tube, minimum pressure valve/aftercooler	02250099-372	1
8	connector, tube-m 1" x 1"	810216-100	1
9	bushing, reducing hex 1-1/2" x 1" plated	868906-040	1
10	separator, moisture 1-1/2"npt (I)	02250078-841	1
11	U-bolt, 3/8" x 1-1/2" pipe plated	868306-150	1
12	nipple, pipe xs 1/2" x 4"	866424-040	1
13	tee, reducing 1-1/2" x 1/2" x 1-1/2" plated	867506-026	1
14	transducer, pressure 0-250psi 1-5dvc N4	02250078-933	1
15	bushing, reducing 1/2" x 1/8" plated	868902-005	1
16	connector, tube-m 1/4" x 1/8" nylon	250018-427	1
17	tubing, nylon 1/4" black	02250054-861	–
18	washer, springlock reg plated 3/8"	837806-094	2
19	clamp, tube rubber center 1-3/8" dia	2500025-638	1
20	support, bracket moisture separator ls10	02250100-634	1
21	screw, ser washer 5/16"-18 x 3/4"	829705-075	3
22	connector, SAE x ORFS 0.75"	02250099-765	2
23	hose, mp ORFS f-swivel end .75" x 45"	02250099-175	1
24	reducer, straight thread 1-1/4" x 3/4" viton	870020-012	2
25	filter, fluid 1-5/8" SAE connection (II)	02250096-783	1
26	connector, tube 1/8M x 1/4T stainless steel	250139-024	1
27	elbow, tube 1/8M x 1/4T stainless steel	250211-013	1
28	tubing, stainless steel 1/4" 20ga	841215-004	–
29	tee, tube-run straight thread 3/4" x 1-1/16"	811912-106	1
30	tube, fluid filter/thermal valve	02250099-367	1
31	connector, tube straight thread 3/4" x 1-1/16"	811812-106	2
32	tube, thermal valve/oil cooler	02250099-369	1

(Continued on page 61)

(I) For maintenance on moisture separator no. 02250078-841, order replacement element no. 02250081-108, and automatic drain no. 02250087-422.

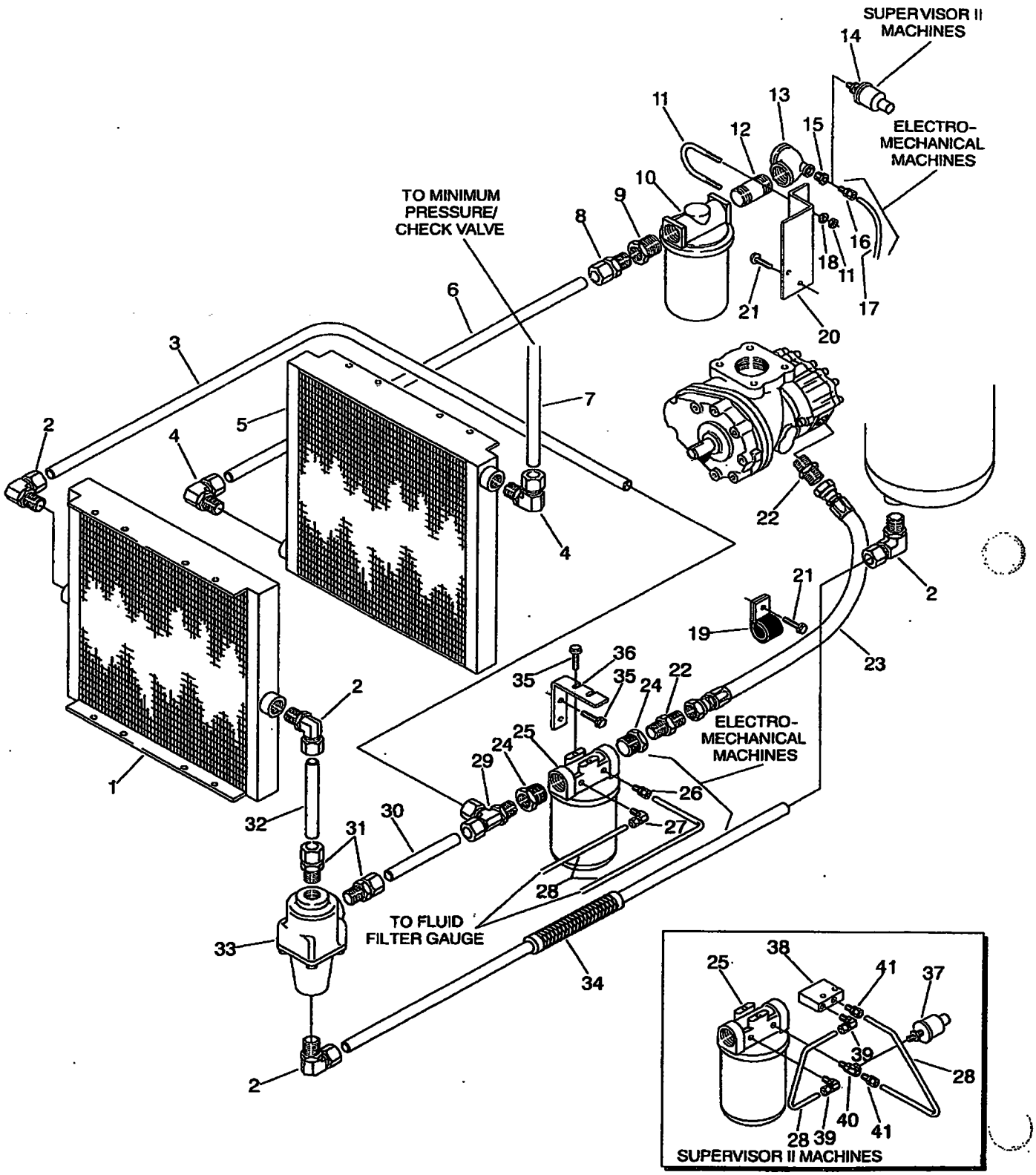
(II) For maintenance on fluid filter no. 02250096-783, order replacement element no. 250025-525.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.6 COOLING AND LUBRICATION SYSTEM- AIR-COOLED



8.6 COOLING AND LUBRICATION SYSTEM- AIR-COOLED (CONTINUED)

key number	*description*	*part number*	*quantity*
33	valve, thermal (170°F) **(III)**	02250096-738	1
	•valve, thermal (190°F) **(IV)**	02250103-509	1
34	tube, flexible tank/thermal valve ls10	02250100-616	1
35	screw, ser washer 5/16"-18 x 3/4"	829705-075	4
36	support, bracket oil filter	02250103-970	1
37	transducer, pressure 0-250psi 1-5dvc N4	02250078-933	1
38	switch, pressure differential 20psid	02250050-154	1
39	elbow, tube 1/8"M x 1/4"T stainless steel	250211-013	2
40	tee, tube 1/8F x 1/8M x 1/8F	02250077-903	1
41	connector, tube 1/8"M x 1/4"T stainless steel	250139-024	2

(III) For maintenance on thermal valve (170°F) no. 02250096-738, order repair kit no. 250025-621.

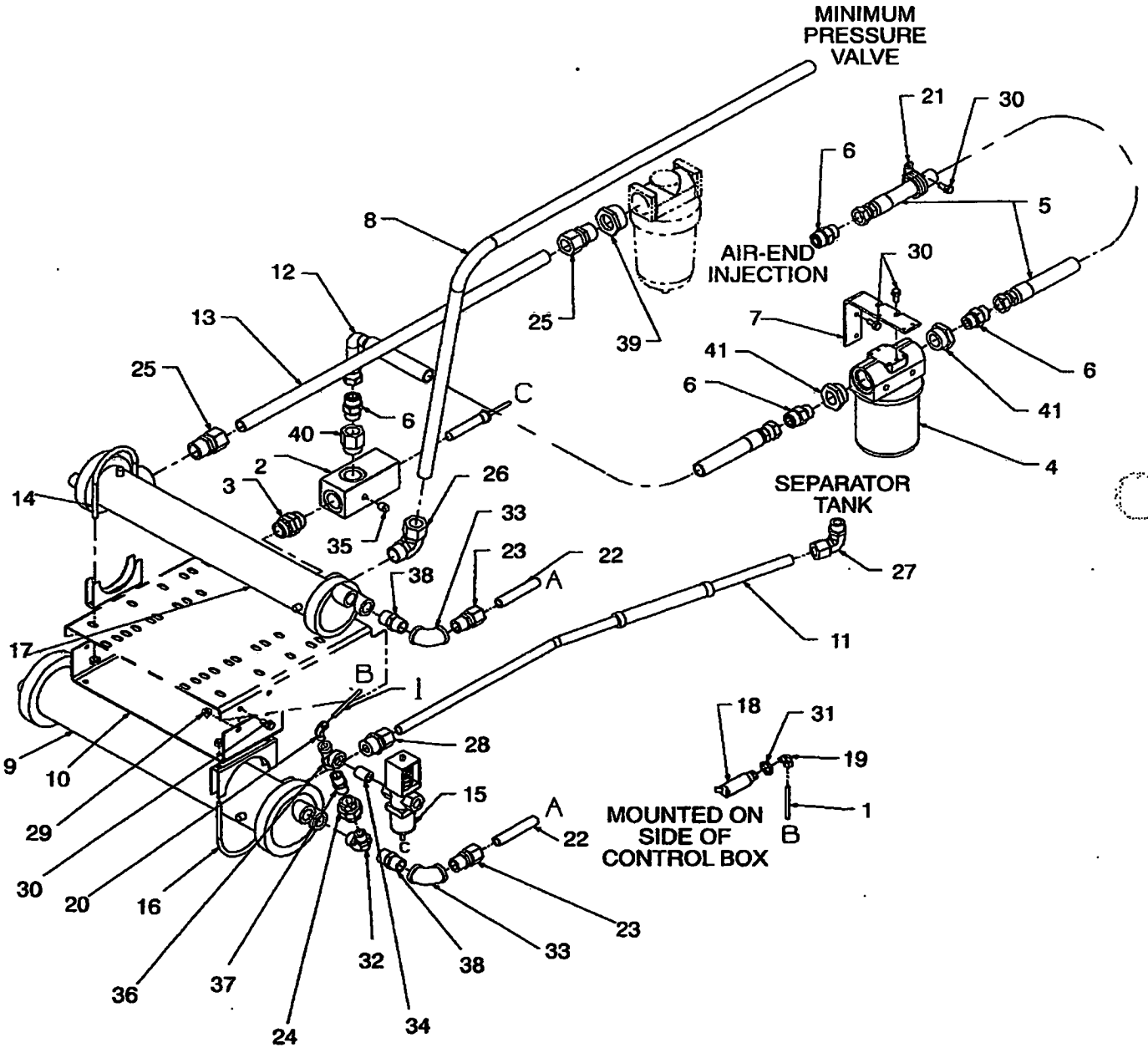
(IV) For maintenance on thermal valve (190°F) no. 02250103-509, order repair kit no. 02250103-562.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.7 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 25 & 30HP/ 18 & 22KW



8.7 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 25 & 30HP/ 18 & 22KW

key number	description	part number	quantity
1	tube,nylon .25"od x .04w black	02250054-861	4 ft
2	tee,sae/npt oil return	02250085-979	1
3	adapter, sae 1 5/16 x 1 5/16-12	02250086-022	1
4	filter, fluid 1 5/8 sae str thrd con (I)	02250096-783	1
5	hose, medium pressure orfs f-swvl end 45"long	02250099-175	1
6	connector,sae x orfs 0.75"	02250099-765	4
7	support, bracket oil filt ls-10 l.f.	02250103-970	1
8	tube,1"od clr/tank 25/30hp	02250110-168	1
9	cooler, heat exchanger std sae ports	02250110-238	1
10	support, bracket w.o.clr ls-10-lf	02250110-454	1
11	tube, flexible tank/w.o.c. 3/4"	02250110-456	1
12	hose, medium pressure orfs f-swvl 3/4"x 31" 90	02250113-370	1
13	tube,wc/moist sep ls10	02250113-436	1
14	clamp, exhaust 3 1/2"	040284	2
15	valve, water regulator 1/2"	041265	1
16	clamp, exhaust 4 1/2"	041983	2
17	heat exchanger, 3 x 24 25/30hp	043096	1
18	switch, pressure n.o. 10 psi	250017-992	1
19	elbow, 90 1/4t pls x 1/8 npt m	250018-429	1
20	elbow, 90 1/4t pls x 1/4 npt m	250018-430	1
21	clamp, tube rubber 1-3/8"F	250025-638	1
22	tubing, nylon 3/4"od	250039-353	3 ft
23	connector,male plastic tubing 3/4" x 3/4	250039-357	2
24	union, pipe galv 1/2	802315-020	1
25	connector, tube-m 1 x 1	810216-100	2
26	elbow, tube 90 deg m 1 x 1	810516-100	1
27	elbow, tube str thrd 3/4 x 1 1/16	811612-106	1
28	connector, tube str thd 3/4 x 1 5/16	811812-116	1
29	nut,hex f pltd 5/16-18	825305-283	4
30	screw, hex ser washer 5/16-18 x 3/4	829705-075	9
31	locknut, conduit 1/2"	847200-050	1
32	elbow, pipe-90m 3/4 x 1/2	860512-050	1
33	elbow, pipe 90 deg plt 3/4"	866215-030	2
34	nipple,pipe-xs plt 1/2 x cl	866408-000	1
35	plug, pipe 1/4" 3000# stl plt	866900-010	1

(Continued on page 65)

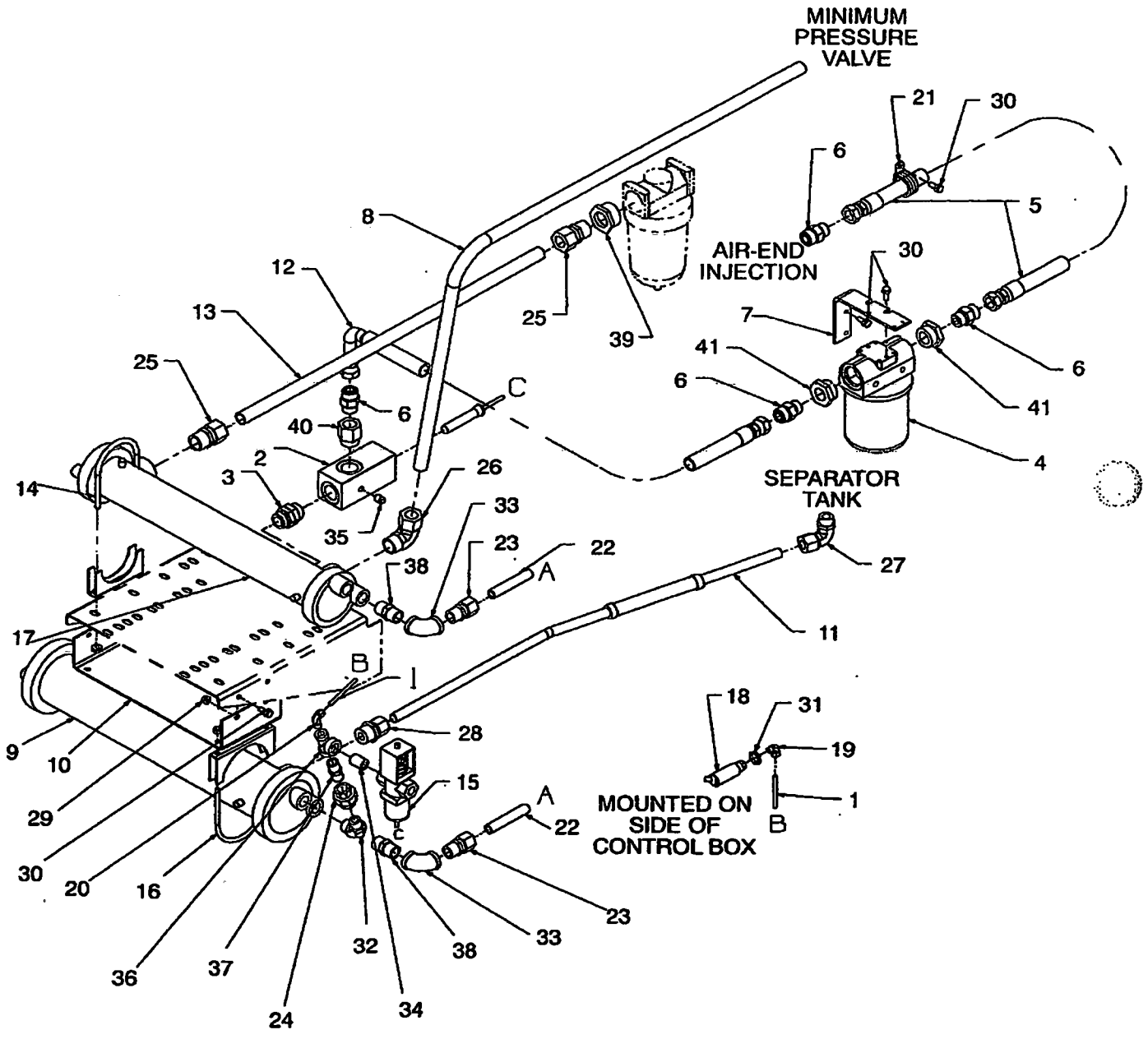
(I) For maintenance on fluid filter no. 02250096-783, order replacement element no. 250025-525.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.7 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 25 & 30HP/ 18 & 22KW



8.7 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 25 & 30HP/ 18 & 22KW (CONTINUED)

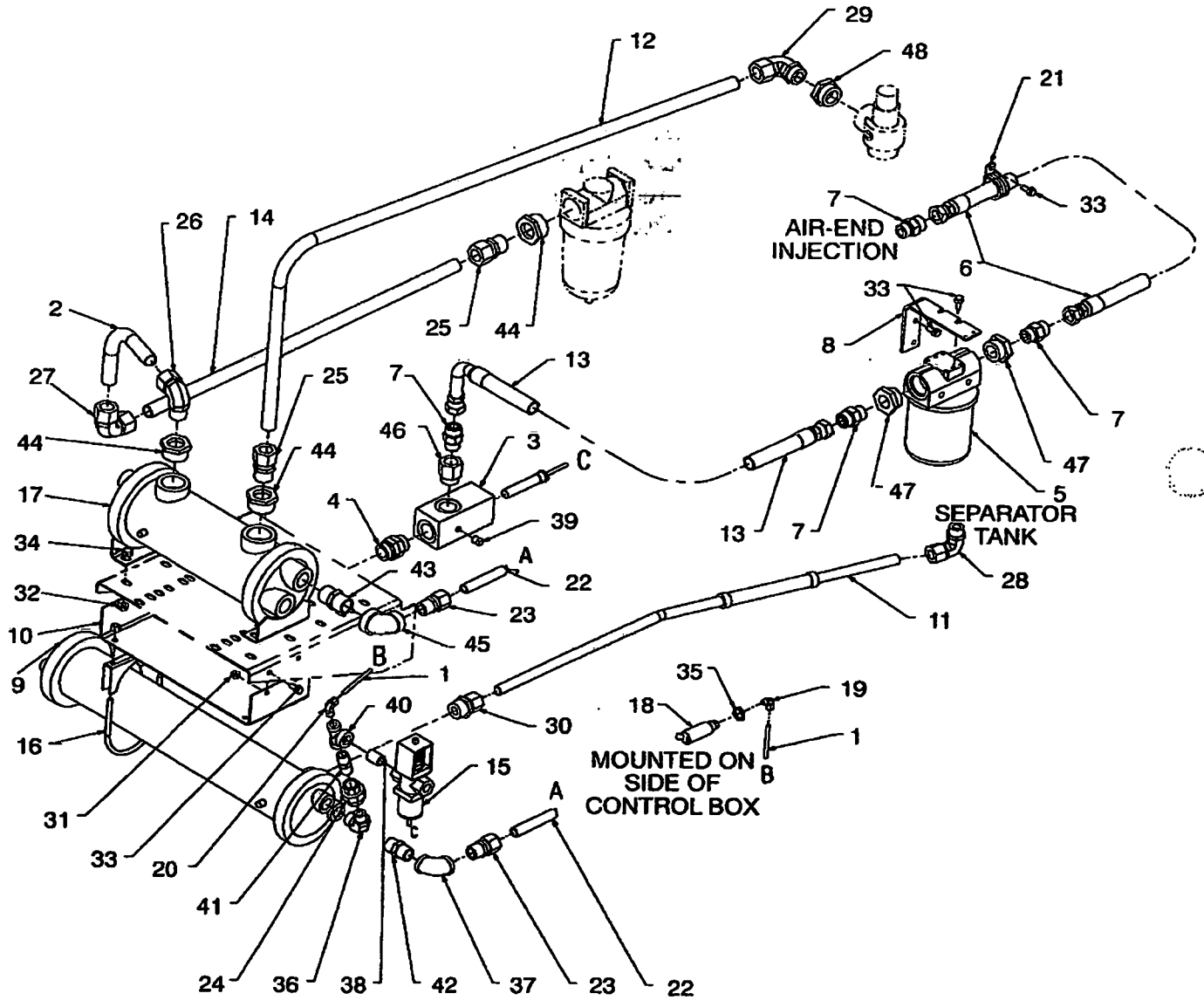
key number	*description*	*part number*	*quantity*
36	tee, reducing pltd 1/2 x 1/4 x 1/2	867502-012	1
37	nipple,pipe-hx pltd 1/2 x 1/2	868508-050	1
38	nipple,pipe-hx pltd 3/4 x 3/4	868512-075	2
39	bushing,red hex pltd 1 1/2 x 1	868906-040	1
40	reducer,str thrd viton 1 x 3/4	870016-012	1
41	reducer,str thrd viton 1 1/4 x 3/4	870020-012	2

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.8 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 40HP/ 30KW



8.8 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 40HP/ 30KW

key number	description	part number	quantity
1	tube,nylon .25"od x .04w black	02250054-861	4 ft
2	tube,1"od ls-10-lf	02250064-798	1
3	tee,sae/npt oil return	02250085-979	1
4	adapter, sae 1 5/16 x 1 5/16-12	02250086-022	1
5	filter, fluid 1 5/8 sae str thrd con (l)	02250096-783	1
6	hose, medium pressure orfs		
	f-swvl end 45"long	02250099-175	1
7	connector,sae x orfs 0.75"	02250099-765	4
8	support, bracket oil filt ls-10 l.f.	02250103-970	1
9	cooler, heat exchanger std sae ports	02250110-238	1
10	support, bracket w.o.clr ls-10-lf	02250110-454	1
11	tube, flexible tank/w.o.c. 3/4"	02250110-456	1
12	tube,1"od aftclr/tank ls-10-40hp w	02250110-458	1
13	hose, medium pressure orfs		
	f-swvl 3/4"x 31" 90	02250113-370	1
14	tube,wc/moist sep ls10	02250113-436	1
15	valve, water regulator 1/2"	041265	1
16	clamp, exhaust 4 1/2"	041983	2
17	heat exchanger, 40hp ls-10-lf air/oi	043062	1
18	switch, pressure n.o. 10 psi	250017-992	1
19	elbow, 90 1/4t pls x 1/8 npt m	250018-429	1
20	elbow, 90 1/4t pls x 1/4 npt m	250018-430	1
21	clamp, tube rubber 1-3/8"F	250025-638	1
22	tubing, nylon 3/4"od	250039-353	3 ft
23	connector,male plastic tubing 3/4" x 3/4	250039-357	2
24	union, pipe galv 1/2	802315-020	1
25	connector, tube-m 1 x 1	810216-100	2
26	elbow, tube 90 deg m 1 x 1	810516-100	1
27	elbow, tube union 1	811216-100	1
28	elbow, tube str thrd 3/4 x 1 1/16	811612-106	1
29	elbow, tube str thrd 1 x 1 5/16	811616-131	1
30	connector, tube str thd 3/4 x 1 5/16	811812-116	1
31	nut,hex f pltd 5/16-18	825305-283	4
32	nut,hex f pltd 3/8-16	825306-347	4
33	screw, hex ser washer 5/16-18 x 3/4	829705-075	9
34	screw, hex ser washer 3/8-16 x 3/4	829706-075	4
35	locknut, conduit 1/2"	847200-050	1

(Continued on page 69)

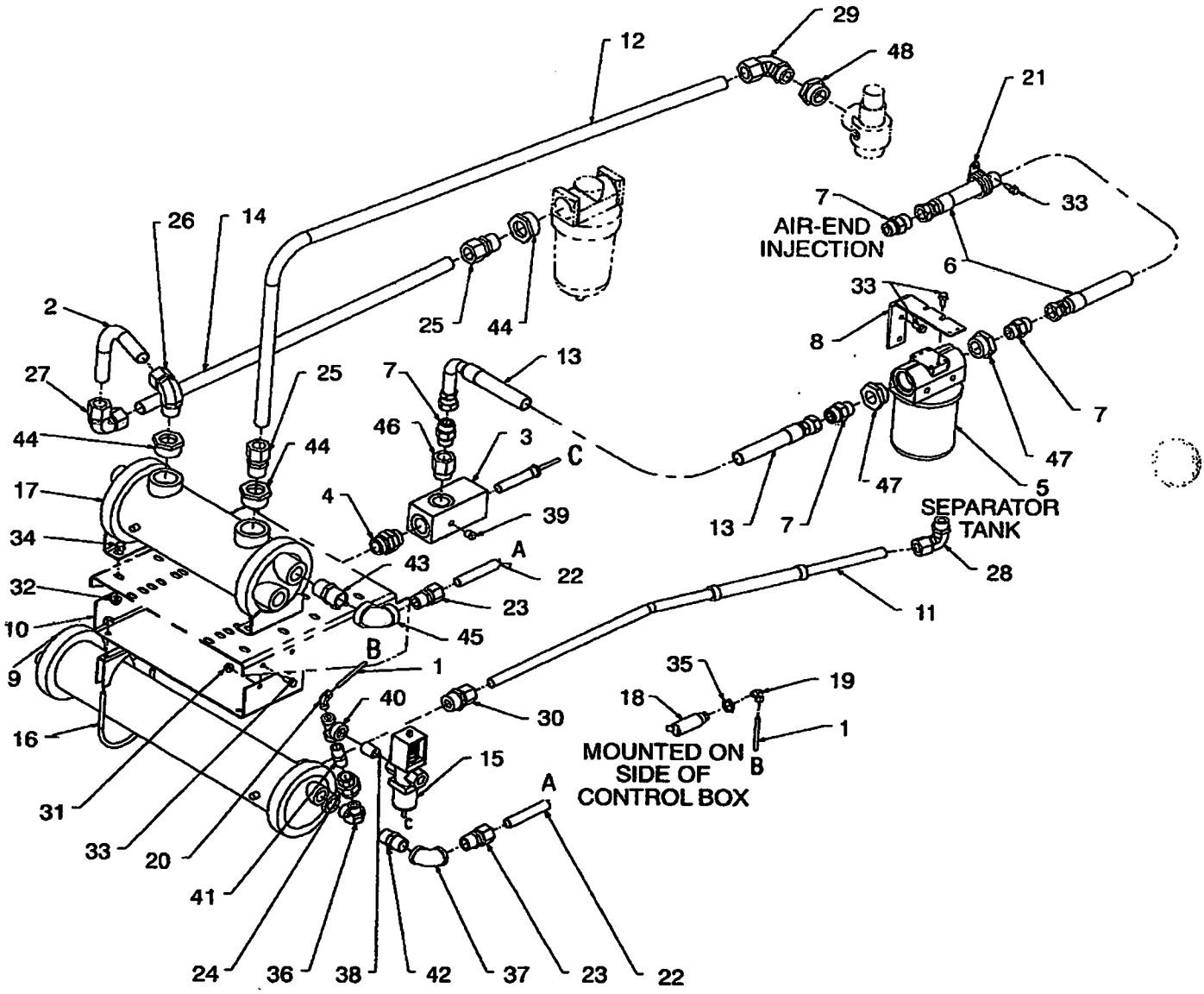
(l) For maintenance on fluid filter no. 02250096-783, order replacement element no. 250025-525.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.8 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 40HP/ 30KW



8.8 COOLING AND LUBRICATION SYSTEM- WATER-COOLED 40HP/ 30KW (CONTINUED)

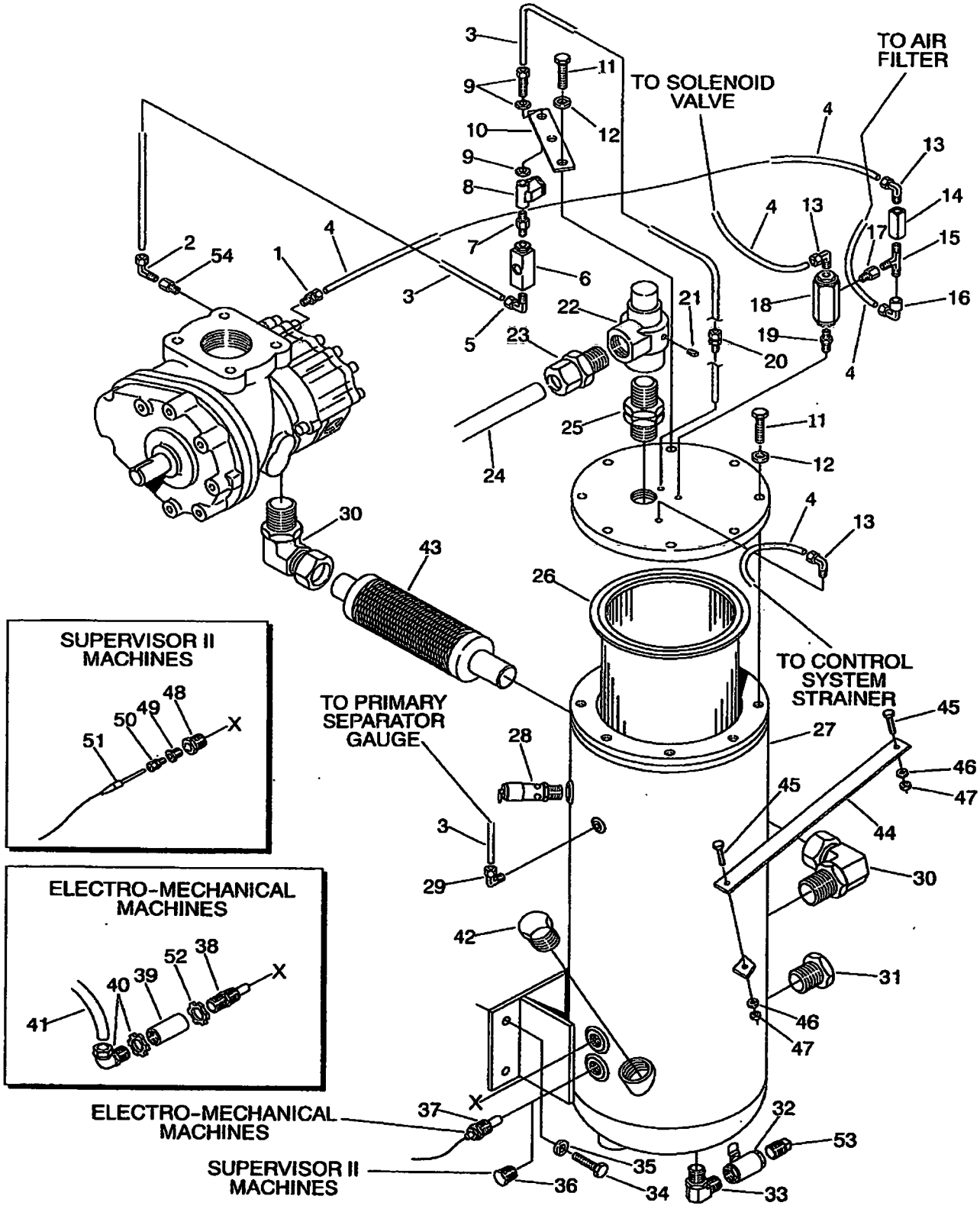
key number	*description*	*part number*	*quantity*
36	elbow, pipe-90m 3/4 x 1/2	860512-050	1
37	elbow, pipe 90 deg plt 3/4"	866215-030	1
38	nipple,pipe-xs plt 1/2 x cl	866408-000	1
39	plug, pipe 1/4" 3000# stl plt	866900-010	1
40	tee, reducing pltd 1/2 x 1/4 x 1/2	867502-012	1
41	nipple,pipe-hx pltd 1/2 x 1/2	868508-050	1
42	nipple,pipe-hx pltd 3/4 x 3/4	868512-075	1
43	nipple,pipe-hx pltd 1 x 1	868516-100	1
44	bushing,red hex pltd 1 1/2 x 1	868906-040	3
45	elbow, red 1 x 3/4 150# plt	869204-030	1
46	reducer,str thrd viton 1 x 3/4	870016-012	1
47	reducer,str thrd viton 1 1/4 x 3/4	870020-012	2
48	reducer,str thrd viton 1 1/4 x 1	870020-016	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.9 DISCHARGE SYSTEM



8.9 DISCHARGE SYSTEM

key number	description	part number	quantity
1	connector, 1/4"tube x 1/4"npt	250018-428	1
2	elbow, tube-m 1/4"t x 1/8"p stainless steel	250211-013	1
3	tube, stainless steel 1/4" 20ga	841215-004	–
4	tube, nylon 1/4" black	02250054-861	–
5	elbow, tube-m 1/4" stainless steel	250211-005	1
6	glass, sight-in line 1/4"npt	046559	1
7	orifice, .094" 1/4"npt steel	022033	1
8	strainer, v-type 300psi x 1/4"npt (I)	241771	1
9	connector, tube-male bulkhead 1/4"t x 1/4"p ststl	870204-025	1
10	support, bracket-oil return	02250101-192	1
11	capscrew, hex gr5 1/2"-13 x 1-1/4" plated	829108-125	8
12	washer, springlock reg plated 1/2"	837808-125	8
13	elbow, 1/4"tube x 1/4"npt	250018-430	3
14	valve, check 1/4" nptf brass viton seal	02250115-272	1
15	tee, pipe 1/4" male npt	869825-025	1
16	elbow, female 1/4"npt x 1/4"T	250041-287	1
17	orifice, .125" x 1/4"mnpt x 1/4"fnpt	02250046-537	1
18	valve, blowdown 1/4" npt	02250049-634	1
19	nipple, pipe 1/4"npt hex	868504-025	1
20	connector, flex 1/4"t x 1/4"p	020169	1
21	plug, pipe 1/8"npt 3000# plated	866900-005	1
22	valve, minimum pressure check 1-5/8" SAE (II)	02250097-609	1
23	connector, tube-straight thread 1" x 1-5/8"	811816-163	1
24	tube, minimum pressure valve/aftercooler	02250099-372	1
25	adapter, SAE 1-5/8"-12 x 1-5/8"-12	02250055-015	1
26	element, separator-primary (III)	250034-113	1
27	tank, separator air/oil 10"dia SAE/ISO	02250096-708	1
28	valve, pressure relief 1/2"npt 200#	250006-938	1
29	elbow, tube-m straight thread ss 1/4" x 7/16"	870807-025	1
30	elbow, tube straight thread 1-1/2" x 1-7/8"	811624-188	2

(Continued on page 73)

(I) For maintenance on strainer no. 241771, order repair kit no. 241772.

(II) For maintenance on minimum pressure check valve no. 02250097-609, order repair kit no. 250026-758; repair kit (for cap) no. 02250046-397; repair kit (for o-ring) no. 02250048-362; repair kit (for piston) no. 02250051-338.

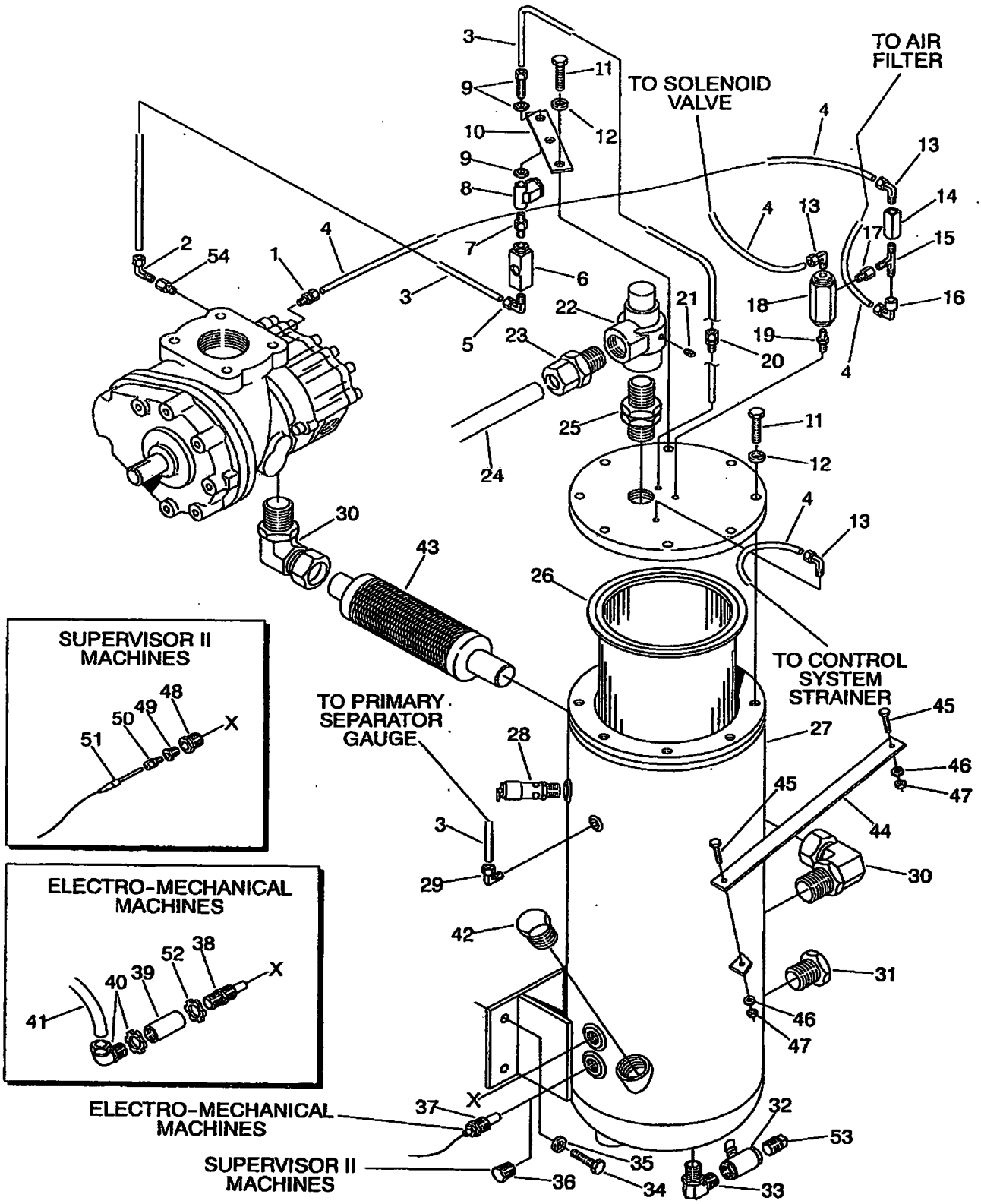
(III) For maintenance on separator element, order replacement element no. 250034-114.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.9 DISCHARGE SYSTEM



8.9 DISCHARGE SYSTEM (CONTINUED)

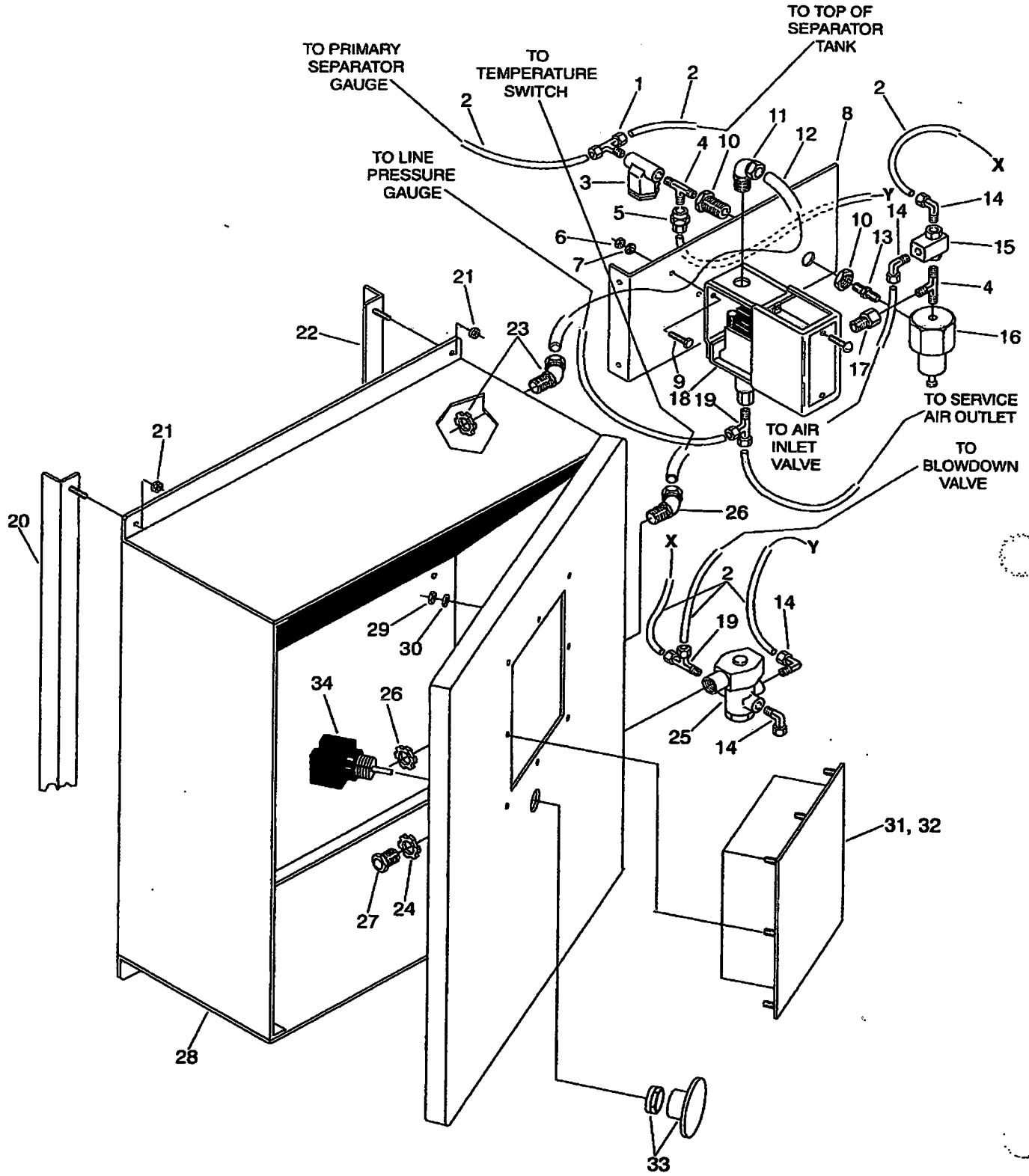
key number	description	part number	quantity
31	plug, sight glass 1-5/16"SAE	02250097-610	1
32	valve, ball 3/8"m x 3/8"f nptf	02250100-094	1
33	elbow, 90° 3/4"SAE x 3/8"f nptf	02250100-093	1
34	capscrew, hex gr5 1/2"-13 x 1-1/4" plated	829108-125	4
35	washer, springlock reg plated 1/2"	837808-125	4
36	plug, straight thread 3/4"-16 SAE viton	250042-623	1
37	gauge, temperature-sump 100°-250°	02250100-096	1
38	switch, temperature 240° 3/4" SAE	02250100-095	1
39	coupling, conduit 1/2"	250007-179	1
40	elbow, 90° conduit 1/2"	846600-050	1
41	conduit, csa flex 1/2"	846315-050	2.5 ft
42	plug, o-ring 1-1/4"	040029	1
43	joint, expansion ls10 unit/tank	02250097-823	1
44	support, tank brace ls10	02250107-906	1
45	capscrew, hex gr5 3/8"-16 x 1"	829106-100	2
46	washer, springlock reg plated 3/8"	837806-094	2
47	nut, hex plated 3/8"-16	825206-337	2
48	adapter, pipe-f 1/2"SAE x 1/4"npt	811504-025	1
49	bushing, reducing 1/4" x 1/8" plated	867100-005	1
50	fitting, compression adjustable	250028-635'	1
51	probe, rtd 100 ohm platinum	250039-909	1
52	locknut, conduit 1/2"	847200-050	1
53	plug, pipe 3/8" 3000# steel	807800-015	1
54	orifice, 1/8 m x 1/8 f x .062	224427	1
55	decal, fluid Sullube	02250069-389	1
	•decal, fluid 24KT	02250069-395	1
	•decal, fluid SRF 1/4000	02250069-391	1
56	decal, warning mixing fluids	02250110-891	1
57	sign, warning compressor fluid fill cap	049685	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.10 CONTROL SYSTEM AND ELECTRICAL PARTS



8.10 CONTROL SYSTEM AND ELECTRICAL PARTS

key number	description	part number	quantity
1	tee, tube 1/4" male branch	250028-582	1
2	tubing, nylon 1/4" black	0225054-861	-
3	strainer, v-type 300 psi x 1/4" npt (I)	241771	1
4	tee, pipe 1/4" male npt	869825-025	2
5	connector, 1/4" tube x 1/4" female npt	250041-084	1
6	nut, hex plated #10-24	825202-130	2
7	washer, springlock reg plated #10	837802-047	2
8	support, bracket pneumatic cntrls	02250104-420	1
9	screw, machine-round #10-24 x 1/2"	831602-050	2
10	bulkhead, pipe 1/4" npt	841500-025	1
11	elbow, 90° conduit 1/4	846600-050	1
12	conduit, csa flex 1/2"	846315-050	0.4 ft
13	nipple, ipe 1/4" hex	868504-025	1
14	elbow, 1/4" tube x 1/4" npt	250018-430	4
15	valve, shuttle 1/4" npt	408893	1
16	valve, pressure regulator (II)	250017-280	1
17	orifice, .040 x 1/4" fnpt x 1/4" mnpt	02250091-395	1
18	switch, pressure (<= 140 psi/ 9.7 bar) (N12)	040694	1
	•switch, pressure (<= 140 psi/ 9.7 bar) (N4)	042570	1
	•switch, pressure (< 140 psi/ 9.7 bar) (N12)	407778	1
	•switch, pressure (< 140 psi/ 9.7 bar) (N4)	410108	1
19	tee, tube 1/4" male run	250038-059	2
20	support, bracket strtr box ls 10 lh	02250106-969	1
21	nut, hex flanged plated 5/16"-18	825305-283	4
22	support, bracket strtr box ls 10 rh	02250104-194	1
23	elbow, 45° conduit 1/2"	846500-050	1
24	locknut, conduit seal N4 1/2"	02250071-362	1
25	valve, solenoid 1/4" 3-way (<= 140 psi/ 9.7 bar) (III)	250038-674	1
	•valve, solenoid 1/4" 3- way (> 140 psi/ 9.7 bar) (IV)	250038-675	1
26	elbow, 45°conduit1/2"	846500-050	1

(Continued on page 77)

(I) For maintenance on strainer no. 241771, order repair kit no. 241772.

(II) For maintenance on pressure regulator valve no. 250017-280, order repair kit no. 250019-453.

(III) For maintenance on solenoid valve no. 250038-674, order repair kit no. 250038-673, and replacement coil no. 250031-772.

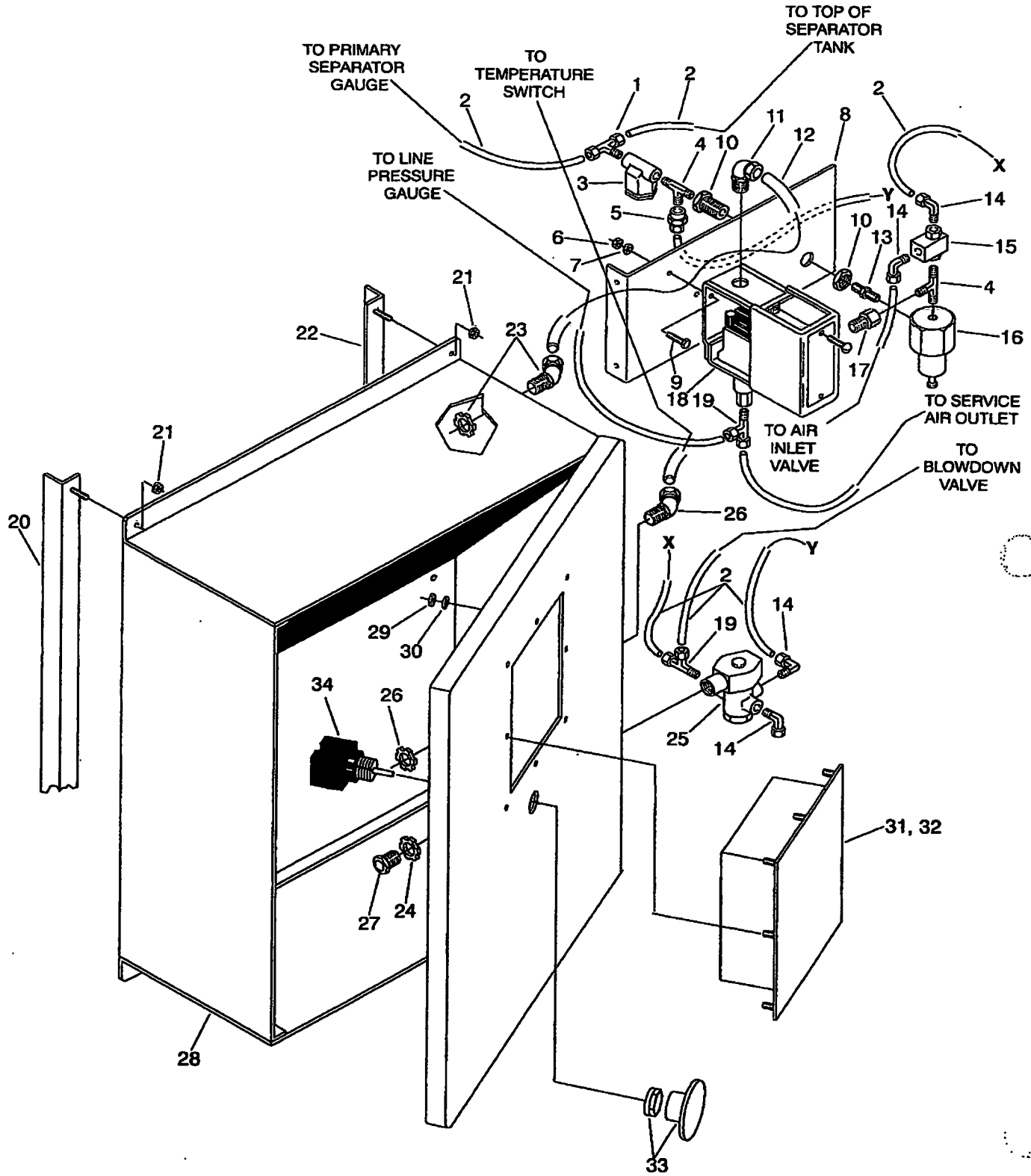
(IV) For maintenance on solenoid valve no. 250038-675, order repair kit no. 02250055-939, and replacement coil no. 250038-730.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.10 CONTROL SYSTEM AND ELECTRICAL PARTS



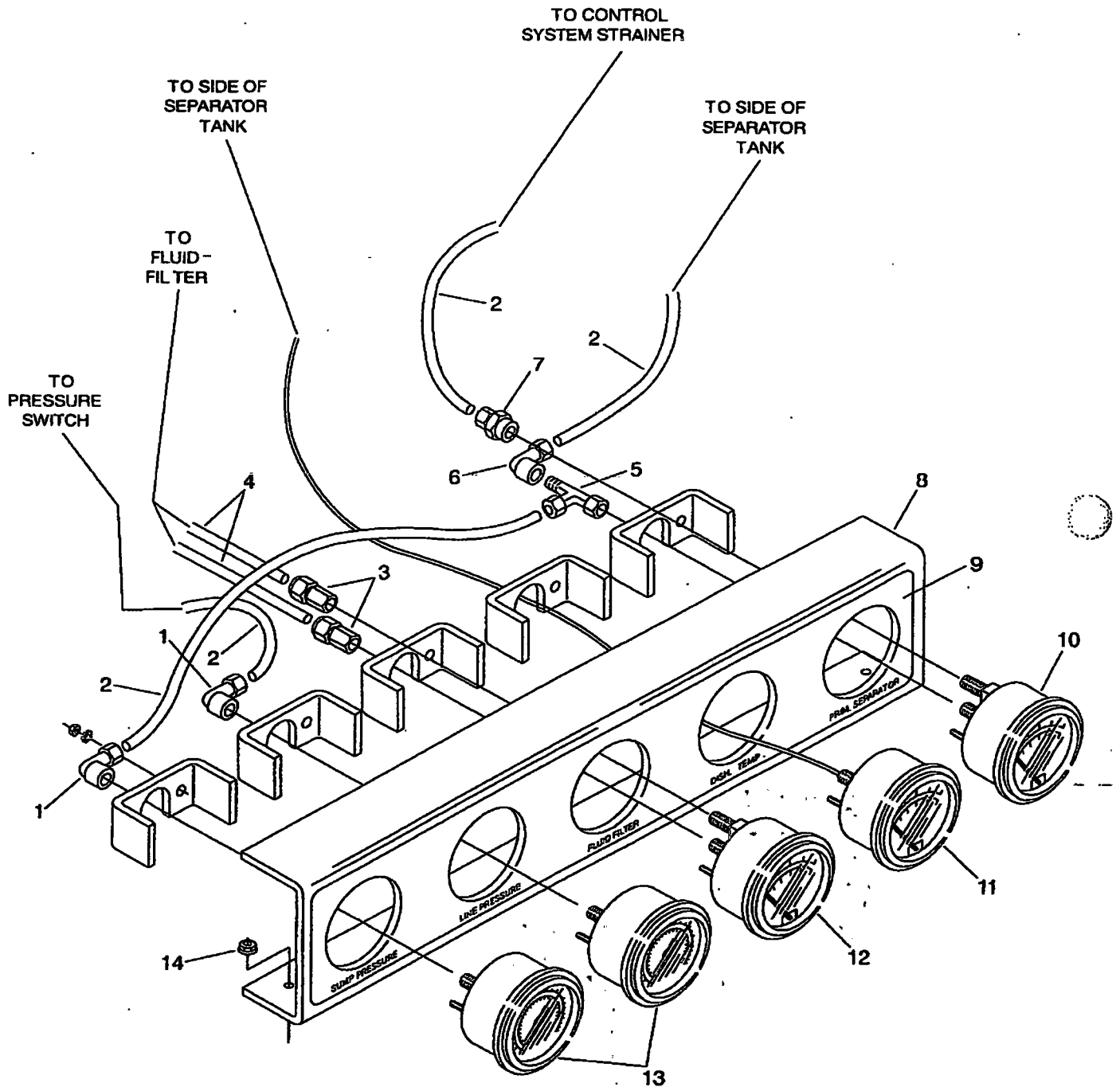
8.10 CONTROL SYSTEM AND ELECTRICAL PARTS (CONTINUED)

key number	*description*	*part number*	*quantity*
27	nipple, chase 1/2"	847815-050	1
28	box, electrical strtr ls 10	consult factory	1
30	washer, springlock m4	838804-090	8
31	gasket, panel Supervisor II	02250048-822	1
32	controller, electro-mechanical	02250106-694	1
	•controller, Supervisor II dlx	02250083-801	1
33	switch, emergency shut-off	02250085-504	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8
ILLUSTRATIONS AND PARTS LIST

8.11 INSTRUMENT PANEL



8.11 INSTRUMENT PANEL

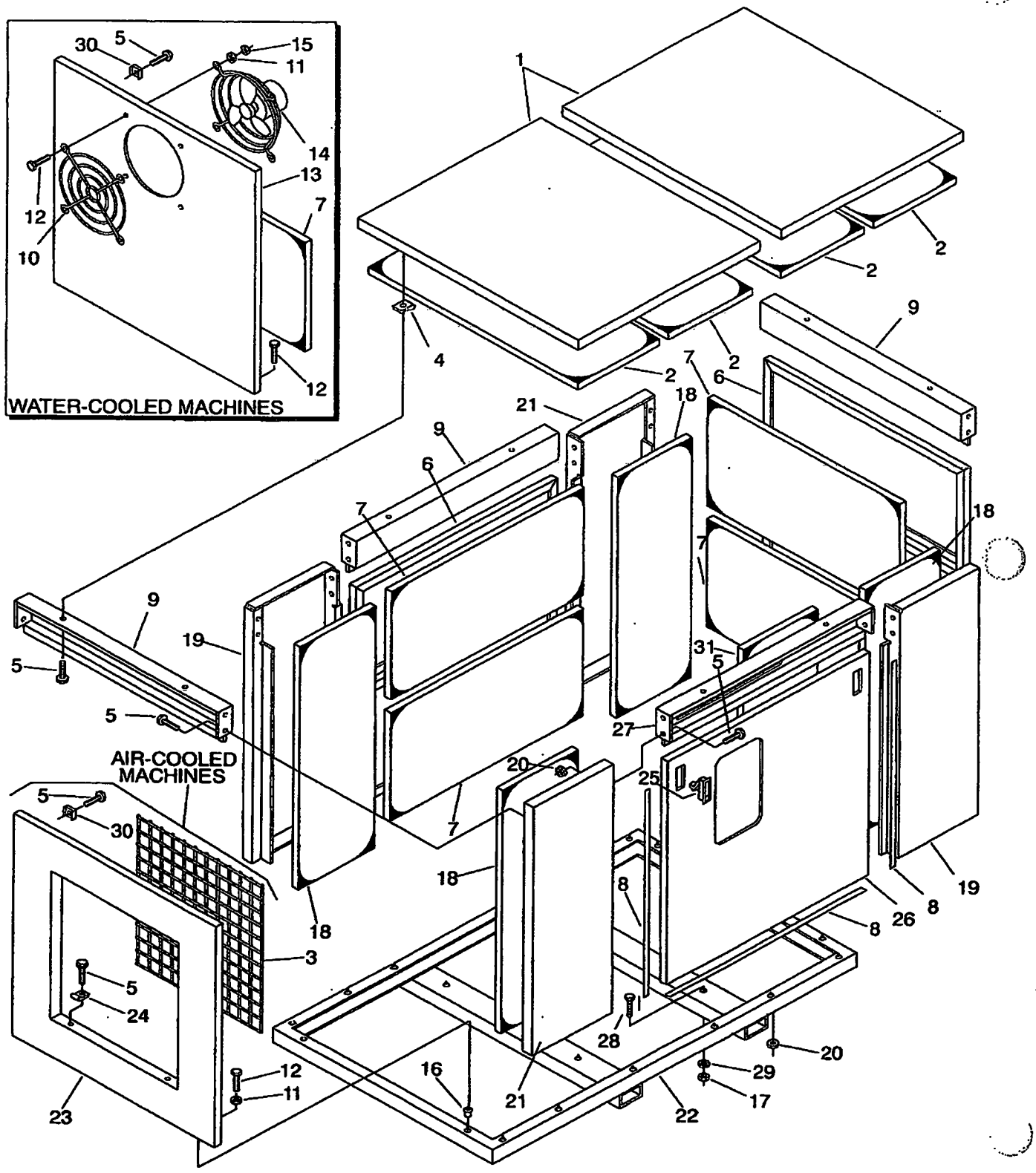
key number	*description*	*part number*	*quantity*
1	elbow, 90° 1/4"t x 1/8" female npt	250041-286	2
2	tubing, nylon 1/4" black	02250054-861	-
3	connector, tube-f 1/4"t x 1/8"p stainless steel	250139-050	2
4	tubing, stainless steel 1/4" 20ga	841215-004	-
5	tee, adaptor 1/4"t x 1/8"m x 1/8"f	869704-012	1
6	elbow, tube-f 1/4"t x 1/8"p stainless steel	250211-030	1
7	connector, female 1/4"t x 1/8"npt	250021-379	1
8	panel, mounting gauge e/mdc	02250104-355	1
9	decal, instrument panel 10 series universal	02250060-034	1
10	gauge, differential pressure 0-30psi	250003-799	1
11	gauge, temperature 100°-250°F-3/4" SAE	02250100-096	1
12	gauge, differential pressure 0-15psi	250003-798	1
13	gauge, pressure 2" dia 0-230#	250005-185	2
14	nut, hex flanged plated 5/16"-18	825305-283	2

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.12 ENCLOSURE



8.12 ENCLOSURE

key number	description	part number	quantity
1	panel, roof ls10	250018-316	2
2	panel, fiberglass 5" x 35-1/2"		4
3	connector, tube-f 1/4"t x 1/8"p stainless steel	242095	1
4	nut, retainer "j" 5/16"-18	861505-140	14
5	screw, ser washer 5/16" x 3/4"(AC)	829705-075	40
	•screw, ser washer 5/16" x 3/4"(WC)	829705-075	36
6	panel, access	014620	2
7	panel, fiberglass 15-1/4" x 32-1/2"		4
8	weatherstrip, felt	02250058-345	75
9	panel, enclosure center	224585	3
10	guard, fan 13"	241579	1
11	washer, springlock reg plated 1/4"(AC)	837804-062	8
	•washer, springlock reg plated 1/4"(WC)	837804-062	12
12	capscrew, hex gr5 1/4"-20 x 1"(AC)	829104-100	8
	•capscrew, hex gr5 1/4"-20 x 1"(WC)	829104-100	12
13	panel, wc end	02250043-677	1
14	fan, enclosure wc	241580	1
15	nut, hex plated 1/4"-20	825204-226	4
16	rivet, tubular 1/4"-20	049824	8
17	nut, hex plated 1/2"-13	825208-448	4
18	panel, fiberglass 13" x 36-1/2"	250020-059	4
19	panel, enclosure – right hand corner	224583	2
20	nut, hex ser washer 5/16"-18 plated (AC)	825305-283	28
	•nut, hex ser washer 5/16"-18 plated (WC)	825305-283	24
21	panel, enclosure-left hand corner	224584	2
22	frame, enclosure-sub	014790	1
23	panel, cooler end (AC)	02250105-122	1
24	clamp, wire	043194	4
25	latch, door black	02250094-632	4
26	panel, access front	02250105-123	1
27	panel, enclosure instrument access(e/m dc)	02250104-191	1
	•panel, enclosure center(supervisor)	224585	1
28	capscrew, hex gr5 pltd 1/2"-13 x 1-1/2"	829108-150	4
29	washer, springlock reg plated 1/2"	837808-125	4
30	nut, retainer 5/16"-18	861405-092	4
31	panel, fiberglass	250034-038	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.13 DECAL GROUP

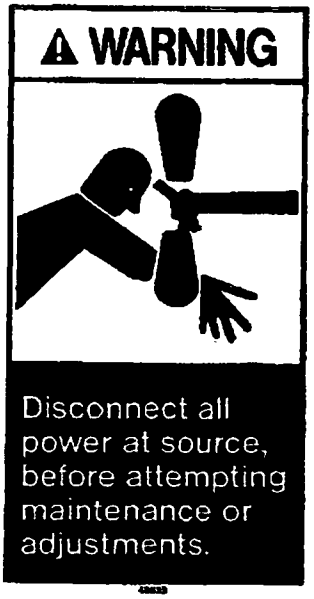


1

1 CR	1 TR	LINE PRESS	INLET
2 CR	2 TR	DISCH PRESS	T1
3 CR	3 TR	WATER PRESS	T2
4 CR	4 TR	SEPARATOR	T3
5 CR	1 M	SPIRAL VALVE	T4
6 CR	2 M	INLET VALVE	T5
1 FU	3 M	CIS VALVE	T6
2 FU	4 M	OIL PRESS	T3
3 FU	HCR	OIL FILTER	T4

2500369-457

2



3



4

CAUTION: This machine is equipped with Automatic Stop / Start Control System. DO NOT ATTEMPT to make any adjustment without disconnecting both main line and control circuit electrical power. 41065

6



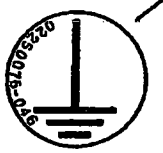
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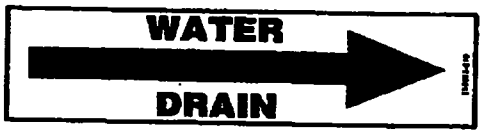
5



7



8



10

LS-10

11

8.13 DECAL GROUP

key number	*description*	*part number*	*quantity*
1	decal, fork lifting	241814	4
2	decal, electrical component	250038-457	1
3	sign, warning sever fan	049855	2
4	sign, warning sever fan port	049965	1
5	sign, danger electrocution	049850	1
6	decal, warning auto start	041065	1
7	decal, 460 voltage international (I)	02250069-399	1
8	decal, earth ground	02250075-046	1
	•decal, protective earth ground (not shown)	02250075-045	1
	•decal, PE designation (not shown)	02250075-540	1
9	decal, warning ground fault	049852	1
10	decal, water drain	250022-810	1
11	decal, LS-10 2" high	02250060-916	1

(Continued on page 85)

(I) Compressor voltage may vary. Consult Factory with machine serial number.

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.13 DECAL GROUP



8.13 DECAL GROUP (CONTINUED)

key number	*description*	*part number*	*quantity*
12	sign, warning "food grade" lube	250003-144	1
13	sign, danger air breathing	250027-935	1
14	sign, warning compressor fluid fill cap	049685	1
15	decal, warning auto start	250017-903	1
16	decal, fluid Sullube	02250069-389	1
	•decal, fluid 24KT (not shown)	02250069-395	1
	•decal, fluid SRF 1/4000 (not shown)	02250069-391	1
17	decal, warning mixing fluids	02250110-891	1
18	decal, gauge fluid level	250020-730	1
19	decal, danger high voltage	042218	1
20	decal, "water in"	250019-107	1
21	decal, "water out"	250019-108	1
22	decal, water inlet/outlet	049873	1

(Continued on page 87)

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8
ILLUSTRATIONS AND PARTS LIST

8.13 DECAL GROUP

SULLAIR®

23

24

24KT

25

26

This product was manufactured to the highest quality standards in an ISO 9001 certified system.
Ce produit a été fabriqué selon les normes les plus strictes de qualité dans un système ISO 9001 certifié.
Dieses Produkt wurde in einem mit ISO 9001 Zertifikat versehenenSystem hergestellt und entspricht den höchsten Qualitäts normen.
Dette produkt er fremstillet i overensstemmelse med de strengeste kvalitetsnormer i et ISO 9001 - certificeret anlæg.

ISO 9001

Το προϊόν αυτό έχει κατασκευασεί σύμφωνα με τις αλέον αυστηρές προδιαγραφές
ποιότητας σε εγκατάσταση πιστοποιημένη με ISO 9001.
Dit produkt werd volgens de hoogste kwaliteitseisen geproduceerd in een ISO-9001 gecertificeerd kwaliteitssysteem.
Este producto ha sido fabricado según los más altos estándares de calidad en un sistema con la certificación ISO 9001.
Questo prodotto è stato fabbricato secondo i più alti standard qualitativi, in un sistema omologato ISO 9001.
本產品是由取得最高品管水准 ISO 9001 資格之製造廠所生產

© Copyright 1998 Sullair Corporation. All Rights Reserved

GENUINE SULLAIR. SERVICE PARTS

MODEL:
LS10 25HP, 30HP & 40HP

DESCRIPTION:	P/N
ELEMENT, SEPARATOR	250034-114
ELEMENT, AIR FILTER (25/30HP)	043334
ELEMENT, AIR FILTER (40HP)	040598
ELEMENT, FLUID FILTER	250025-525
KIT, THERMO VLV REPAIR (170°F)	250025-621
KIT, THERMO VLV REPAIR (190°F)	02250103-562
KIT, INLET VALVE REPAIR	250019-451
KIT, INLET VALVE SPRING	250020-315
KIT, MIN PRESS CHECK REPAIR	02250110-988
KIT, BLOWDOWN VALVE REPAIR	250031-772
KIT, FLUID RETURN LINE STRAINER	241772
KIT, PRESSURE REGULATOR REPAIR	250019-453

•• STD. COMPRESSOR FLUID OPTIONS:

SRF 1/4000 FLUID (5 GAL.)	250019-562
SULLUBE 32 FLUID (5 GAL.)	250022-669
24KT FLUID (5 GAL.)	02250051-053

•• SEE COMPR. FILL DECAL FOR CORRECT FLUID

THE ABOVE PARTS SHOULD BE ORDERED FROM A LOCAL SULLAIR DISTRIBUTOR. FOR INFORMATION REGARDING THE LOCATION OF YOUR NEAREST SULLAIR DISTRIBUTOR CONTACT:

SULLAIR CORPORATION TEL. (800) SULLAIR
PARTS DIVISION
1625 E. SECOND ST.
MICHIGAN CITY, IN. 46360

02250103-910

27

DANGER!
Lethal shock hazard. Disconnect all power at source before opening or servicing.

DANGER!
Danger mortel d'électrocution. Débranchez toute source d'alimentation avant toute ouverture ou intervention de maintenance de la machine.

GEFAHR!
Tödlich Stromschlaggefahr. Vor jeder Öffnung oder jedem Eingriff am Anlasserrelais oder am Schaltschrank sämtliche Stromzufuhrenvziehen.

PERICOLO!
Pericolo mortale di elettrocuzione. Disinserire tutte le fonti di alimentazione prima di qualsiasi apertura o di qualsiasi intervento di manutenzione della macchina.

¡PELIGRO!
Peligro mortal de electrocución. Desconectar todas las fuentes de alimentación antes de abrir o de realizar una intervención de mantenimiento en la máquina.

!危险
内有高压，小心触电。拆卸保养之前应断开所有电源。

28

MACH. S/N _____ MODEL # _____
CUST. NAME _____
ADDRESS _____
CITY / STATE _____ ZIP _____
CUST. PRODUCT _____
BRAND OF FLUID _____
HOURS ON MACH. _____ FLUID _____
DATE SAMPLE TAKEN: _____
DISCHARGE TEMP. _____ °F
AMBIENT TEMP. _____ °F
FLUID USAGE RATE - GAL / MO. _____
SAMPLE TAKEN FROM: _____
COMMENTS: _____

8.13 DECAL GROUP (CONTINUED)

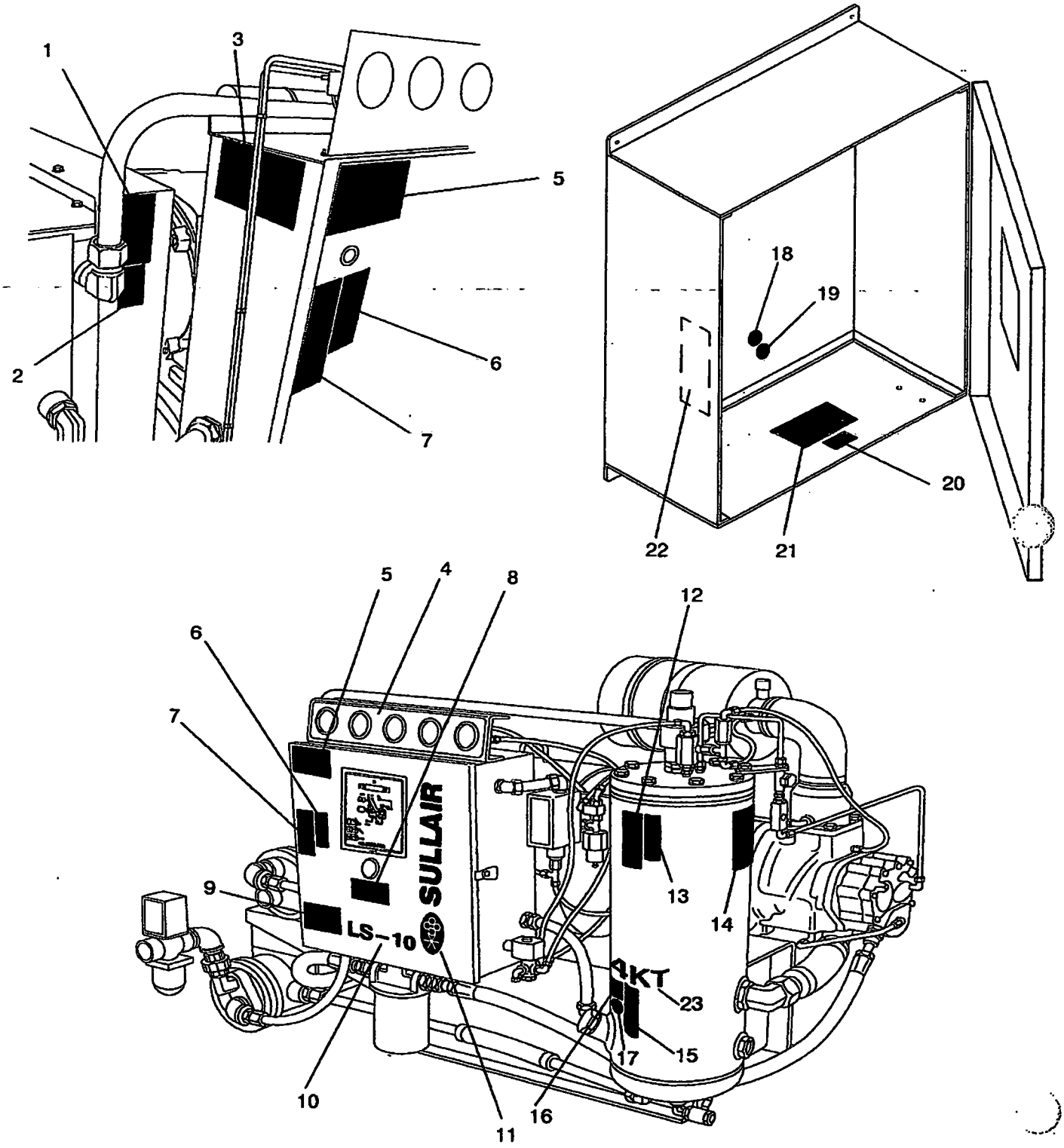
key number	*description*	*part number*	*quantity*
23	decal, Sullair	02250059-054	2
24	decal, 24 KT	02250061-016	1
25	decal, maintenance kit LS-10	02250103-910	1
26	decal, ISO 9001	02250057-624	1
27	decal, electrocution hazard international	02250077-472	1
28	decal, fluid sample	250022-675	1
32	plate, rotation arrow (not shown)	02250057-737	1
33	decal, instrument pnl universal (not shown)	02250051-301	1
34	decal, instument pnl universal (not shown)	02250051-303	1
35	decal, instrument pnl universal-dual cntrl (not shown)	02250059-410	1
36	decal, instrument pnl 10 Series universal (see Section 8.9)	02250060-034	1
37	label, Supervisor II info univ dlx (not shown)	02250071-152	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8

ILLUSTRATIONS AND PARTS LIST

8.14 DECAL LOCATIONS



8.14 DECAL LOCATIONS (CONTINUED)

key number	*description*	*part number*	*quantity*
1	sign, warning sever fan	049855	2
2	sign, warning sever fan port	049965	1
3	decal, instument pnl universal	02250051-303	1
4	decal, instrument pnl universal	02250051-301	1
5	decal, electrocution hazard international	02250077-472	1
6	sign, danger electrocution	049850	1
7	decal, warning auto start	250017-903	1
8	decal, warning auto start	041065	1
9	decal, ISO 9001	02250057-624	1
10	decal, LS-10 2" high	02250060-916	1
11	decal, Sullair	02250059-054	2
12	sign, warning "food grade" lube	250003-144	1
13	sign, danger air breathing	250027-935	1
14	decal, maintenance kit LS-10	02250103-910	1
15	sign, warning compressor fluid fill cap	049685	1
16	decal, warning mixing fluids	02250110-891	1
17	decal, fluid Sullube	02250069-389	1
	•decal, fluid 24KT	02250069-395	1
	•decal, fluid SRF 1/4000	02250069-391	1
18	decal, protective earth ground	02250075-045	1
19	decal, PE designation	02250075-540	1
20	decal, danger hi voltage	042218	1
21	decal, 460 voltage international (I)	02250069-399	1
22	decal, warning auto start (II)	250017-903	1
23	decal, 24 KT (III)	02250061-016	1

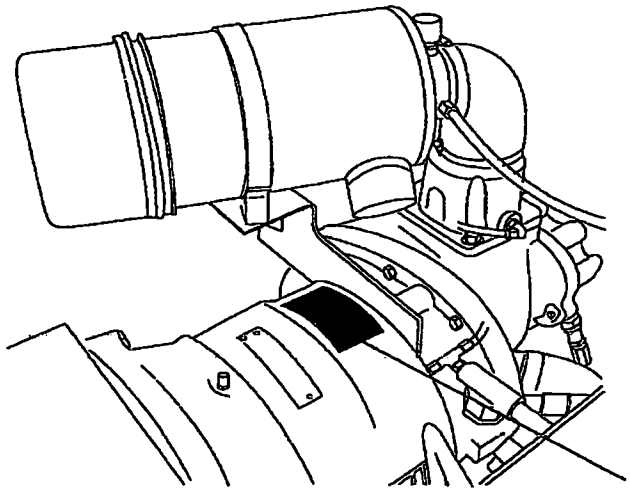
(Continued on page 91)

(I) Compressor voltage may vary. Consult Factory with machine serial number.
(II) Decal is located where shown, but on the inside of the control box (left side).
(III) Decal used when applicable with 24KT fluid only.

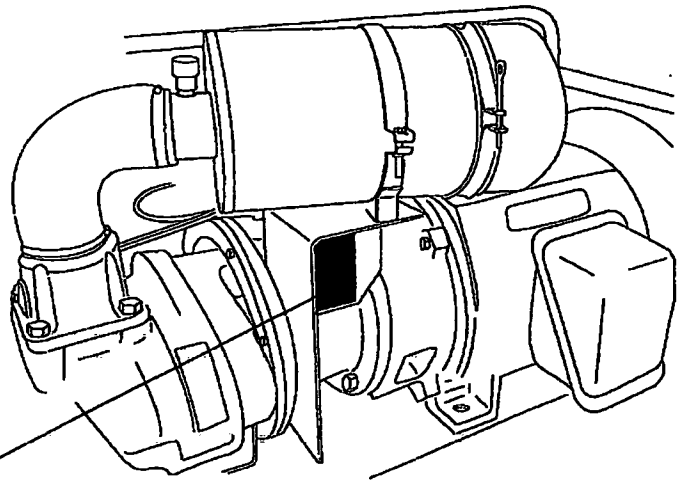
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8
ILLUSTRATIONS AND PARTS LIST

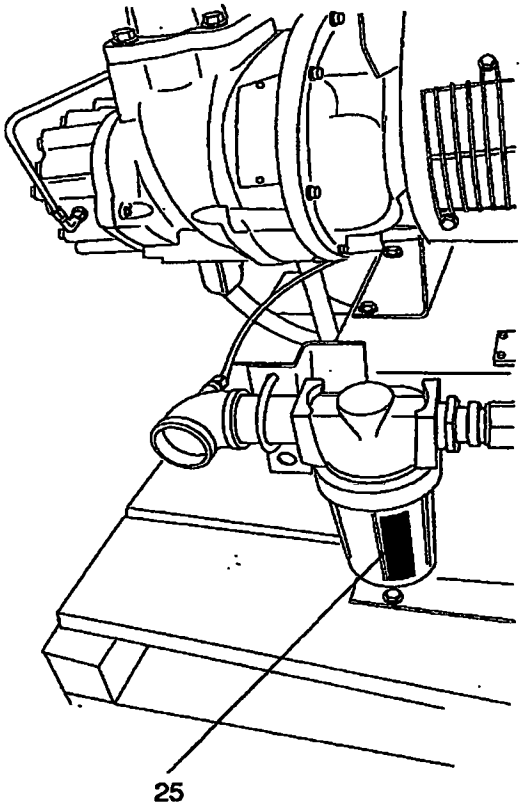
8.14 DECAL LOCATIONS

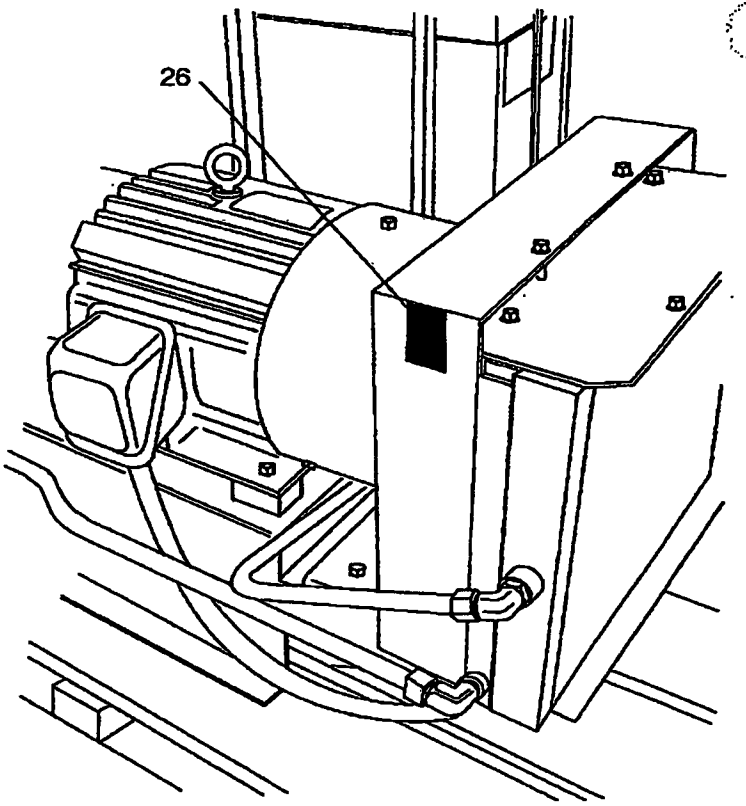


25–30 HP Model



40 HP Model





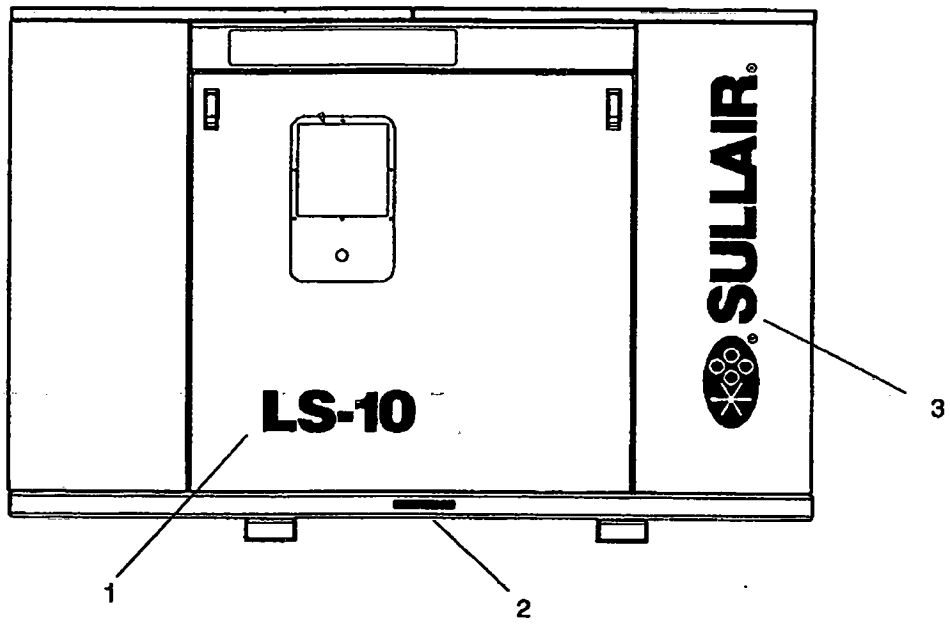
8.14 DECAL LOCATIONS (CONTINUED)

key number	*description*	*part number*	*quantity*
24	sign, warning sever fan	049855	2
25	decal, water drain	250022-810	1
26	sign, warning sever fan port	049965	1

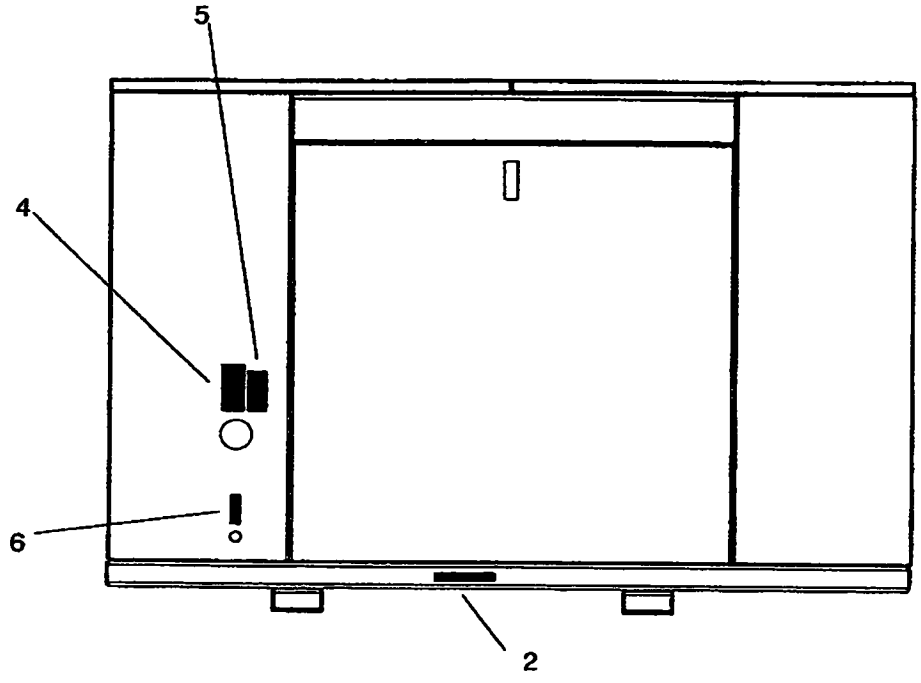
PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

Section 8
ILLUSTRATIONS AND PARTS LIST

8.15 DECAL LOCATIONS- ENCLOSURE



FRONT VIEW



REAR VIEW

8.15 DECAL LOCATIONS- ENCLOSURE

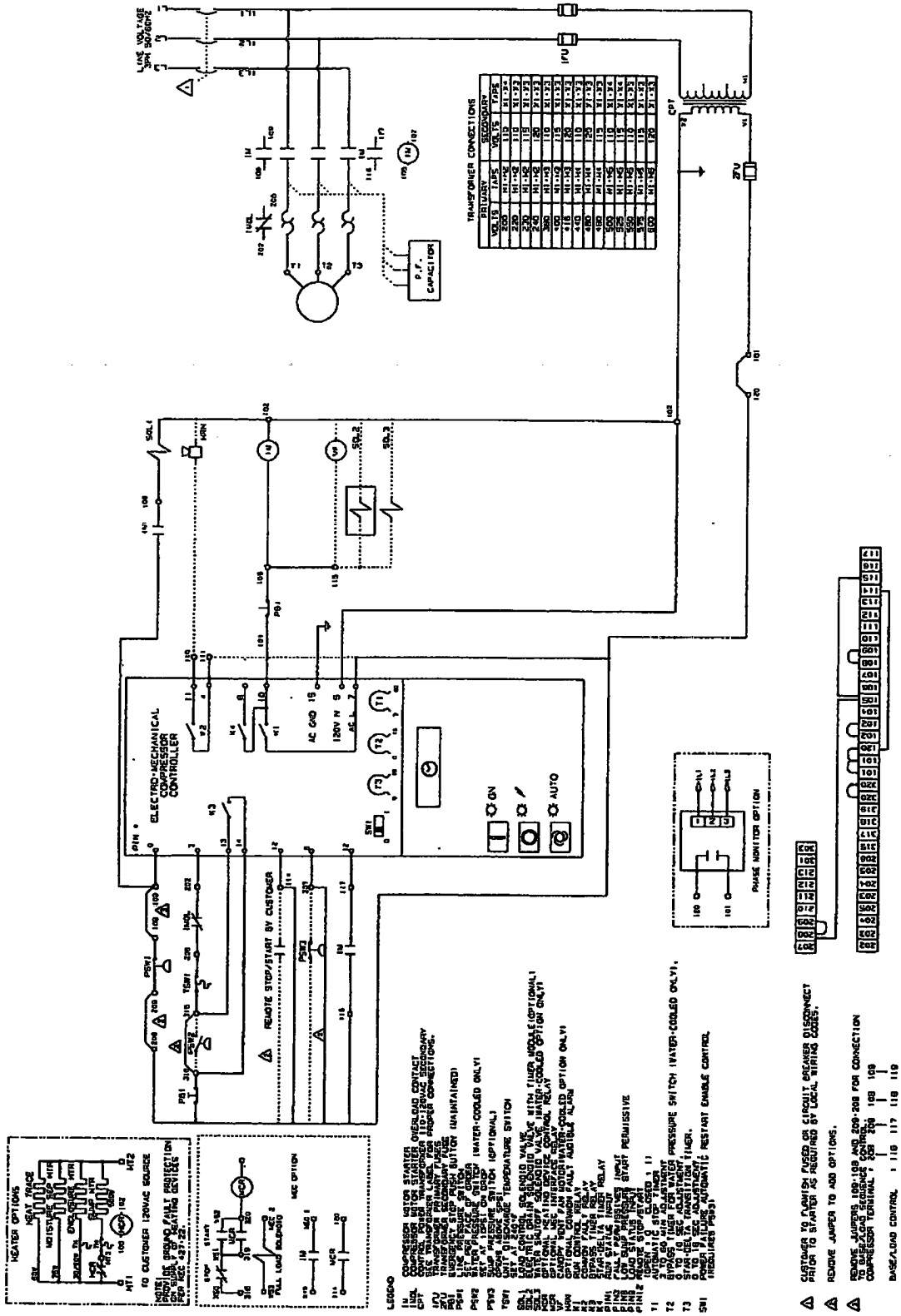
key number	*description*	*part number*	*quantity*
1	decal, LS-10 2" high	02250060-916	1
2	decal, fork lifting	241814	2
3	decal, Sullair	02250059-054	1
4	sign, warning "food grade" lube	250003-144	1
5	sign, danger air breathing	250027-935	1
6	decal, water drain	250022-810	1

PLEASE NOTE: WHEN ORDERING PARTS, INDICATE SERIAL NUMBER OF COMPRESSOR

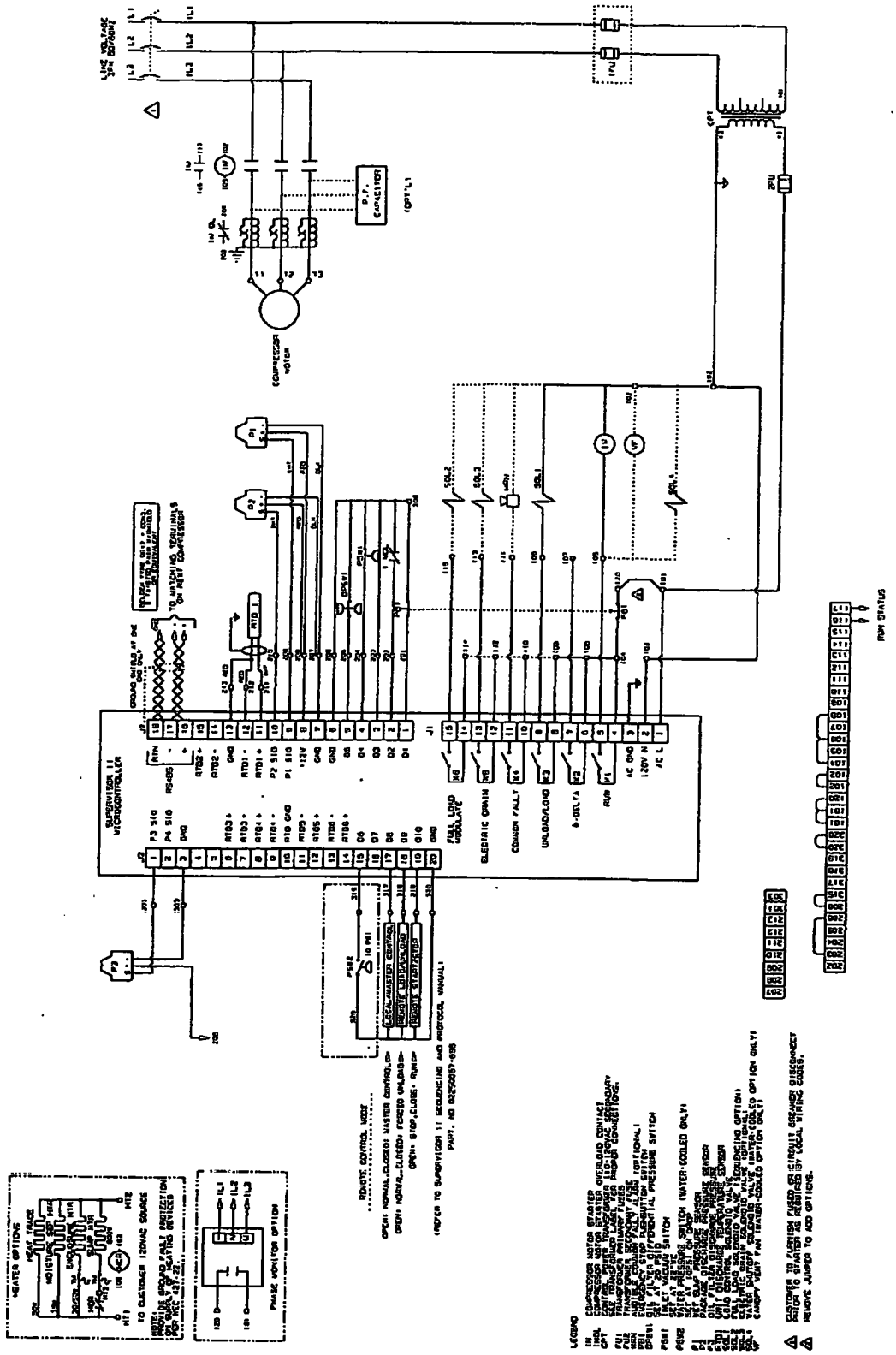
Section 8

ILLUSTRATIONS AND PARTS LIST

8.16 WIRING DIAGRAM- ELECTRO/MECHANICAL (AIR-COOLED/WATER-COOLED)

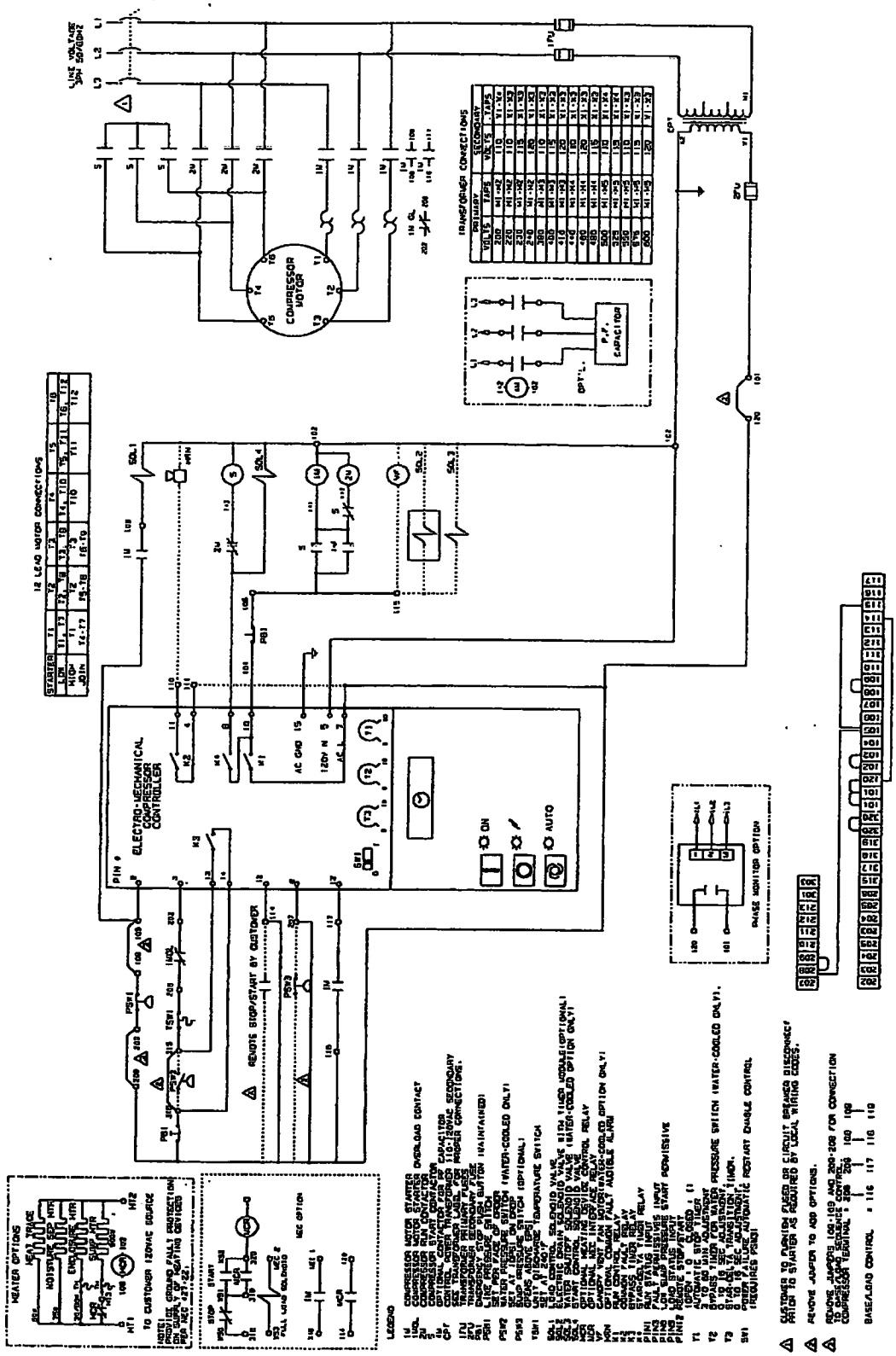


8.17 WIRING DIAGRAM- SUPERVISOR II DELUXE (AIR-COOLED/WATER-COOLED)

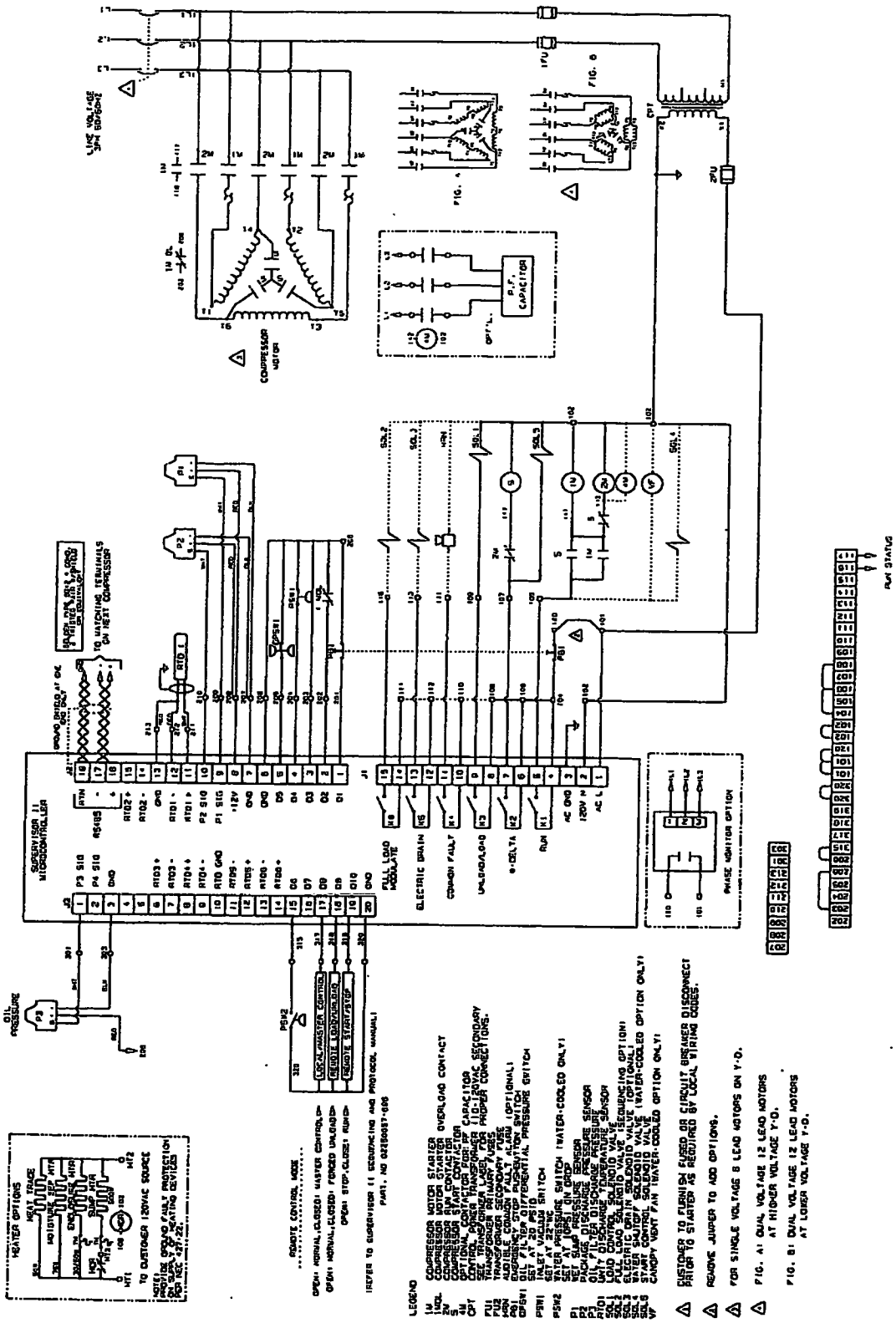


Section 8
ILLUSTRATIONS AND PARTS LIST

8.18 WIRING DIAGRAM- WYE-DELTA ELECTRO-MECHANICAL (AIR-COOLED/WATER-COOLE

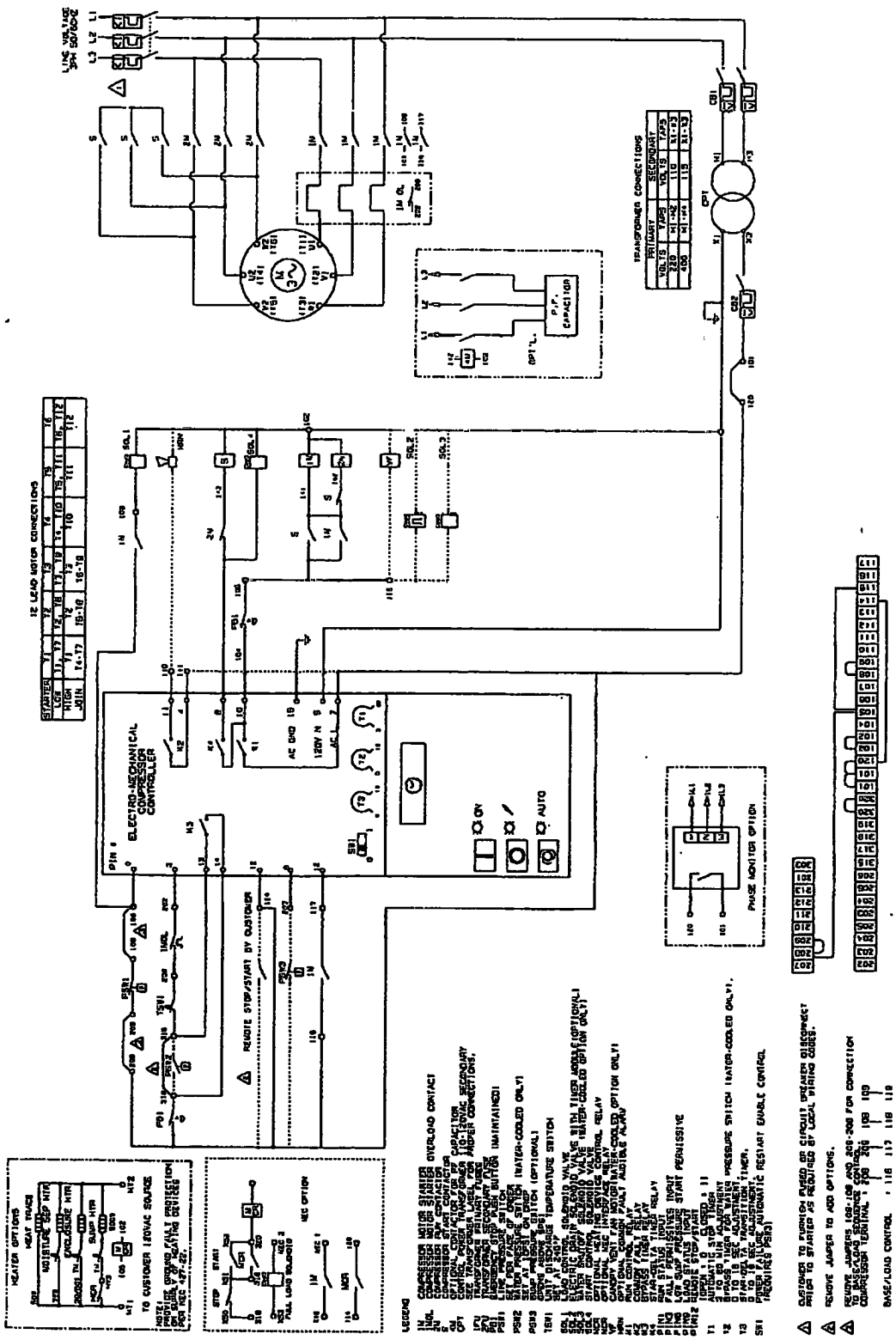


8.19 WIRING DIAGRAM- WYE-DELTA SUPERVISOR II DELUXE (AIR-COOLED/WATER-COOLED)

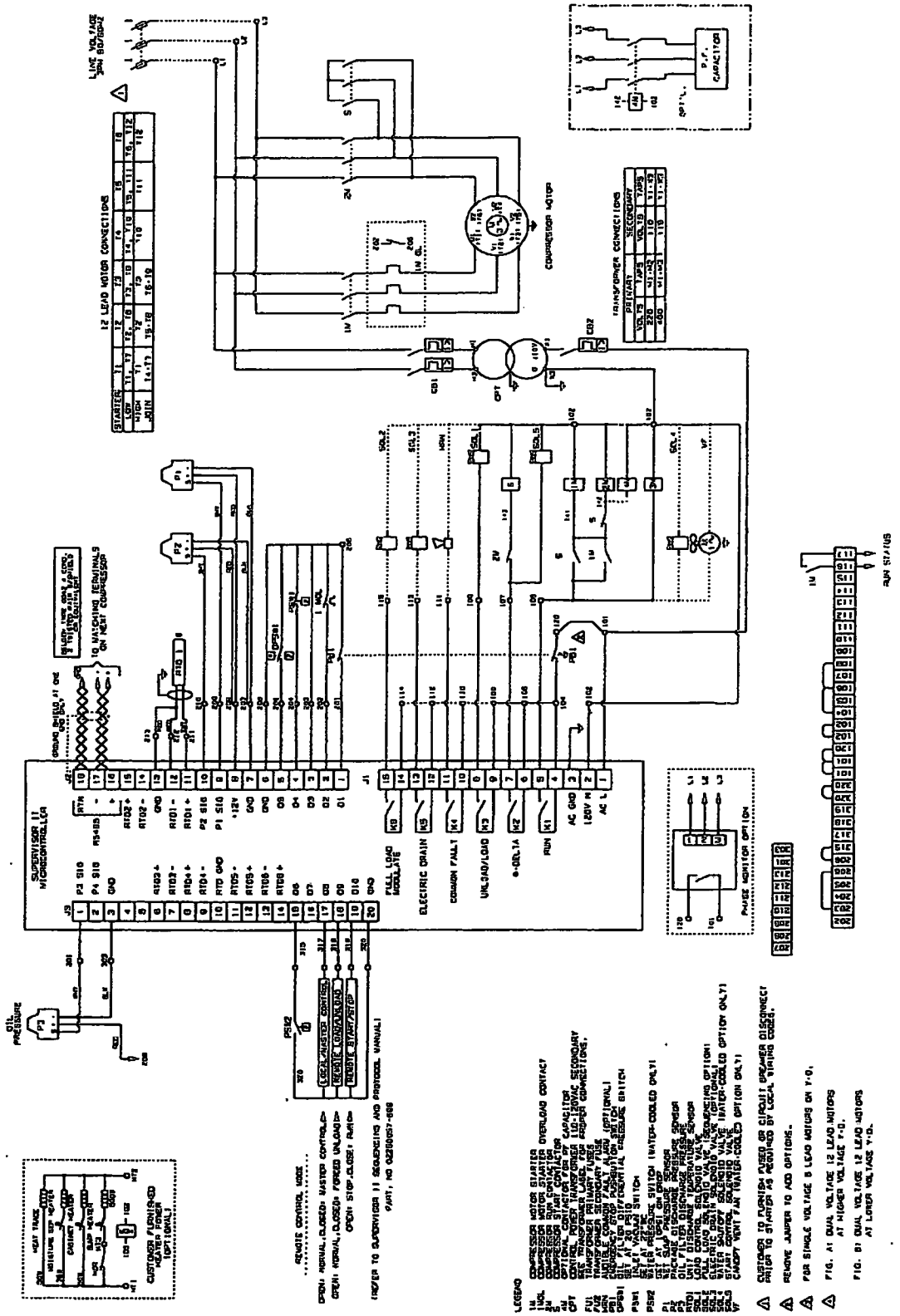


Section 8
ILLUSTRATIONS AND PARTS LIST

8.20 WIRING DIAGRAM– WYE-DELTA ELECTRO-MECHANICAL (EUROPEAN) (AIR-COOLED/WATER-COOLED)



8.21 WIRING DIAGRAM– WYE–DELTA SUPERVISOR II (EUROPEAN) (AIR–COOLED/WATER–COOLED)



WORLDWIDE SALES AND SERVICE

SULLAIR ASIA, LTD.
Sullair Road, No. 1
Chiwan, Shekou
Shenzhen, Guangdong PRV.
PRC POST CODE 518068
Telephone: 755-6851686
Fax: 755-6853473

SULLAIR EUROPE, S.A.
Zone Des Granges BP 82
42602 Montbrison Cedex, France
Telephone: 33-477968470
Fax: 33-477968499

SULLAIR CORPORATION
3700 East Michigan Boulevard
Michigan City, Indiana 46360 U.S.A.
Telephone: 1-219-879-5451
Fax: (219) 874-1273
Fax: (219) 874-1835 (Parts)
Fax: (219) 874-1288 (Service)

CE

Printed in U.S.A.

Specifications Subject To
Change Without Prior Notice

FORM U-3 MANUFACTURER'S CERTIFICATE OF COMPLIANCE COVERING PRESSURE VESSELS TO BE STAMPED WITH THE UM SYMBOL. SEE U-1(j)

(659692)

As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1

PV DH-115/165

1. Manufactured and certified by HANKISON INTERNATIONAL DIVISION OF HANSEN INC., 75 MUSEUM ROAD ARDEN, WASHINGTON, PENNSYLVANIA 15301 (Name and address of manufacturer)

2. Manufactured for STOCK A-1 AIR COMPRESSOR - ADDISON IL (Name and address of purchaser)

3. Location of installation UNKNOWN (Name and address)

4. Type Vertical (Horiz., vert. or sphere) | SEPARATOR (Tank, separator, etc.) | 2.1 CU FT (Capacity) | 24642 - 24643 (Mfg's serial No.)

C7563.65284071 (CRN) | 33.8344-11 REV.F (Drawing no.) | 2000 (Year built)

5. ASME Code, Section VIII, Div. 1 Edition 1998, Addenda 1999 (Edition and Addenda (Date)) | - (Code Case No.)

6. Shell: (a) No. of course(s): 1 (b) Overall length (ft & in.): 5',3.125"

Course(s)			Material	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B & C)			Heat Treatment	
No.	Diameter, in.	Length (ft & in.)	Spec./Grade or Type	Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	8.250" ID	5',3.125"	SA-53 Gr B	.188"	0	E	None	85	2	-	65	-	-

7. Heads: (a) SA-414 Gr G - (Mat'l Spec No., Grade or Type) H.T. - Time & Temp. (b) SA-414 Gr G - (Mat'l Spec No., Grade or Type) H.T. - Time & Temp.

	Location (Top, Bottom, Ends)	Thickness Min.	Thickness Corr.	Radius Crown	Radius Knuckle	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure Convex	Side to Pressure Concave	Category A Type	Category A Full, Spot, None	Category A Eff.
(a)	Top	.176"		-	-	2:1	-	-	-	-	CONCAVE	SMLS	None	85
(b)	Bottom	.176"		-	-	2:1	-	-	-	-	CONCAVE	SMLS	None	85

If removable, bolts used (describe other fastening) - (Mat'l Spec. No., Grade, Size, No.)

8. Type of Jacket - Jacket Closure - (Describe as ogee & weld, bar, etc.)

If bar, give dimensions, if bolted describe or sketch -

9. MAWP 250 Internal / - External psi at max. temp. 200 Internal / - External °F Min. design metal temp. -20 °F at 250 psi.

10. Impact test NO PER UG-20(F) (Indicate yes or no and the component(s) impact tested)

11. Hydro., ~~pneu.~~, or ~~comb.~~ test press. 325 Proof test -

12. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain)	No	Diameter or Size	Flange Type	Material Nozzle	Material Flange	Nozzle Thickness Nom.	Nozzle Thickness Corr.	Reinforcement Material	How Attached Nozzle	How Attached Flange	Location (Insp. Open.)
IN/OUTLET	1/1	NPS 2	NIPL	SA-106B	-	.154"	0	-	WELDED	-	-
INSP OPEN	2	NPS 1	H-CPLG	SA-105	-	CL3000	0	-	WELDED	-	T/B HEAD
INSTR	2	NPS 1/8	H-CPLG	SA-105	-	CL3000	0	-	WELDED	-	-

13. Supports: Skirt NO (Yes or no) Lugs 3 (No.) Legs 1 (No.) Other - (Describe) Attached SHELL, BTM HEAD, WELDED (Where and how)

14. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report:
(List the name of part, item number, mfg's. name and identifying number)

-

15. Remarks: 4) B/M: 33.8344-11 ECO.6
9) HYDRO TESTED IN VERTICAL POSITION
12) SAFETY VALVE LOCATED ELSEWHERE IN SYSTEM

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements made in this report are correct and that all details of design, material, construction, and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1.

UM Certificate of Authorization No. 17,117 Expires SEPT. 16 2000

Date 7/13/00 Name HANKISON INTERNATIONAL DIVISION OF HANSEN INC. (Manufacturer) Signed Eric Tolbert (Representative)

R 002018

A-1 AIR COMPRESSOR CORP.

☐ 679 W. Winthrop Ave.
Addison, IL 60101
(630) 543-2606

☐ 6203 N. Material Ave.
Rockford, IL 61111
(815) 633-2323

☐ 9368 S. Calumet Ave.
Munster, IN 46321
(219) 924-0424

SERVICE ORDER

Name: BFI LANDFILL
Address: 701 GREENBAY Rd
City/State: ZION IL Zip:
Requested By: TOM W. LAWN / LARRY
Instructions: PERFORM Start up

A-1 Job #: 71750
Cust. P.O.#:
Date: 8/3/00
Mileage:
Phone: ( )

TERMS:

☐ C.O.D.
☐ Net, 30 Days
☐ Submit For Warranty (Pending Manufacturer's Approval)
☑ Other MEMO

QTY	PART NUMBER	DESCRIPTION	✓	PRICE	AMOUNT

Done By	RSW						
Date	8-3-00						
Travel Time	1¼						
Job Time	2¼						
Travel Time	1¼						
Total Hours							

Sub Total	
Tax	
Misc	
Freight	
@ /Hr.	
@ /Hr.	
Total	

Customer Signature

Signature acknowledges receipt of materials above and services as described. Any claims must be made within 30 days.

X _____ Date _____

Make		Rated Voltage	
Model #		Rated Amperage	
Serial #		Volts L1-L2	
Hours		Volts L2-L3	
H.P.		Volts L3-L1	
Frame		Amps L1	
Enclosure		Amps L2	
Service Factor		Amps L3	
RPM		Starter Size	
Ambient Temp.		Wire Size	
Discharge Temp.		Fuse Size	
Lubricant		Cut In PSI	
Sump Capacity		Cut Out PSI	
Dryer Model		Refrigerant	
Serial #		Charge	
H.P.		Suction Pres.	
Capacity CFM		Disch. Pres.	
Inlet Temp.		Voltage	
Outlet Temp.		Amps	

Any warranties on the products sold hereby are those made by the original manufacturer. A-1 Air Compressor Corp. hereby expressly disclaims all warranties, either express or implied, including any implied warranty of merchantability or fitness for a particular purpose, and neither assumes nor authorizes any other person to assume for it any liability in connection with the sale of said products.

Work Performed/Recommendations:
Perform Start up set pressure 140:150 Advised customer os maintance system set up

Appendix B.7

Air Dryer Information

Instruction Manual

NEMA-7 PRESSURE-SWING DESICCANT TYPE COMPRESSED AIR DRYERS

GENERAL SAFETY INFORMATION

1. **Pressurized devices:** This equipment is a pressure containing device. Do not exceed maximum operating pressure as shown on equipment serial number tag. Make sure equipment is depressurized before working on or disassembling it for service.
2. **Electrical:** This equipment requires electricity to operate. Install equipment in compliance with national and local electrical codes. Standard equipment is supplied with NEMA 1 electrical enclosures and is not intended for installation in hazardous environments. Disconnect power supply to equipment when performing any electrical service work.
3. **Breathing Air:** Air treated by this equipment may not be suitable for breathing without further purification. Refer to OSHA standard 1910.134 for the requirements for breathing quality air.

IMPORTANT: READ PRIOR TO STARTING THIS EQUIPMENT

A. ***UNPACKING***

This shipment has been thoroughly checked, packed and inspected before leaving our plant. It was received in good condition by the carrier and was so acknowledged.

1. Check for Visible Loss or Damage. If this shipment shows evidence of loss or damage at time of delivery to you, insist that a notation of this loss or damage be made on the delivery receipt by the carrier's agent.
2. Check for Concealed Loss or Damage. When a shipment has been delivered to you in apparent good order, but concealed damage is found upon unpacking, notify the carrier immediately and insist on his agent inspecting the shipment. Fifteen days from receipt of shipment is the maximum time limit for requesting such inspection. Concealed damage claims are not our responsibility as our terms are F.O.B. point of shipment.

B. ***MOVING CAUTION:***

Do not lift by piping. Use lifting lugs or fork lift.

MODEL	RATED FLOW	DESIGNATED AS MODELS
25 45 60	25 SCFM 45 SCFM 60 SCFM	25 45 60
80 115 → 165	80 SCFM 115 SCFM 165 SCFM	80 115 165 ←
260 370 450	260 SCFM 370 SCFM 450 SCFM	260 370 450
590 750 930	590 SCFM 750 SCFM 930 SCFM	590 750 930
1130 1350 1550	1130 SCFM 1350 SCFM 1550 SCFM	1130 1350 1550
2100 3000 4100 5400	2100 SCFM 3000 SCFM 4100 SCFM 5400 SCFM	2100 3000 4100 5400

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NOTE

Supplemental instructions for units supplied with the optional Automatic Purge Saving System are shown in italics.

MINI INSTRUCTIONS

For complete instructions on installation, operation, and maintenance, consult manual.

INSTALLATION

1. Install on level surface.
2. Ambient temperature range: 35 to 120°F (1.7 to 49°C) [if low ambient package supplied: -10 to 120°F (-23 to 49°C)]
3. Install purge mufflers if shipped separately.
. Connect air from compressor to inlet.
   - Maximum compressed air temperature: 120°F (49°C)
   - Maximum compressed air pressure: Refer to serial number tag.
   - Minimum compressed air pressure: See section 2.2.1.2 .
5. Connect outlet to air system.
6. Refer to serial number tag for correct voltage. Connect to terminal strip in electrical enclosure. Standard units: connect wires to L1 and L2, and ground screw. *Automatic purge saving system: connect wires to positions 2 and 3; ground to position 1.*

I I. START UP

1. Set or verify control board settings. See page 10.
2. SLOWLY pressurize unit.
3. Energize dryer by turning on/off switch on.
4. Adjust purge air flow rate. Turn purge rate valve until Purge Pressure Gauge reads as shown in following table.
   NOTE: One tower must be purging when setting purge pressure.

150 psig M.W.P. models

INLET PRESSURE (psig)		60-100	110	120	130	140	150
CYCLE TIME JUMPER SETTING	10 Min.	45	43	41	39	37	36
	4 Min.	70	66	63	60	58	56

2.. psig M.W.P. models

INLET PRESSURE (psig)		125	130	135	140	145	150	175	200	225	250
CYCLE TIME JUMPER SETTING	10 Min.	80	79	78	77	76	75	70	64	60	57
	4 Min.	—	—	—	—	—	132	123	115	108	102

II . OPERATIONAL CHECKPOINTS

1. **POWER ON LIGHT** - Power on light is illuminated.
2. **MOISTURE INDICATOR** - Indicator should be green (Allow 4 hours after start up for indicator to turn green).
3. **TOWER PRESSURE GAUGES** -
   - Tower on line should read line pressure
   - Tower off line should read 2 psig or less while purging. If pressure exceeds 2 psig replace purge muffler elements.
     NOTE: An extra set of elements is shipped with dryer.
4. **PURGE PRESSURE GAUGE** - Verify proper setting.
5. **ON DRYERS SO EQUIPPED, CHECK FOR ALARM CONDITION.**

✓ . DEPRESSURIZATION

Isolate dryer. Run timer until both tower pressure gauges read 0 psig.

1.0 DESCRIPTION

1.1 Function

1.1.1 Dryer Dual tower regenerative desiccant dryers are an economical and reliable way to dry compressed air to dew points below the freezing point of water (dew points as low as -150°F [1 ppb @ 100 psig] are possible) or reduce the moisture content of compressed air when used in critical process applications.

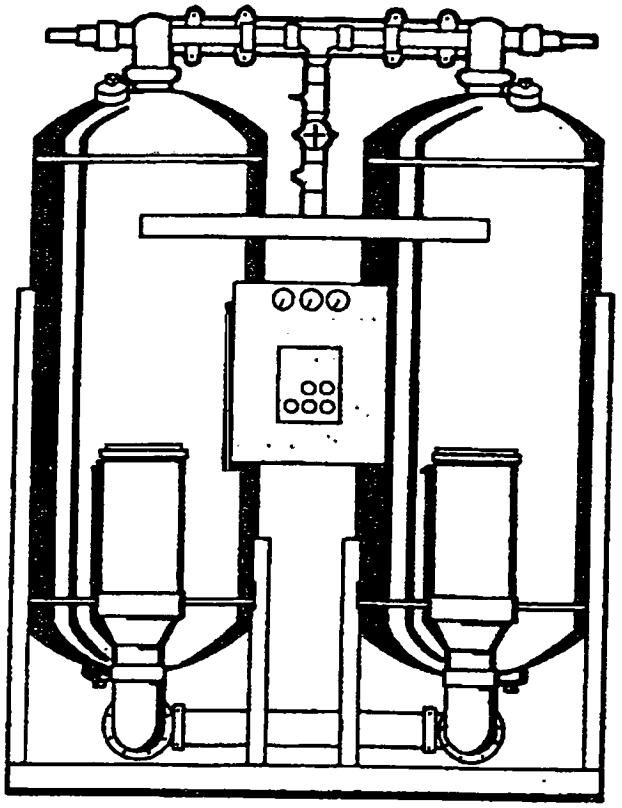
These dryers continuously dry compressed air by using two identical towers, each containing a desiccant bed. While one tower is on-stream drying the compressed air, the other tower is off-stream being regenerated (reactivated, i.e., dried out). The towers are alternated on- and off-stream so that dry desiccant is always in contact with the wet compressed air. In this way a continuous supply of dry air downstream is possible.

Desiccant dryers lower the dew point of compressed air by adsorbing the water vapor present in the compressed air onto the surface of the desiccant. Desiccant is a highly porous solid containing extensive surface area.

Adsorption occurs until the partial pressure of the water vapor in the air and that on the surface of the desiccant come into equilibrium. As adsorption occurs, heat is released (referred to as the heat of adsorption) and is stored in the bed for use during regeneration.

Desiccant is regenerated by driving off (desorbing) the water collected on its surface. Pressure-swing (also called heatless or heaterless because no outside heat is added) dryers regenerate by expanding a portion (approximately 14 - 15% at 100 psig) of the dried air to atmospheric pressure. This "swing in pressure" causes the expanded air to become very dry (have a very low vapor pressure). This very dry air (called purge air) plus the stored heat of adsorption allows the moisture to desorb from the desiccant. The purge air then carries the desorbed water out of the dryer.

1.1.2 Optional Automatic Purge Saving System
The Automatic Purge Saving System is designed to save energy (purge air) when pressure-swing dryers are operated at reduced loads.
The patented Purge Saving System operates by monitoring the changes in temperature within the desiccant beds. These changes in temperature are the result of heat (thermal energy) that is released when a bed is on-line drying (heat of adsorption), and the heat that is used when a bed is off-line being regenerated (heat of desorption).
The magnitude of these changes in temperature is an indirect measure of the water vapor content in the air being dried. This information is used to determine the time a tower stays on line during the drying cycle.



1.2 Operation

1.2.1 Dryer *(Refer to Figure 1A.)*

Compressed air flows through inlet switching valve (3A) to tower (4A) where the air is dried. After the air is dried it flows through check valve (5A) and then to the dryer outlet.

A portion of the dry air, the purge stream, branches off from the main air stream prior to the outlet. The purge stream flow rate is controlled by the adjustable purge rate valve (6) and the purge orifice (7).

The purge flow, which has been throttled to near atmospheric pressure, is directed through check valve (5D) to tower (4B). As the purge flow passes over the desiccant in tower (4B), it removes the water vapor which was deposited there while the tower was on-line drying. The purge air then passes through purge and repressurization valve (9B) and purge muffler (10B) to the atmosphere.

The dryer operates in this configuration for a period of time depending on whether the dryer is supplied with a standard or automatic control system, and on standard control systems, the cycle time chosen (4 or 10 minutes) and the Purge Economizer Switch setting.

After this time period, purge and repressurization valve (9B) closes allowing tower (4B) to repressurize slowly. Adequate repressurization time is allowed so that tower 4B is fully repressurized before switchover. On units with the standard control system, after 2 minutes on a 4 minute cycle or 5 minutes on a 10 minute cycle, or on units with the automatic purge saving system, after the sensing system determines that the desiccant bed is loaded, air inlet switching valve (3B) opens and inlet switching valve (3A) closes. After six seconds purge and repressurization valve (9A) opens.

(Refer to Figure 1B.) Tower (4B) is now drying the main air stream while tower (4A) is being regenerated by the purge air stream. The operation of the inlet switching and purge and repressurization valves is sequenced by the control system located in the electrical box.

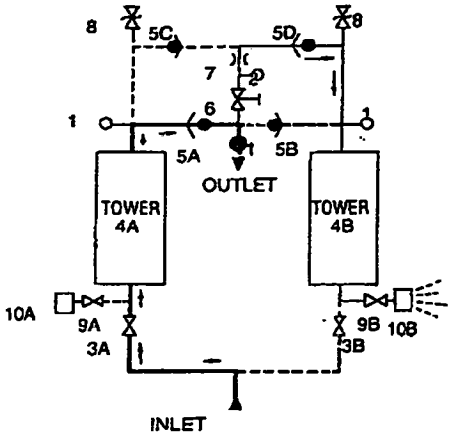


FIGURE 1A
TOWER 4A DRYING: TOWER 4B REGENERATING

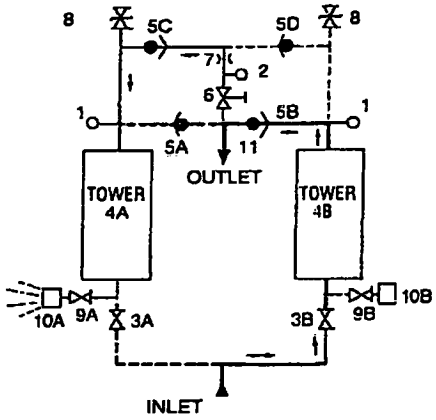


FIGURE 1B
TOWER 4B DRYING: TOWER 4A REGENERATING

1. Pressure Gauges (Desiccant Drying Towers)
2. Purge Pressure Gauge
3A. Left Air Inlet Switching Valve
3B. Right Inlet Switching Valve
4. Desiccant Drying Towers
5. Check Valves
6. Adjustable Purge Rate Valve
7. Purge Orifice
8. Pressure Relief Valves
9A. Left Purge / Repressurization Valve
9B. Right Purge / Repressurization Valve
10. Purge Mufflers
11. Moisture Indicator

LEGEND

Process Stream ——————

Purge Stream ——————

1.2.2 Optional Automatic Purge Saving System *(Refer to Figure 1C)*

Assume Tower A is on-line drying the air while tower B has just gone off-line to be regenerated. At the beginning of tower B's regeneration cycle a temperature measurement is made at position B1. After the tower has been regenerated, another measurement is made at B1. The drop in temperature sensed during regeneration is an indirect measure of the water vapor content of the inlet air. The Purge Saving System's microprocessor then uses this information to calculate an allowable temperature rise in the bed during the drying cycle.

When tower B goes back on-line, a temperature probe at position B2 measures the initial bed temperature at this point and then monitors the bed until the calculated temperature rise occurs. The temperature rise occurs as heat of adsorption is released during the drying process. The time for the temperature rise to occur depends on flow rate. At 100% flow the temperature rise takes five minutes, at 17% flow it takes 30 minutes.

When the calculated temperature rise is reached, the towers switch with tower A now drying and tower B being regenerated. Tower B regenerates for 3.9 minutes, repressurizes, and remains idle until it is called upon for the next drying cycle.

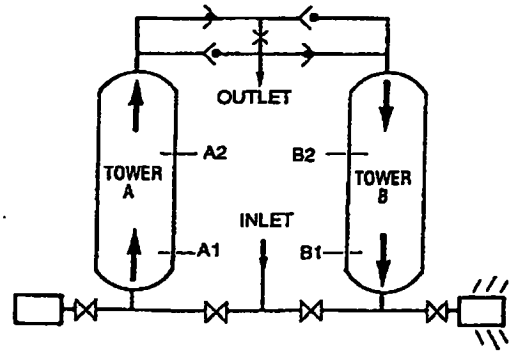


FIGURE 1C

2.0 INSTALLATION

2.1 Location in the compressed air system.

NOTE

Air Compressor should be adequately sized to handle air system demands as well as purge loss. Failure to take this into account could result in overloading air compressors and/or insufficient air supply downstream.

NOTE

It is desirable to install dryer where compressed air is at the lowest possible temperature (downstream of aftercoolers) and the highest possible pressure (upstream of pressure reducing valves) without exceeding the maximum working pressure. *(Refer to Figure 2A)*

(A) AFTERCOOLER/SEPARATOR - Compressed air entering dryer must be cooled to at least 120°F (49°C). Use aftercooler and separator if higher temperatures are present.

NOTE

Installation of a refrigerated dryer ahead of a pressure-swing desiccant dryer does not increase desiccant dryer capacity or reduce purge flow requirements. However a cooling unit installed ahead of the desiccant dryer reduces the inlet air

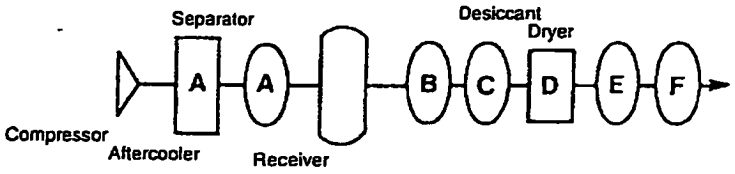


FIGURE 2A

(B & C) PREFILTERS - Adequate filtration is required upstream of the dryer in order to protect the desiccant bed from contamination. The following filters are recommended:

B - Air Line Filter - On compressed air systems utilizing non-lubricated (oil-free) air compressors, use to protect desiccant bed from solid and liquid contamination. On systems with lubricated compressors, use as a prefilter to the oil aerosol removal filter.

C - Oil Aerosol Removal Filter - On systems with lubricated compressors, use to remove oil aerosols and protect desiccant bed from oil contamination.

(D) DESICCANT DRYER

(E & F) AFTERFILTERS - To ensure downstream air purity (prevent desiccant dust from traveling downstream) adequate filtration downstream of the dryer is required. Depending on the degree of purity you require from your compressed air system, the following filters are recommended:

E - Air Line Filter - Use as an afterfilter to remove desiccant fines and protect downstream components from solid particles 1 micron and larger.

F - Oil Aerosol Removal Filter - Use as an afterfilter to filter out desiccant fines and protect downstream components from solid particles 0.025 micron and larger.

OR

Oil Vapor Adsorber - Use as an afterfilter to remove oil vapor and its subsequent taste and odor and to protect down-stream components from solid particles 0.025 micron and larger.

NOTE

By-pass lines and isolation valves are recommended so that maintenance work can be performed without shutting off the air supply.

2.2 Minimum & Maximum Operating Conditions

The compressed air supply inlet should be checked periodically to ensure that equipment design specifications are not exceeded. Normally the compressor installation includes inter-coolers, aftercoolers, separators, receivers, or similar equipment which adequately pretreat the compressed air supply in order to avoid excessively high air temperatures and liquid slugging of downstream equipment.

2.2.1 Compressed air conditions

2.2.1.1 Maximum working pressure:

Refer to dryer Serial Number Tag.

WARNING

Do not operate the dryer at pressures above the maximum pressure shown on the tag.

2.2.1.2 Minimum working pressures:

150 psig MWP models -

60 psig (4.1 bar) for dryers operated on a 10 minute cycle

80 psig (5.6 bar) for dryers operated on a 4 minute cycle

250 psig MWP models -

125 psig (8.6 bar) for dryers operated on a 10 minute cycle

150 psig (10.3 bar) for dryers operated on a 4 minute cycle.

If lower inlet pressures are encountered, consult factory.

2.2.1.3 Maximum inlet compressed air temperature:

120°F (49°)

NOTE

If inlet air is higher than 120°F (49°C) the air must be precooled with an aftercooler.

2.2.2 Ambient temperatures:

Minimum:

Standard units: 35°F (1.7°C)

Units with optional low ambient package: - 10°F (-23°C)

Maximum: 120°F (49°C)

NOTE

If dryer is installed in ambients below 35°F (1.7°C) heat tracing of the prefilters and inlet piping and valves is necessary to prevent condensate from freezing. If installing heat tracing, observe electrical class code requirements for type of duty specified.

2.3 Mounting

Install dryer on a level pad on floor. Holes are provided in the floor stand base angles for floor anchors if desired.

NOTE

Floor anchors must be used if area is subject to vibrations.

2.4 Piping

2.4.1 Inlet and Outlet c onnections

Observe location of inlet and outlet connections as indicated in Figure 2B, 2C, or 2D and connect inlet and outlet piping.

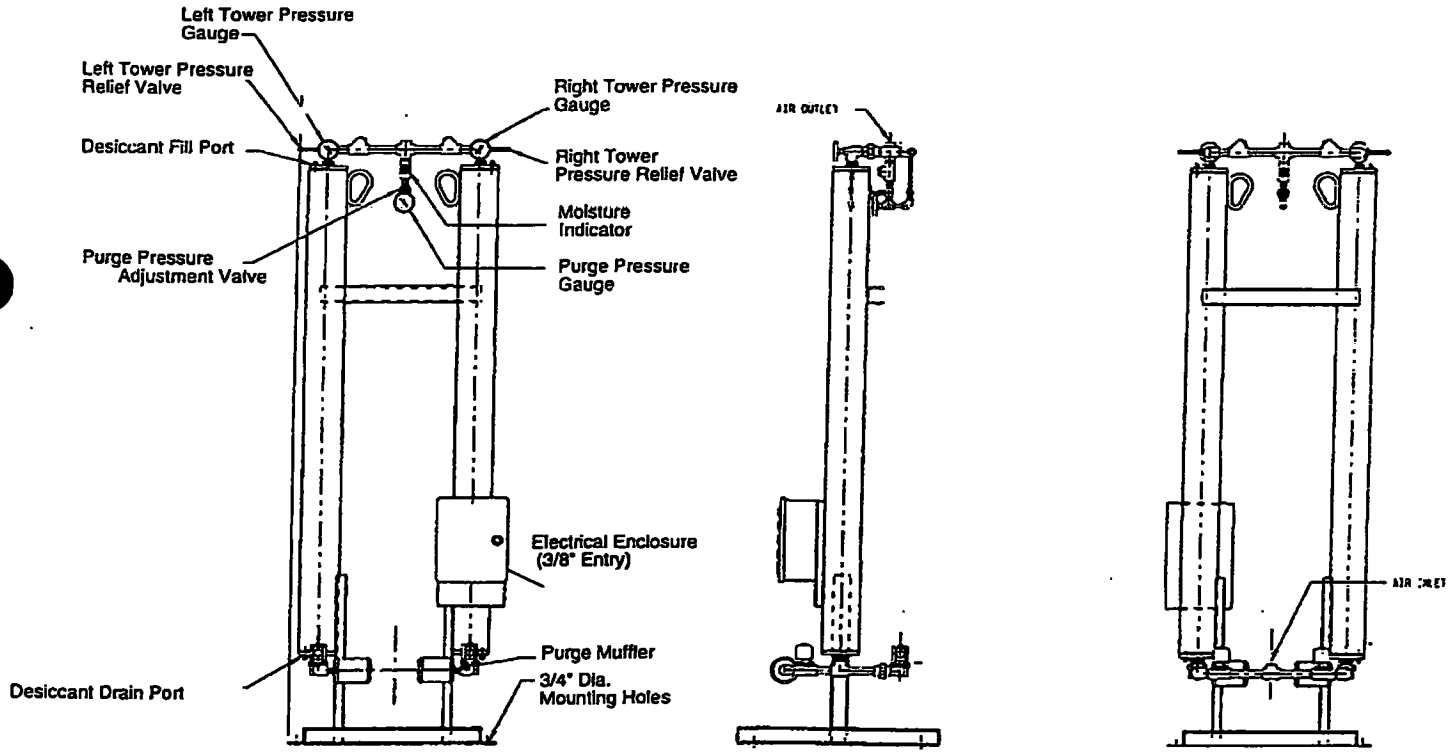
NOTE

All piping must be supported so as not to bear on the dryers or filters.

2.4.2 Isolation valves

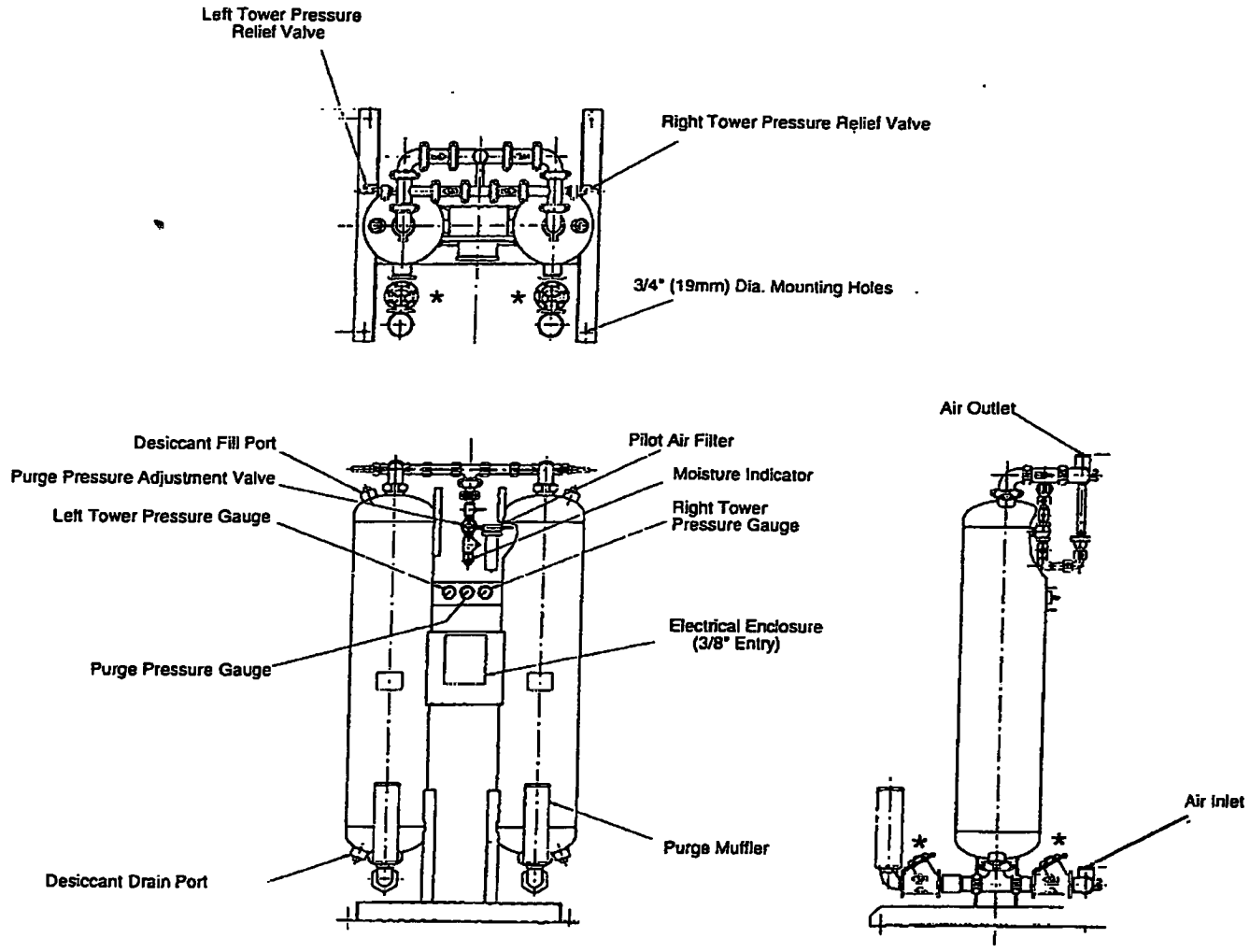
If isolation valves are installed, it is recommended that gate valves be used to ensure that dryer is pressurized slowly. This is particularly true if isolation valves are placed before and after pre- and after- filters where rapid pressurization could cause excessive pressure drop across filter cartridges.

FIGURE 2B Models 25 through 80



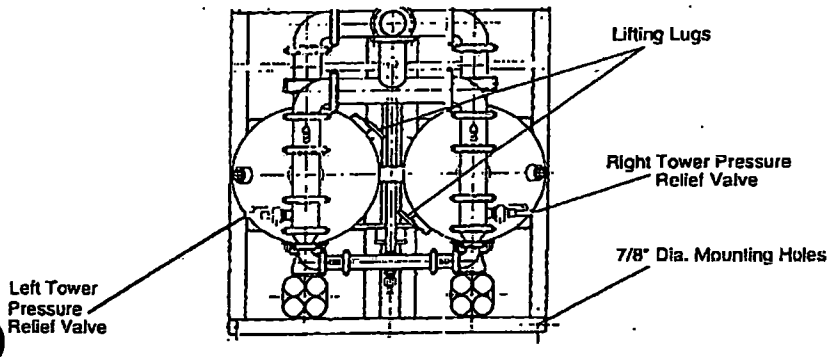
FRONT VIEW *RIGHT SIDE VIEW* *REAR VIEW*

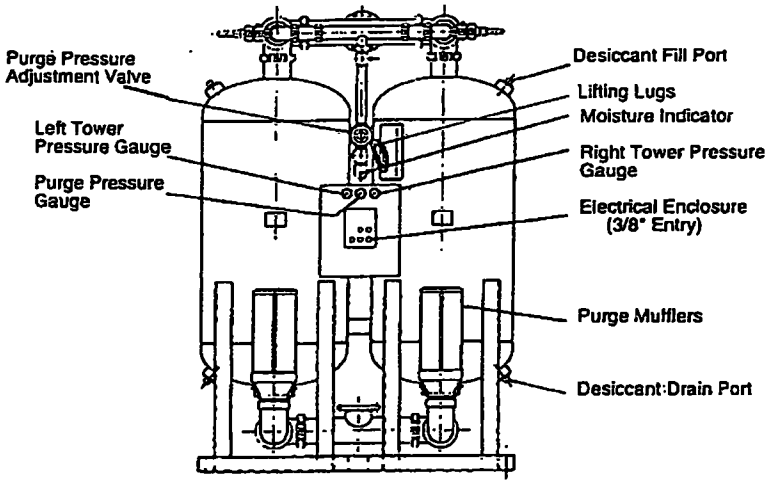
FIGURE 2C Models 115 through 2100

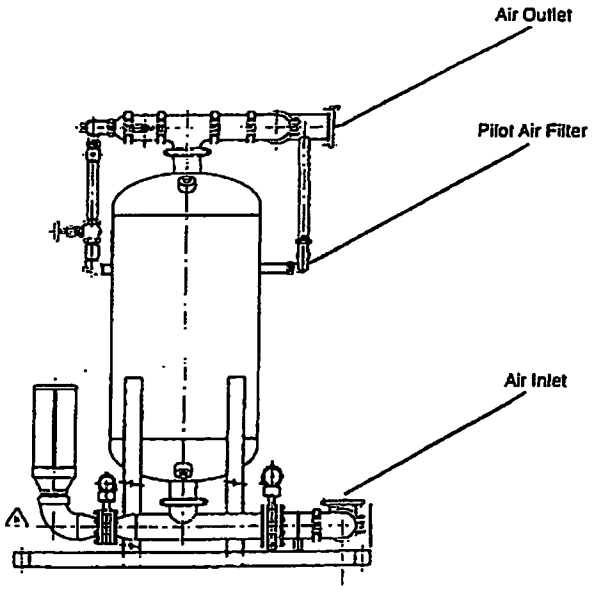


*Models 115 through 260 use solenoid valves. Models 370 through 2100 use air operated butterfly valves.

FIGURE 2D Models 3000 thru 5400







2.5 Electrical Connections

2.5.1 Power to Unit

NOTE
Check Serial Number Tag for correct voltage.

2.5.1.1 Standard Unit

2.5.1.2 Automatic Purge Saving System *(Refer to Figure 2F)*
Connect wires to terminals at positions 2 and 3 on the terminal strip. Ground to position 1. Do not make connections to terminals labeled with grounding symbol or labeled with RS.
Set the voltage selection switch located at the lower edge of the control board for the proper supply voltage.
Electrical entry is 7/8" Dia. hole for 1/2" nominal conduit entry.

(Refer to Figure 2E)
Connect wires to terminals L1 and L2 and ground screw on mounting plate. Electrical entry is 3/8".

2.5.2 Connections for external alarm
2.5..2.1 Standard Unit
Switching Failure Alarm (optional) - Dry contacts for a remote alarm are supplied at terminals 11 and 12
Maximum contact rating is:
30 VAC - 0.15 amp
110 VAC - 0.3 amp
30 VDC - 1.0 amp

2.5.2.2 Automatic Purge Saving System
Dry contacts for a remote alarm are supplied at terminals 6 and 7.
Maximum contact rating is:
230 VAC - 4.3 amp
115 VAC - 8.7 amp
200 VDC - 0.15 amp
100 VDC - 0.35 amp
50 VDC - 1.2 amp
30 VDC - 4.5 amp
25 VDC - 10 amp
10 VDC - 10 amp

2.6 Provisions for Purge Exhaust - Purge exhaust must be routed through the factory supplied mufflers or piped to a remote location.
2.6.1 Purge mufflers - If shipped separately, install purge exhaust mufflers in the locations shown in Figure 2B, 2C or 2D.
2.6.2 If purge exhaust is piped to a remote location, choose a pipe size large enough so that back pressure through the piping is not created.

WARNING

Do not operate dryer without one of the above measures. Exhausting air will result in noise levels above OSHA permissible levels and exhausting gas could potentially cause harm to persons or property.

2.7 Initial Desiccant Charge - The dryer is shipped complete with desiccant and ready to operate after piping and electrical connections are made.

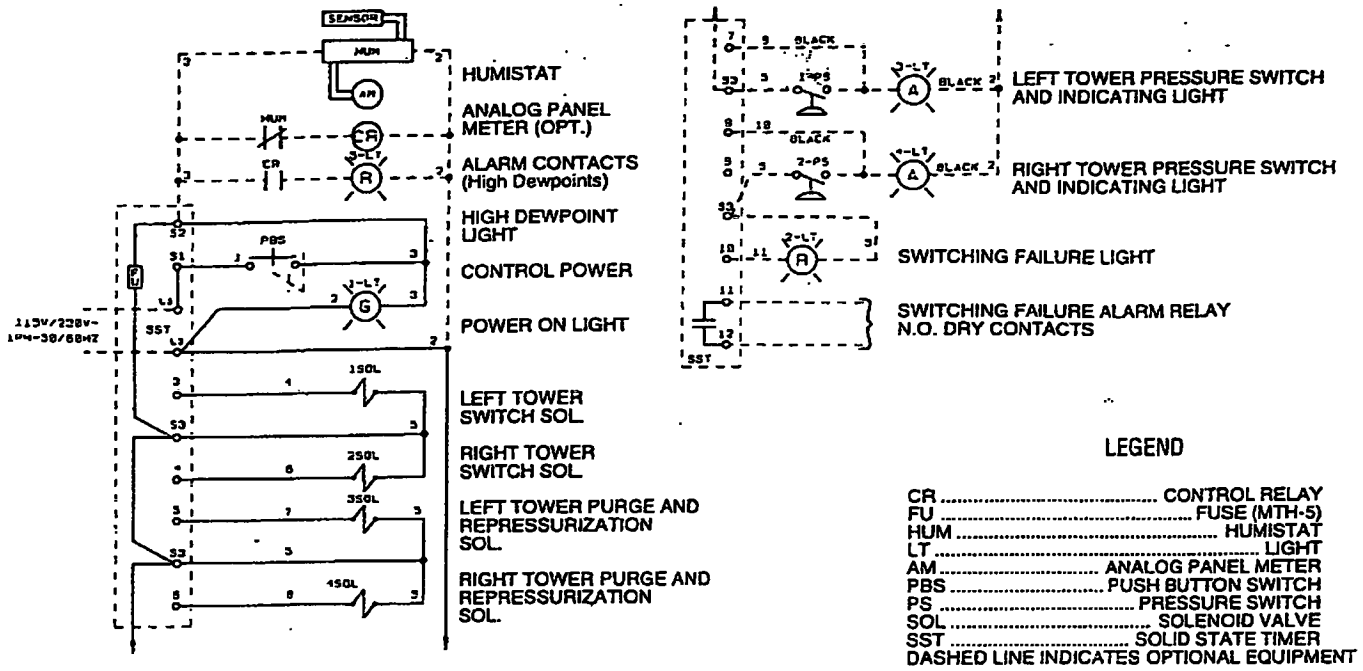


FIGURE 2E Electrical Schematic (Standard Dryers)

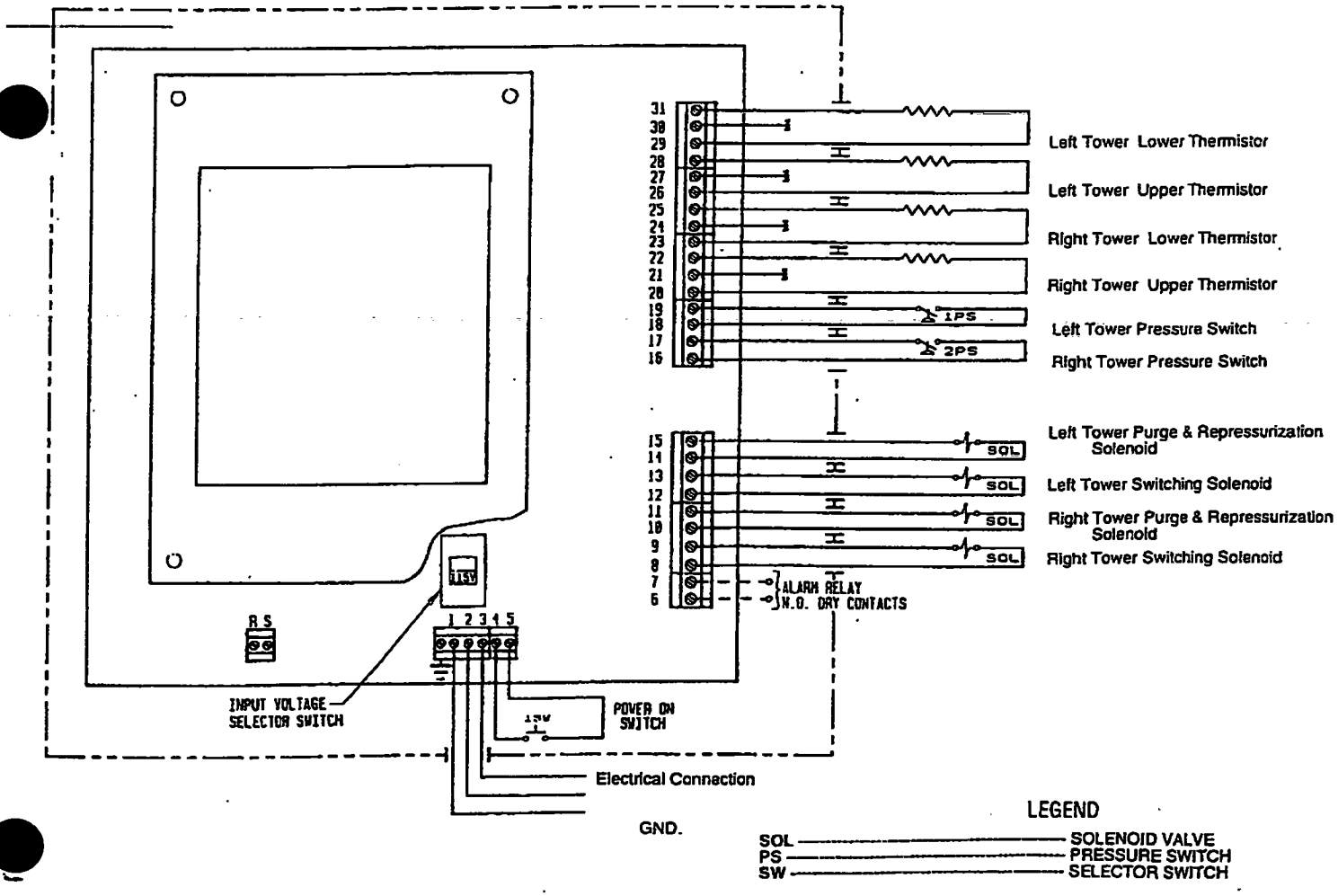


FIGURE 2F. ELECTRICAL SCHEMATIC (DRYERS WITH AUTOMATIC PURGE SAVING SYSTEM)

3.0 OPERATION

3.1 Start-up

3.1.1 Control board settings-Set or verify settings on control board (control board is found in electrical enclosure)

3.1.1.1 Standard Unit Control Board

NOTE

Make settings with dryer de-energized (Power-On light off).

3.1.1.1.1 Cycle Time Jumper- Determine if dryer is to operate on a 4 or 10 minute cycle time. Outlet dew points vary with inlet temperatures and cycle times. Refer to Table 9 to determine cycle time required to produce the desired dew point.

1)For a **10 minute cycle** - position jumper on top two terminals per Figure 3A1.

2) For a **4 minute cycle** - position jumper on bottom two terminals per Figure 3A2.

3.1.1.1.2Purge Economizer Switch- (DIP type switch) - Locate Purge Economizer Switch, Figure 3A3.

1)To set switch when dryer is operated at 100% of flow capacity, refer to Table 1.

NOTE

Switch positions vary depending on cycle time and MWP of dryer.

MWP of dryer is as indicated on Serial Number Tag.

2)To set switch for flows below 100% of flow capacity:

If dryer is operated at less than maximum flow capacity a reduction in purge air usage may be possible. Refer to Section 3.5.4 to determine maximum inlet flow capacity at operating pressure. Divide your actual flow by Maximum Flow to get % of Maximum Flow.

3) Refer to Table 8 and set DIP switches in Purge Economizer Switch (Figure 3A3) accordingly. Push switches up for ON. If actual flow rate through the dryer is unknown, set the switches for 100%.

EXAMPLE: A 60 scfm unit with 150 psig MWP operating on a 10 minute cycle has a Maximum Rated Inlet Flow of 60 scfm @ 100 psig. Currently only 30 scfm is used. 30/60 = .50 = 50%. To save purge air set the Purge Economizer Switch for 50% as shown in Table 8: DIP switches 1 and 4 are OFF, DIP switches 2 and 3 are ON.

NOTE

If full flow is restored, Purge Economizer Switch must be reset for 100%.

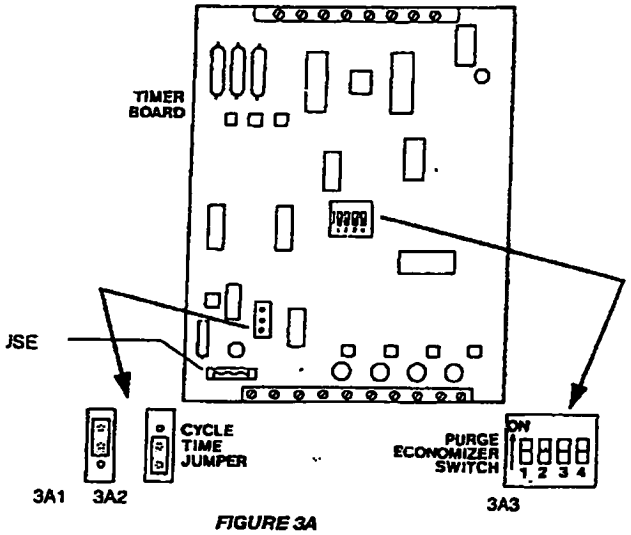


FIGURE 3A

BLE 1 Purge Economizer Switch Setting For Maximum(100%)Flow

DRYER MWP		150 psig				250 psig			
DIP SWITCH NUMBER		1	2	3	4	1	2	3	4
CYCLE TIME JUMPER SETTING	10 Minute	Off	Off	Off	Off	Off	Off	On	Off
	4 Minute	Off	Off	On	Off	Off	On	On	Off

3.1.1.2 Automatic Purge Saving System Control Board

3.1.1.2.1 Voltage selection *- Set the voltage selection switch located at the lower edge of the power board for the proper voltage.*

NOTE:

Make certain that paper insulation in front of battery has been removed.

3.1.1.2.2 Cycle selection

A cycle selector allows two choices in the fixed cycle mode and three in the demand cycle mode. Cycle selection is accomplished by depressing the cycle selector switch repeatedly until the light indicating the desired cycle model illuminates.

1) Fixed cycle mode

10 minute *- in this mode the dryer switches towers every 5 minutes. With 100°F (38°C) inlet air, a -40°F (-40°C) pressure dew point is produced.*

4 minute *- In this mode the dryer switches towers every 2 minutes. With 100°F (38°C) inlet air, a -100°F (-73°C) pressure dew point is produced.*

(2) Demand Cycle Mode

In this mode the dryer switches when the desiccant bed is loaded as signalled by a calculated temperature rise. Unit can be set to produce three outlet dew points, -40°F (-40°C), 0°F (-17.8°C) and 40°F (4.4°C).

NOTE:

Automatic control will begin 1/2 cycle after start-up.

NOTE:

If a cycle change is made while dryer is operating, dryer will finish previous cycle (right tower drying terminates) before changing. Indicating light of newly selected mode will blink until changeover is complete. If it is necessary to begin a new selection immediately, shut unit off and on. (This is not recommended if either tower is in the regeneration mode since rapid repressurization could result.)

NOTE:

If switching to a cycle mode producing a lower dew point (e.g. 0°F to -40°F [-17.8 to -40°C]) while dryer is operating, one or two days of operation may possibly be needed before the new dew point is achieved.

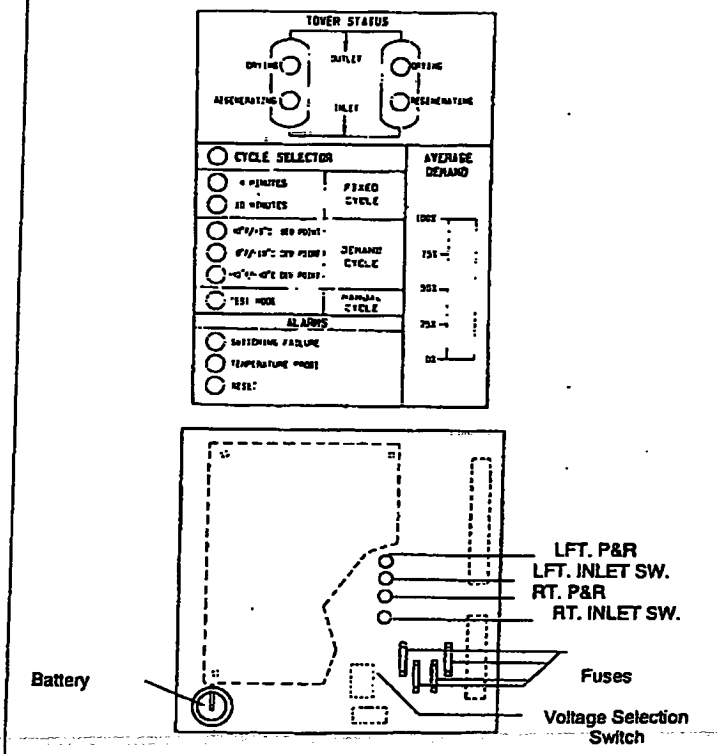


FIGURE 3B

3.1.2 SLOWLY pressurize dryer to full line pressure (open inlet valve, outlet valve remains closed).

NOTE

During initial start-up check entire system for leaks. If necessary, depressurize and correct any leaks.

3.1.3 Energize dryer using the power switch located on the electrical box (power-on light illuminated).

NOTE

Standard control board - Units with switching failure alarm: alarm (light) may be activated if unit is energized before it is pressurized. To deactivate alarm, turn power switch off, then back on when both towers are at line pressure.

3.1.4 Adjust the purge rate valve.

3.1.4.1 Determine:

1)Maximum working pressure (MWP) of dryer from the dryer serial number tag

2) Air pressure at inlet to dryer

3) Cycle time setting (4 or 10 minutes) For units with optional Automatic Purge Saving System in the demand cycle mode use the 10 minute setting.

3.1.4.2 Refer to *Table 2* for proper purge rate pressure setting at the conditions found in 3.1.4.1

3.1.4.3 Adjust purge rate valve until purge flow indicator reads required pressure setting.

NOTE

Adjustment must be made while a tower is purging (air exhausting from muffler).

NOTE

INSUFFICIENT PURGE AIR WILL EVENTUALLY RESULT IN SATURATION OF DESICCANT BED AND WET AIR DOWNSTREAM. MAKE CERTAIN THAT CYCLE TIME, PURGE CONOMIZER SWITCH, AND PURGE PRESSURE ARE CORRECTLY SET.

3.1.5 Establish normal flow through dryer (open outlet isolation valve). Close air by-pass valve if present.

NOTE

When dew points below -40°F (-40°C) are required, the dryer must be run with an inlet flow rate of less than 50% of maximum until the desired dew point is attained. Depending on the initial dryness of the desiccant, this can take as long as 2 to 3 days. This stabilization period is required on initial startup, after dryer has been shutdown for extended periods of time, or after dryer maintenance (desiccant change, etc.).

3.1.6 With the inlet pressure to the dryer at its minimum level, readjust the purge pressure as determined in 3.1.4.

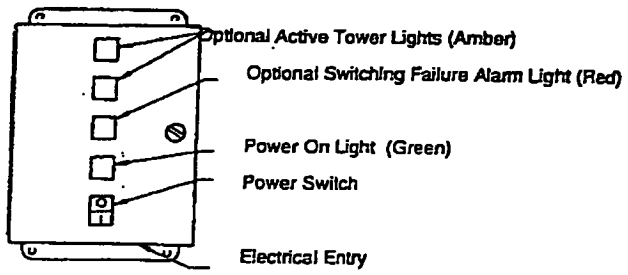
Purge Rate Pressure Setting (psig)

150 psig M.W.P. models

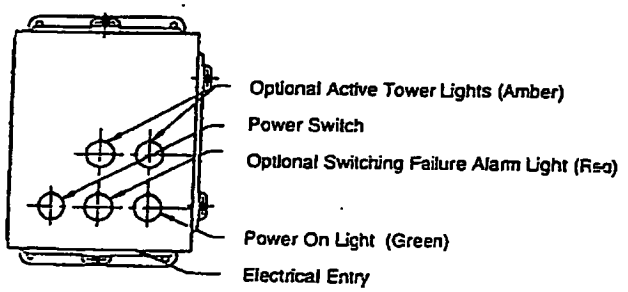
INLET PRESSURE (psig)		60-100	110	120	130	140	150
CYCLE TIME JUMPER SETTING	10 Min.	45	43	41	39	37	36
	4 Min.	70	66	63	60	58	56

250 psig M.W.P. models

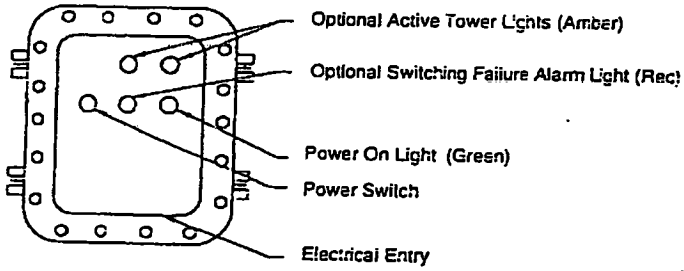
INLET PRESSURE (psig)		125	130	135	140	145	150	175	200	225	250
CYCLE TIME JUMPER SETTING	10 Min.	80	79	78	77	76	75	70	64	60	57
	4 Min.	—	—	—	—	—	132	123	115	108	102



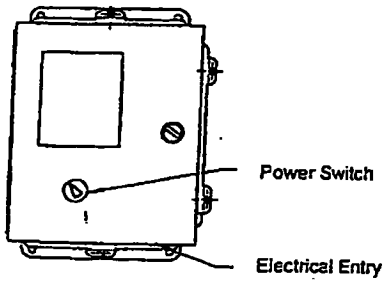
STANDARD ELECTRICAL ENCLOSURE
NEMA - 1



STANDARD ELECTRICAL ENCLOSURE
NEMA - 4, 4X



STANDARD ELECTRICAL ENCLOSURE
NEMA - 7



ELECTRICAL ENCLOSURE
Automatic Purge Saving System
NEMA - 4, 4X

FIGURE 3C Electrical Enclosures

3. 2 Operational Check Points

3.2.1 Standard Unit

3.2.1.1 Power to unit -Check periodically that there is power to the unit (power-on light illuminated).

3.2.1.2 Moisture Indicator- Every four hours check moisture ir. .or. Indicator should be green. Outlet relative humidity of the desiccant dryer is indicated by the color change humidity indicator. Green indicates a R.H. below 3% and yellow indicates a R.H. above 3%. Table 10 (page 15) indicates outlet dew point when moisture indicator changes from green to yellow at various inlet temperatures. During start-up the indicator may be yellow, however, it should begin to change to green within four hours.

3.2.1.3 Purge Flow Indicator -Every four hours check the purge pressure and adjust as required. Adjustment should be made when the inlet pressure to the dryer is at its minimum level.

NOTE

Adjustment must be made while a tower is purging (air exhausting from muffler).

3.2.1.4 Switching Failure Alarm (optional)

If unit is supplied with Switching Failure Alarm, periodically check for flashing red alarm light. Alarm light will flash if either tower fails to pressurize or depressurize to the required levels at the proper time.

NOTE

Alarm will activate if dryer is energized without being pressurized.

NOTE

If towers are switching properly and alarm light continues to operate, reset alarm by turning off power (power switch) for 30 nds with both towers pressurized.

3.2.1.5 Tower Status Lights (optional) - dryers with optional active tower lights - illuminated light indicates which tower is on line (pressurized)

3.2.1.6 Tower pressure gauges

3.2.1.6.1 Periodically check tower pressure gauges to verify that tower pressure gauge of tower on line reads line pressure and tower pressure gauge of tower off line reads below 2 psig.

NOTE

Read off line tower gauge wheri tower is purging (air exhausting from muffler)

3.2.1.6.2 Check mufflers for back pressure

Excessive back pressure may result due to the accumulation of dust in the muffler. This sometimes occurs after start-up because of dusting of the desiccant during tower filling and dryer transport.

If the tower pressure gauge of the off-stream tower rises out of the black area on the gauge dial, muffler elements should be replaced. A set of purge exhaust muffler replacement elements is supplied with the dryer.

3.2.2. Units with Automatic Purge Saving System

***3.2.21 Power to unit** - Check periodically that there is power to the unit (power-on light illuminated).*

***3.2.2.2 Moisture Indicator** - Every four hours check moisture indicator. Indicator should be green. Outlet relative humidity of the desiccant dryer is indicated by the color change humidity indicator. Green indicates a R.H. below 3% and yellow indicates a R.H. above 3%. Table 10 (page 15) indicates outlet dew point when moisture indicator changes from green to yellow at various inlet temperatures. During start-up the indicator may be yellow, however, it should begin to change to green within four hours.*

***3.2.2.3 Purge Flow Indicator** -Every four hours check the purge pressure and adjust as required. Adjustment should be made when the inlet pressure to the dryer is at its minimum level.*

NOTE

Adjustment must be made while a tower is purging (air exhausting from muffler).

3.2.2.4 Alarms

***3.2.2.4.1 Switching Failure Alarm** - The switching failure alarm operates by sensing tower pressures after tower changeover. If towers have failed to pressurize or depressurize to the required levels, an alarm condition exists. The alarm light blinks while the alarm condition exists. If the alarm condition clears for two complete cycles, the light will switch to a steady glow. Depressing the reset switch will extinguish the light, but will not interrupt the drying cycle.*

If the tower being regenerated fails to repressurize, the dryer will not switch towers. The switching failure alarm will be activated and the dryer will remain in this mode until the tower repressurizes.

***3.2.2.4.2 Temperature Probe Alarm** - (operates in a demand cycle mode only) This alarm is actuated by a short circuit, an open circuit, or temperatures below 40°F (4.4°C) or above 150°F (65.5°C). The alarm light blinks while the alarm condition exists. After the alarm condition clears for one complete cycle, the light will switch to a steady glow. Depressing the reset switch will extinguish the light, but will not interrupt the drying cycle.*

***3.2.2.4.3 Dryer Cycle** (operates in demand cycle mode only) Either alarm will cause the controller to automatically switch to a fixed 10 minute cycle (cycle mode light will not indicate this).*

After the alarm condition clears and the light stops blinking, the controller will clear the internal information and switch back to a demand mode. It is not necessary to push the alarm reset for the dryer to return to the selected demand cycle mode. However, to extinguish the alarm light, press the alarm reset button.

NOTE

After an alarm condition clears, the dryer will not return to a demand cycle mode until the dryer completes two cycles if a switching failure alarm is experienced or one cycle if a temperature probe alarm is experienced. This occurs even if the alarm reset is depressed and the alarm light is extinguished.

3.2.2.4.4 Relay for Remote Alarm

The remote alarm relay will close when an alarm occurs and remain closed until the alarm clears and is reset. The relay does not cycle as the lights blink.

3.2.2.5 Dryer status lights - indicate when left and right towers are drying and regenerating.

3.2.2.6 Valve energized lights

Four LEDs are furnished on controller to indicate which air control valves are energized at any particular time

3.2.2.7 Average Demand Meter

The demand meter displays the average demand on the dryer for the last 4 cycles. It is determined by dividing 40 (time to complete 4 cycles at full flow) by the actual time to complete the last 4 cycles.

3.2.2.8 Tower pressure gauges

3.2.2.8.1 Periodically check tower pressure gauges to verify that tower pressure gauge of tower on line reads line pressure and tower pressure gauge of tower off line reads below 2 psig.

NOTE

Read off line tower gauge when tower is purging (air exhausting from muffler)

3.2.2.8.2 Check mufflers for back pressure

Excessive back pressure may result due to the accumulation of dust in the muffler. This sometimes occurs after start-up because of dusting of the desiccant during tower filling and dryer transport.

If the tower pressure gauge of the off-stream tower rises out of the black area on the gauge dial, muffler elements should be replaced. A set of purge exhaust muffler replacement elements is supplied with the dryer.

3.2.3 All MODELS - Determine if air control valves are operating and sequencing correctly.

Refer to Section 1.2 and Figure 1A and 1B for a general description of operating sequence.

3.2.3.1 Inlet switching and purge/repressurization valves.

1) Tower pressure gauge of tower on line should read line pressure. No air should be leaking from purge/repressurization valve of the on line tower.

2) Tower pressure gauge of tower off line should read below 2 psig while tower is purging. If excessive purge air is exhausting during purge cycle, inlet valve may have failed to close or a check valve may be sticking.

3.2.3.2 Check valves

Check valve sticking will result in excessive air discharge through a muffler. If excessive air is discharged through the muffler on the left, check if valve 5a or 5d is sticking. If excessive air is discharged through the muffler on the right, check if valve 5b or 5c is sticking.

3.2.3.3 Operating Sequence

For dryers with standard control board and dryers with automatic purge saving system operating on a fixed time cycle-

Figure 3D and *Table 3A* show valve sequence times when dryer is operating on a 10 minute cycle. *Figure 3E* and *Table 3B* show sequence times when dryer is operating on a four minute cycle.

FIGURE 3D For dryers operating on a 10 minute cycle

VALVE	TIME (Min.) 0	1	2	3	4	5	6	7	8	9	10
3A	OPEN					CLOSED					
3B	CLOSED					OPEN					
9B	CI 6"	OPEN			CI(1)	CLOSED					
9A	CLOSED					CI 6"	OPEN (1)				CLOSED (1)

(1) Purge / repressurization Valve remains open and closed in any 5 minute period depending on the setting of the Economizer Switch. See table below for open and closed times.

TABLE 3A Purge valve open times for dryers operating on a 10 minute cycle.

MODEL	ECONOMIZER SWITCH SETTING	OPEN	CLOSED
150 MWP	100%	3' 54"	1'
	75%	2' 54"	2'
	50%	1' 54"	3'
	25%	54"	4'
250 MWP	100%	2' 54"	2'
	67%	1' 54"	3'
	33%	54"	4'

FIGURE 3E For dryers operating on a 4 minute cycle

VALVE	TIME (MIN) 0	1	2	3	4
3A	OPEN		CLOSED		
3B	CLOSED		OPEN		
9B	CI 6"	OPEN (2)	CLOSED (2)	CLOSED	
9A	CLOSED		CI 6"	OPEN	CLOSED

(2) Purge / repressurization Valve remains open and closed in any 2 minute period depending on the setting of the Economizer Switch. See table below for open and closed times.

TABLE 3B Purge valve open times for dryers operating on a 4 minute cycle.

MODEL	ECONOMIZER SWITCH SETTING	OPEN	CLOSED
150 MWP	100%	1' 6"	48"
	67%	42"	1' 12"
250 MWP	100%	42"	1'12"

3.3 Shut Down

3.3.1 Depressurize dryer

3.3.1.1 Open by-pass valve (if one is installed) and close inlet and outlet isolation valves.

3.3.1.2 Run timer through a tower change cycle until pressure gauges on both towers read 0 psig.

3.3.2 De-energize dryer

Turn dryer off using on-off switch (Power-On light extinguished).

3.4 Loss of Power

Control valves are designed so that upon loss of power the air dryer is capable of drying air until the desiccant exposed to the air flow is saturated.

3.5 Verify that dryer is operating within design parameters

3.5.1 Maximum working pressure:

Refer to Serial Number Tag to determine maximum working sure of dryer.

WARNING

Do not operate dryer at pressures above the maximum pressure shown on the tag.

3.5.2 Minimum working pressures:

150 psig MWP models -

60 psig (4.1bar) for dryers operated on a 10 minute cycle

80 psig (5.6 bar) for dryers operated on a 4 minute cycle

250 psig MWP models

125 psig (8.6 bar) for dryers operated on a 10 minute cycle

150 psig (10.3 bar) for dryers operated on a 4 minute cycle.

If lower inlet pressures are encountered, consult factory.

3.5.3 Maximum operating temperature: 120°F (49°C).

3.5.4 Maximum Inlet Flow Capacity

3.5.4.1 At 100 psig (6.9 bar): For maximum inlet flow at 100 psig (6.9 bar) refer to *Table* 4

3.5.4.2 At pressures other than 100 psig (6.9 bar) : Multiply inlet flow from *Table* 4 by multiplier from *Table* 5 that corresponds to system pressure at inlet to dryer.

3.6 Determining Purge and Outlet Flows:

3.6.1 Purge Flows

3.6.1.1 Maximum Purge Flow.- Maximum Purge Flow (MFP) is the amount of purge air flowing through the off-stream tower when the purge/repressurization valve is open. After the purge/ r' ssurization valve closes, the purge flow will gradually decrease . ; off-stream tower repressurizes to line pressure.

For maximum purge flow multiply inlet flow at rated conditions from *Table* 4 by Maximum Purge Flow Factor from *Table 6* that corresponds to the dryer MWP, Cycle Time Setting, and air pressure at inlet to dryer. For dryers supplied with the optional Automatic Purge Saving System operating in the Demand Cycle Mode, use 10 minutes as the cycle time.

3.6.1.2 Average Purge Flow - For dryers with the standard control board and dryers with the Automatic Purge Saving System operating in the fixed cycle mode:

The Average Purge Flow (APF) is the actual amount of flow used during the entire purge/repressurization cycle. It includes the maximum purge flow (MFP) for a portion of the purge/repressurization time and the volume of air used for repressurization, averaged over the cycle time.

To determine average purge flow, multiply maximum inlet flow at rated conditions from *Table* 4 by Average Purge/Repressurization Flow Factor from *Table 7* that corresponds to the dryer Maximum Working Pressure, Inlet Pressure, Cycle Time Setting, and Economizer Switch Setting.

3.6.2 Outlet Air Flow

3.6.2.1 Minimum Outlet Flow

Determine minimum outlet flow available from dryer by subtracting Maximum Purge Flow (MFP) found in 3.6.1.1 from inlet flow o the dryer.

3.6.2.2 Average Outlet Flow - For dryers with the standard control board and dryers with the Automatic Purge Saving System operating in the fixed cycle mode:

Determine average outlet flow available by subtracting Average Purge Flow (APF) found in 3.6.1.2 from the inlet flow to the dryer.

NOTE

Average outlet flow may be used to determine available downstream air supply if a storage vessel (e.g. receiver tank) of sufficient volume is available between dryer and point of air usage. Otherwise use minimum outlet flow to determine downstream air available.

EXAMPLE

Find maximum inlet flow, maximum and average purge flows, and minimum and average outlet flows for a 60 scfm unit with a MWP of 150 psig operated at 120 psig on a 10 minute cycle. Dryer will operate with an inlet air flow of 48 scfm.

Step 1: Find Maximum Inlet Flow by multiplying Maximum Inlet Flow at Rated Conditions from *Table* 4 by Inlet Pressure Correction Factor from *Table 5*: 60 x 1.08 = 64.8 scfm.

Step 2: Find Maximum Purge Flow by multiplying Inlet Flow at Rated Conditions from *Table 4* by Maximum Purge Flow Factor from *Table 6*: 60 x .162 = 9.7 scfm.

Step 3: Find Average Purge Flow by multiplying Maximum Inlet Flow at rated conditions from *Table 4* by Average Purge/ Repressurization Flow Factor from *Table 7:* 60 x .103 = 6.2 scfm.

NOTE

A 48 scfm dryer is operating at 75% of maximum flow (@ 120 psig): 48/64.8 = 74%. Average purge flow is based on Economizer Switch setting of 75%.

Step 4: Find Minimum Outlet Flow available by subtracting Maximum Purge Flow (Step 2) from inlet flow: 48 - 9.7 = 38.3 scfm.

Step 5: Find Average Outlet Flow available by subtracting Average Purge Flow (Step 3) from inlet flow: 48 - 6.2 = 41.8 scfm.

3.7 Determining outlet pressure dew point at various inlet compressed air temperatures:

The outlet pressure dew point is determined by the compressed air temperature at the inlet to the dryer and cycle time selected (4 or 10 minutes). Use *Table 9* to determine outlet dew points at various inlet compressed air temperatures and cycle times.

TABLE 4 Maximum Inlet Flow at Rated Conditions

MODEL	25	45	60	80	115	165	260	370	450	590	750	930	1130	1350	1550	2100	3000	4100	5400
Inlet @ 100 psig (scfm) (1) (2)	25	45	60	80	115	165	260	370	450	590	750	930	1130	1350	1550	2100	3000	4100	5400

(1) Convert scfm to metric units as follows: 1 scfm = 1.717m³n/h.

(2) "Performance data obtained and presented in accordance with ANSI/893.45M-1982. Pneumatic fluid power-Compressed air dryers-Methods for rating and testing." Conditions for rating air dryers are: 100 psig (6.9 bar) and 100°F (37.8°C)saturated inlet air, and a maximum 5 psi (.35 bar) pressure drop. Actual pressure drop for all units is less than 3 psi at rated conditions.

TABLE 5 Inlet Pressure Correction Factor

INLET PRESSURE	psig bar	60 4.1	70 4.8	80 5.5	90 6.2	100 6.9	110 7.6	120 8.3	125 3.6	140 9.7	150 10.3	175 12.1	200 13.8	225 15.5	250 17.3
MULTIPLIER		0.65	0.74	0.83	0.91	1.00	1.04	1.08	1.10	1.16	1.20	1.29	1.37	1.45	1.52

TABLE 6 Maximum Purge Flow Factor

DRYER MWP		150 psig						250 psig					
INLET PRESSURE (psig)		50-100	110	120	130	140	150	125	150	175	200	225	250
CYCLE TIME	10 minute	0.175	0.168	0.162	0.156	0.151	0.146	0.214	0.196	0.184	0.172	0.163	0.155
	4 minute	0.249	0.239	0.230	0.221	0.215	0.207	-	0.326	0.304	0.286	0.270	0.257

TABLE 7 Average Purge/Repressurization Flow Factor

DRYER MWP			150 psig										250 psig					
INLET PRESSURE (psig)			60	70	80	90	100	110	120	130	140	150	125	150	175	200	225	250
10 MINUTE CYCLE	ECONOMIZER SWITCH SETTING	25%	0.038	0.039	0.040	0.041	0.041	0.041	0.040	0.040	0.039	0.039						
		50%	0.073	0.073	0.074	0.075	0.076	0.074	0.072	0.070	0.069	0.068						
		75%	0.107	0.107	0.108	0.109	0.110	0.106	0.103	0.100	0.098	0.096						
		100%	0.141	0.142	0.143	0.143	0.144	0.139	0.134	0.131	0.128	0.125						
		33%											0.048	0.048	0.048	0.047	0.047	0.047
		67%											0.090	0.086	0.083	0.080	0.078	0.076
		100%											0.133	0.125	0.118	0.114	0.111	0.108
4 MINUTE CYCLE	ECONOMIZER SWITCH SETTING	67%	0.102	0.104	0.106	0.108	0.109	0.107	0.105	0.104	0.103	0.103						
		100%	0.147	0.149	0.151	0.152	0.155	0.151	0.147	0.146	0.143	0.140						
		100%											-	0.140	0.138	0.135	0.134	0.134

TABLE 8 Purge Economizer Switch Setting

DRYER MWP	% OF MAX. FLOW	10 MINUTE CYCLE DIP SWITCH POSITIONS				% OF MAX. FLOW	4 MINUTE CYCLE DIP SWITCH POSITIONS			
		1	2	3	4		1	2	3	4
150 psig	100	Off	Off	Off	Off	100	Off	Off	On	Off
	75	Off	Off	On	Off	67	Off	On	On	Off
	50	Off	On	On	Off					
	25	On	On	On	Off					
250 psig	100	Off	Off	On	Off	100	Off	On	On	Off
	67	Off	On	On	Off					
	33	On	On	On	Off					

TABLE 9 Outlet pressure dew points for dryers supplied with Activated Alumina Desiccant

INLET TEMP.	°F	35	40	50	60	70	80	90	100	110	120
	°C	1.7	4.4	10.1	15.6	21.1	26.7	32.2	37.8	43.3	48.9
OUTLET P.D.P. 10 MIN. CYCLE	°F	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30
	°C	-59.4	-56.7	-53.9	-51.1	-48.3	-45.6	-42.8	-40.0	-37.2	-34.4
OUTLET P.D.P. 4 MIN. CYCLE	°F	-149	-145	-138	-130	-122	-115	-108	-100	-92	-85
	°C	-100.6	-98.3	-94.4	-90.0	-85.6	-81.7	-77.8	-73.3	-68.9	-65.0

TABLE 10 Outlet pressure dew points at moisture indicator color change

INLET TEMP.	°F	35	40	50	60	70	80	90	100	110	120
	°C	1.7	4.4	10.1	15.6	21.1	26.7	32.2	37.8	43.3	48.9
OUTLET P.D.P.	°F	-34	-28	-22	-16	-10	-4	3	9	15	21
	°C	-36.7	-33.4	-30.0	-26.7	-23.4	-20.0	-16.1	-12.8	-9.5	-6.1

4.0 MAINTENANCE

WARNING

The heatless desiccant dryer is a pressure containing device. Depressurize before servicing. (See Section 3.3)

4.1 Desiccant Replacement

NOTE

The use of the correct replacement desiccant is necessary for proper dryer operation. Never use hygroscopic salts of the type commonly used in "deliquescent" type dryers.

4.1.1 Frequency of desiccant replacement

Desiccant should be replaced whenever the required dew point cannot be maintained while the dryer is being operated within its design conditions and there are no mechanical malfunctions. Refer to section 5.0 for troubleshooting hints.

NOTE

Desiccant life is determined by the quality of the inlet air. Proper filtering of the inlet air will extend the life of the desiccant.

Typically desiccant life is 3 to 5 years.

4.1.2 Procedure for Desiccant Charge Replacement

4.1.2.1 Depressurize and de-energize the dryer. (See section 3.6)

4.1.2.2 Remove the fill and drain plugs from desiccant tower and drain the spent desiccant. Place a container at the base of the vessel to collect the desiccant. If necessary tap the sides of the vessels with a rubber mallet to loosen desiccant.

4.1.2.3 Replace the drain plug using teflon tape sealant or equivalent

4.1.2.4 Fill the desiccant drying tower as full as possible with dry desiccant. Do not tamp desiccant.

4.1.2.5 Replace the fill plug using teflon tape sealant or equivalent.

4.1.2.6 Repeat this procedure for the other drying tower.

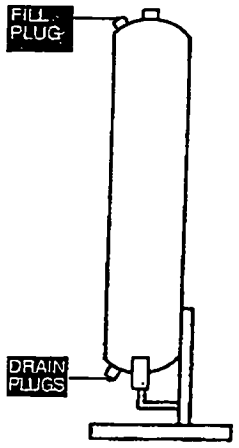


FIGURE 4A

4.1.3 Insuring desiccant dryness

4.1.3.1 Replacement desiccant is shipped in air tight containers. Keep the covers on these containers tightly closed until use to avoid moisture contamination. If desiccant is exposed to air it can be reated in an oven at 400°F (204°C) for four hours before use, or the rocedure in 4.1.3.2 can be used.

4.1.3.2 If the dryer is not refilled with dry desiccant, it will be ecessary to operate the dryer with an inlet flow rate of less than 50% f maximum to dry the desiccant. To do this, set the Economizer witch for 100%, and the purge pressure for 45 psig. (3.1 bar)

4.2 Pilot Air Filter - Cartridge Replacement - Models 370 scfm and larger

4.2.1 Frequency of replacement - Pilot air filter contains a filter cartridge which should be changed yearly or sooner if pressure drop across cartridge prevents valves from actuating. Pilot air pressure must not drop below 60 psig (4.1 bar).

4.2.2 Procedure for cartridge replacement.

WARNING

THE FILTER IS A PRESSURE CONTAINING DEVICE. DEPRESSURIZE DRYER BEFORE SERVICING. (SEE SECTION 3.3)

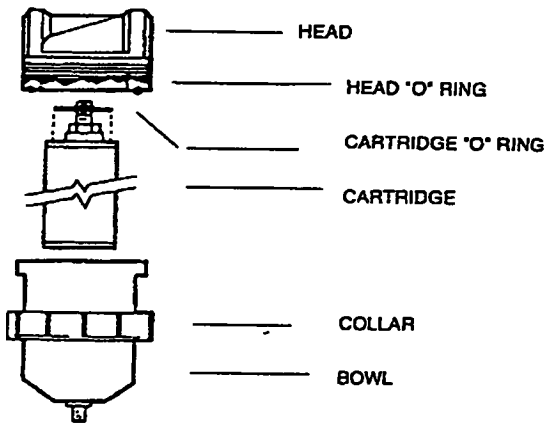


FIGURE 4B

NOTE

4.2.2.1 Unscrew the collar holding the filter bowl to head and remove the filter bowl and collar.

4.2.2.2 Clean the filter bowl.

4.2.2.3 Unscrew the old filter cartridge and discard. Also discard the small O-ring that seals the filter to the filter assembly head. **4.2.2.4** Insert small replacement O-ring on top of replacement filter cartridge and screw replacement filter cartridge into filter assembly head.

It is only necessary to finger tighten the filter cartridge into position to insure the seal. DO NOT WRENCH TIGHTEN.

4.2.2.5 After making sure large O-ring in filter is in place, reassemble filter bowl to filter head.

4.3 Fuse Replacement

4.3.1 Standard Units Only:

4.3.1.1 Fuse is located on board in electrical enclosure. Replace with 1/4 x 1 1/4", fast acting, 5 amp fuse (Bussmann AGC5).

BLE 12 Amount of desiccant required for complete change (lb)

MODEL	25	40	60	80	115	165	260	370	450	590
CTIVATED ALUMINA	48	48	72	106	182	182	316	452	528	710

MODEL	750	930	1130	1350	1550	2100	3000	4100	5400
ACTIVATED ALUMINA	926	1172	1468	1766	2064	2592	3930	4920	7750

4.3.2 Fuse Replacement

Only one of the "Valve Power" and one of the "Control Power" fuses should be installed at any time.

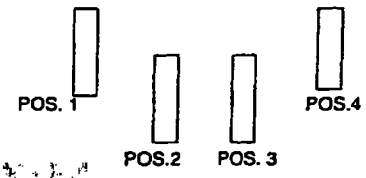
4.3.2.1 Use 1/8 amp fuse in positions 1 & 2

4.3.2.2 Use 1.6 amp fuse in positions 3 & 4.

4.3.2.3 Positions 1 & 4 take 5 mm x 20 mm size.

4.3.2.4 Positions 2 & 3 take 1/4" x 1 1/4" size.

4.3.2.5 Place fuses in positions 2 & 3 or 1 & 4 only. Do not place fuses in all four positions.



4.4 Battery replacement

Controller contains a battery which requires replacement every 3 to 4 years. If the battery is dead and the power is turned off and back on, a 10 minute fixed cycle will be selected by default.

4.5 Diagnostics

Manual Control

Press cycle selector switch until Test Mode Light illuminates. This change will not be acknowledged by the controller until the present cycle is completed (right tower drying terminates) or until the controller is de-energized and re-energized (not recommended when either tower is being regenerated since it will possibly cause a rapid repressurization).

In this mode the dryer is manually controlled and can be stepped through the cycle by depressing the alarm reset switch. At the same time, the average demand meter is functioning as a voltmeter monitoring the voltage from the thermistors. The dryer status and thermistor being monitored are indicated in the table below.

A 0% reading for a thermistor indicates a short circuit and a 100% reading, indicates an open circuit. A curve relating the demand meter reading to the thermistor temperature is shown in Figure 4C.

After the troubleshooting is completed, set the cycle selector to the desired position. Use the reset switch to manually step through the dryer operating sequence until the left tower drying light is illuminated and the reset switch cannot be used to step through the cycle. At this point, the dryer is on automatic control. Verify that the right tower depressurizes and repressurizes automatically before leaving the dryer.

If the dryer is switched from the manual mode and the cycle is not completed using the reset switch, the controller will automatically step through the test mode at a rate of one step every 50 seconds until the cycle is completed.

NOTE

Changes in the cycle selector are only acknowledged when the present cycle is completed. If in manual mode, continue to step through dryer operating sequence until left tower drying begins.

STEP NUMBER	WHAT OCCURS	TOWER STATUS				VALVE POSITION				SOLENOID/TERMINALS ENERGIZED (light illuminated)				FOR AIR-OPERATED VALVES: PILOT VALVE PORT PRESSURIZED				THERMISTOR BEING CHECKED			
		MODE		PRESSURE		L P/R	L IN	R P/R	R IN	L P/R (15/14)	L IN (13/12)	R P/R (1/10)	R IN (9/8)	L P/R	L IN	R P/R	R IN	T L	T R	B L	B R
		LT	RT	LT	RT																
Start		D	D	LP	LP	C	O	C	O					A	A	A	A				
1	R IN closes	D	-	LP	LP	C	O	C	C				E	A	A	A	B	X			
2 (1)	R P/R opens	D	R	LP	<2	C	O	O	C			E	E	A	A	B	B				X
3	No change	D	R	LP	<2	C	O	O	C			E	E	A	A	B	B				X
4 (2) (3)	R P/R closes	D	-	LP	REP	C	O	C	C				E	A	A	A	B	X			
5	R IN opens	D	D	LP	LP	C	O	C	O					A	A	A	A				
6	L IN closes	-	D	LP	LP	C	C	C	O		E			A	B	A	A			X	
7 (1)	L P/R opens	R	D	<2	LP	O	C	C	O	E	E			B	B	A	A		X		
8	No change	R	D	<2	LP	O	C	C	O	E	E			B	B	A	A		X		
9 (2) (3)	L P/R closes	-	D	REP	LP	C	C	C	O	-	E			A	B	A	A			X	

NOTES:

(1) Close purge rate valve during this step to check for any valve leaks. No air should exhaust through the muffler. If air is exhausting through the muffler, check all valves for leaks. After testing for leaks or fixing any leaks, be sure to open the purge pressure valve and reset the purge pressure.

(2) Do not go to the next step until the tower is repressurized.

(3) Switching failure alarm circuit is energized during this step (alarm light should flash until pressure exceeds 40 psig).

CODES:

R IN - Right inlet valve
R P/R - Right purge/repressurization valve
L IN - Left inlet valve
L P/R - Left purge/repressurization valve
LT - Left tower
RT - Right tower

D - Drying
R - Regenerating
LP - Line Pressure
<2 - Less than 2 psig
REP - Repressurizing
C - Closed
O - Open

E - Energized
TL -Top left
TR - Top right
BL - Bottom left
BR - Bottom right

TEMPERATURE RANGE VERSUS AVERAGE DEMAND

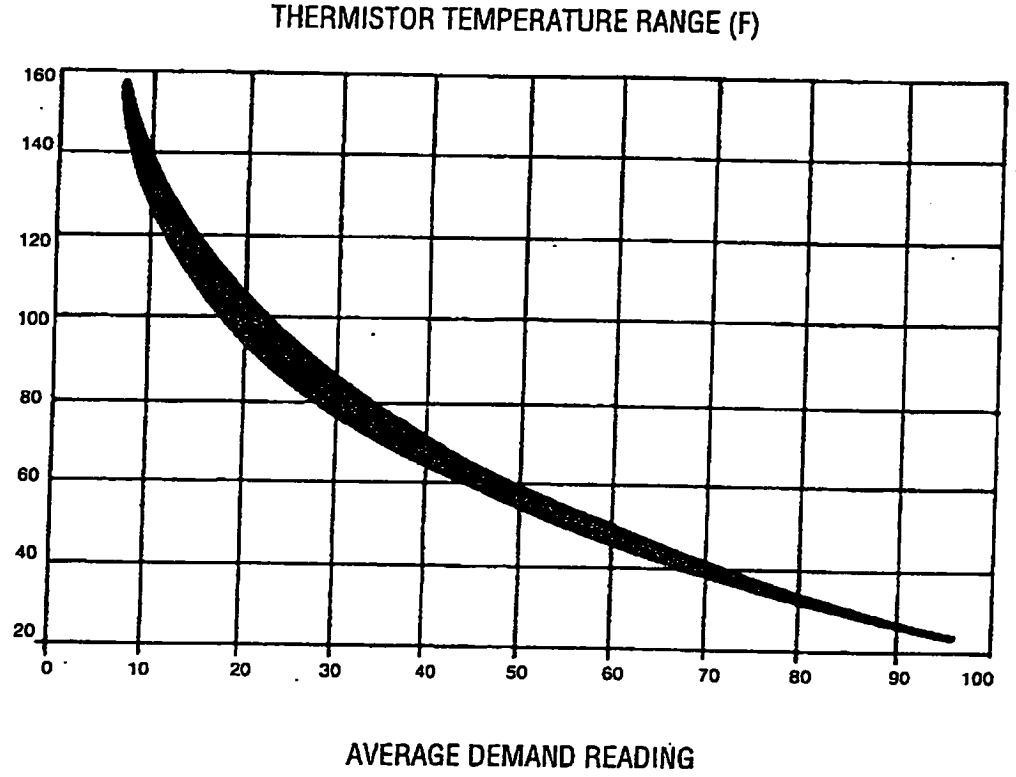


FIGURE 4C

5.0 TROUBLESHOOTING

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
5.1 Power-on light not lit	No power to unit	Check voltage at terminal board.
	On/Off Switch off	Turn on.
	Switch malfunctioning	Replace switch.
	Light burnt out	Replace light.
5.2 Moisture indication Turns yellow (elevated outlet dew points)	Maximum flow being exceeded	Refer to Section 3.5.4 to determine maximum flow.
	Design conditions being exceeded	Refer to Section 3.5 to determine if dryer is being operated within its design limitations.
	Desiccant not adsorbing a. Useful service life has ended	Change desiccant.
	b. Desiccant is contaminated (e.g. with oil)	Take corrective action. Refer to Section 2.1 to determine proper prefiltration then change desiccant.
	c. Premature exhaustion (saturated with water)	Refer to 5.3 for corrective action. Desiccant beds may be reactivated by running at reduced flow until desired outlet dewpoint is achieved.
5.3 Desiccant being exhausted prematurely	Insufficient purge rate a. Improper purge rate valve purge	Refer to Section 3.1.4 to determine correct Purge Pressure Indicator Setting.
	b. Tower not completely depressurized during purge cycle (Tower pressure gauge should read lower than 2 psig)	
	1. Clogged exhaust muffler	Replace muffler.
	2. Purge valve won't open	Check power to valve to determine if valve or timer at fault. On Models 370 and larger, check pilot air line for obstruction.
	3. Check valve stuck open	Repair valve.
	Insufficient purge time a. Improper set points	Refer to Section 3.1.1 to determine correct Economizer Switch and Cycle Time Jumper settings.
	b. Faulty Timer	Refer to Section 3.2.3 to verify proper time sequence.
5.4 Tower fails to pressurize to line pressure	Purge repressurization valve won't close	Check valve for obstruction. On Models 25 thru 260 this valve is normally closed. On Models 370 and larger, check pilot solenoid valve and pilot air line for obstruction.
	Excessive downsteam air demand	
5.5 Tower fails to depressurize to less than 2 psig	Purge rate valve open too far	Check Section 3.1.4 for purge rate indicator setting.
	Clogged muffler	Replace muffler.
	Check valve stuck open	Repair valve.
	Purge repressurization valve won't open	Check power to valve (pilot valve on Models 370 and larger) to determine if valve or timer is at fault.. Models 370 and larger: Check pilot valve, pilot air line, and purge repressurization valve for obstruction.
5.6 Excessive purge air is discharged during purge cycle	Inlet valve won't close	Check power to valve (pilot valve on Models 370 and larger) to determine if valve or timer iis at fault. Check valve for obstruction. Models 370 and larger: Check pilot valve and pilot air line for obstruction.
	Check valve sticking	Refer to Section 3.2.3.2
5.7 Excessive desiccant dust downstream	Faulty timer	Refer to Section 3.2.3 to verify proper time sequence.
	Purge rate valve closed	Refer to Section 3.1.4 to determine Correct Purge Pressure setting.

Desiccant Dryer Repair Parts List
150 PSIG Max. Operating Pressure **NEMA Class 7**

010.600.3D
Rev. D 5/1/99

Model	25	45	60	80	115	165	260
Purge/Repressurization Valve							
Complete Valve	4810.745.3	4810.745.3	4810.745.3	4810.745.2	4810.745.10	4810.745.10	4810.745.12
Repair Kit	4810.442.10	4810.442.10	4810.442.10	4810.442.9	4810.442.12	4810.442.12	4810.442.16
Inlet Switching Valve							
Complete Valve	4810.745.5	4810.745.5	4810.745.4	4810.745.1	4810.745.1	4810.745.7	4810.745.7
Repair Kit	4810.442.11	4810.442.11	4810.442.15	4810.442.8	4810.442.8	4810.442.13	4810.442.13
Pilot Solenoid Valve							
Valve (w/ coil) 120-60/110-50	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12
Valve (w/ coil) 240-60/220-50	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13
Coil 120-60/110-50	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19
240-60/220-50	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20
Valve Body Repair Kit	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26
Purge Air Check Valve	4820.106.1	4820.106.1	4820.106.1	4820.106.1	4820.106.1	4820.104.1	4820.104.1
Outlet Air Check Valve	4820.106.1	4820.106.1	4820.106.2	4820.106.3	4820.106.3	4820.104.2	4820.104.2
Pressure Relief Valve	4820.658.1	4820.658.1	4820.658.1	4820.658.1	4820.658.3	4820.658.3	4820.658.3
Adjustable Purge Rate Valve	4820.283.6	4820.283.6	4820.283.7	4820.283.8	4820.283.8	4820.283.2	4820.283.3
Pilot Air Filter Cartridge	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12
Purge Muffler	3442.516.2	3442.516.2	3442.516.2	3442.516.3	3442.516.4	3442.516.4	3442.516.5
Muffler Insert	3442.101.1	3442.101.1	3442.101.1	3442.101.2	3442.101.3	3442.101.3	3442.101.4
Strainer	4130.698.6	4130.698.6	4130.698.7	4130.698.8	8835.739.1	8835.739.1	8835.739.2
Purge Orifice	33.1677-03	33.1678-03	33.1679-03	33.1680-03	33.1696-01	33.1681-03	33.1682-02
Moisture Indicator	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1
Tower Pressure Gage	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1
Purge Flow Indicator Gage	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1
Off/On Switch	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12
Power On Light (Green)							
120-60/110-50	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16
240-60/220-50	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20
Switch Fail Alarm Light (Red)							
120-60/110-50	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14
240-60/220-50	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18
Tower Indicating Lights (Amber)							
120-60/110-50	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17
240-60/220-50	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21
Timer (c/w Switching Fail Alarm)							
120-60/110-50	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10
240-60/220-50	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11
Pressure Switch	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1
Timer (APSS*)							
120/240 (switchable)	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3
Thermistor (APSS*)	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2

*APSS (Automatic Purge Saving System)

R.002041

Desiccant Dryer Repair Parts List
150 PSIG Max. Operating Pressure **NEMA Class 7**

7610.600.3D
Rev. D 5/1/99

Model	370	450	590	750	930	1130	1350	1550	2100	3000	4100	5400
Purge/Repressurization Valve												
Complete Butterfly Valve Ass.	4820.090.74	4820.090.74	4820.090.74	4820.090.74	4820.090.75	4820.090.76	4820.090.76	4820.090.76	4820.090.77	4820.090.77	4820.090.78	4820.090.78
Butterfly Valve Body	4820.093.4	4820.093.4	4820.093.4	4820.093.4	4820.093.5	4820.093.1	4820.093.1	4820.093.1	4820.093.2	4820.093.2	4820.093.3	4820.093.3
Butterfly Valve Actuator	4820.009.45	4820.009.45	4820.009.45	4820.009.45	4820.009.46	4820.009.46	4820.009.46	4820.009.46	4820.009.47	4820.009.47	4820.009.48	4820.009.48
Inlet Switching Valve												
Complete Butterfly Valve Ass.	4820.090.67	4820.090.67	4820.090.67	4820.090.68	4820.090.68	4820.090.69	4820.090.69	4820.090.70	4820.090.70	4820.090.71	4820.090.71	4820.090.71
Butterfly Valve Body	4820.093.4	4820.093.4	4820.093.4	4820.093.5	4820.093.5	4820.093.1	4820.093.1	4820.093.2	4820.093.2	4820.093.3	4820.093.3	4820.093.3
Butterfly Valve Actuator	4820.009.40	4820.009.40	4820.009.40	4820.009.40	4820.009.40	4820.009.40	4820.009.40	4820.009.41	4820.009.41	4820.009.42	4820.009.42	4820.009.42
Pilot Solenoid Valve												
Valve (w/ coil) 120-60/110-50	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12	4810.741.12
Valve (w/ coil) 240-60/220-50	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13	4810.741.13
Coil 120-60/110-50	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19	4810.132.19
240-60/220-50	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20	4810.132.20
Valve Body Repair Kit	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26	4810.443.26
Inlet Switching Pilot Air Valve	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6	4810.770.6
Purge/Repressurization Pilot Air Valve	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7	4810.770.7
Purge Air Check Valve	4820.104.1	4820.104.1	4820.104.2	4820.104.2	4820.104.2	4820.104.2	4820.104.2	4820.104.3	4820.104.3	4820.104.4	4820.104.5	4820.104.5
Outlet Air Check Valve	4820.104.3	4820.104.3	4820.104.3	4820.104.7	4820.104.7	4820.104.4	4820.104.4	4820.104.5	4820.104.5	4820.104.6	4820.104.6	4820.104.6
Pressure Relief Valve	4820.658.5	4820.658.5	4820.658.6	4820.658.6	4820.658.7	4820.658.7	4820.658.8	4820.658.8	4820.658.9	4820.658.9	4820.658.8	4820.658.9
Adjustable Purge Rate Valve	4820.283.3	4820.283.3	4820.283.9	4820.283.5	4820.283.5	4820.283.5	4820.283.5	4820.283.4	4820.283.4	4820.283.4	4820.283.4	4820.283.10
Air Pressure Regulator	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16	4820.652.16
Pilot Air Filter Cartridge	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12	E7-12
Purge Muffler	3442.516.5	3442.516.5	3442.516.6	3442.516.6	3442.516.6	3442.516.7	3442.516.7	3442.516.7	3442.516.8	3442.516.9	3442.516.9	3442.516.9
Muffler Insert	3442.101.4	3442.101.4	3442.101.5	3442.101.5	3442.101.5	3442.101.6	3442.101.6	3442.101.6	3442.101.7	3442.101.8	3442.101.8	3442.101.8
Strainer	8835.739.2	8835.739.2	8835.739.2	8835.739.2	8835.739.3	8835.739.3	8835.739.3	8835.739.3	8835.739.3	N/A	N/A	I N/A
Purge Orifice	33.1683-02	33.1684-03	33.1685-03	33.1686-03	33.1687-03	33.1688-02	33.1689-02	33.1690-02	33.1691-02	33.1692-01	33.1693-01	33.1694-01
Moisture Indicator	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1	3004-1
Tower Pressure Gage	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1
Purge Flow Indicator Gage	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1	6685.279.1
Off/On Switch	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12	6110.729.12
Power On Light (Green)												
120-60/110-50	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16	6350.452.16
240-60/220-50	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20	6350.452.20
Switch Fail Alarm Light (Red)												
120-60/110-50	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14	6350.452.14
240-60/220-50	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18	6350.452.18
Tower Indicating Lights (Amber)												
120-60/110-50	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17	6350.452.17
240-60/220-50	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21	6350.452.21
Timer (c/w Switching Fail Alarm)												
120-60/110-50	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10	5945.690.10
240-60/220-50	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11	5945.690.11
Pressure Switch	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.1	4130.138.
Timer (APSS*)												
120/240 (switchable)	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3	5945.694.3
Thermistor (APSS*)	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2	6685.756.2

*APSS (Automatic Purge Saving System)

R002042

Appendix B.8

Exhaust Fan/Hood Information

perating Instructions & Parts Manual

2C856B, 2C963B, 3C772, 4C020B and 4C369A thru 4c371A

read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or ty damage! Retain instructions for future reference.

ayton® Hazardous ocation Exhaust Fans

escription

yton hazardous location exhaust fans are d for air exhausting jobs in atmospheres ntaining flammable or explosive vapors or es as defined under section 500 of the tional Electrical Code (NEC). Each unit is ipped with a non-sparking, cast minum fan blade and a U.L. Listed Class iv. I, Group D and Class II, Div. I, Groups and G, totally enclosed, hazardous ation, ball bearing motor with automatic et thermal protection.

TE: Model 3C772 is a 6-wing fan blade t. All other models have 4-wing fan des.

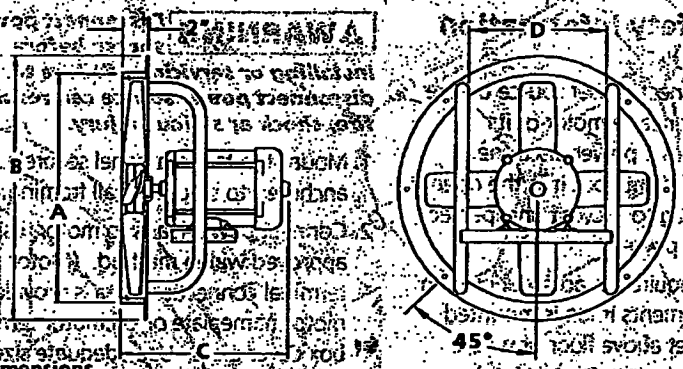


Figure 1 - Dimensions

Dimensions

Model	A (Dia.)	B (Dia.)	C	D
4C020B	13 1/4	16 1/4	12 5/8	
4C369A	17 1/4	20 1/4	13 7/8	
4C370A	19 1/4	22 1/4	13 5/8	
2C963B	21 1/4	24 1/4	13 1/2	
2C856B	25 1/4	28 1/4	13 3/4	
4C371A	25 1/4	28 1/4	13 7/8	
3C772	30 1/2	33 1/2		

king

When receiving the unit, inspect carefully or any damage that may have occurred during transit. A shipping damage claim must be filed with carrier.

ecifications

odel	Blade Dia.	CFM Air Delivery @ SP Shown Free Air	1/8"	Motor 1/4"	3/8"	HP	RPM	Full Load Amps
020B	12"	855	645	330	175	1/4	1725	4.5
369A	16	2000	1640	1260	750	1/4	1725	4.5
370A	18	2210	1810	1300	800	1/4	1725	4.5
963B	20	2475	1860	1350	850	1/4	1725	4.5
856B	24	3535	2520	1720	1000	1/3	1725	6.4
371A	24	4265	3320	2480	2200	1/2	1725	9.0/4.5
772	30	7135	6000	5000	3500	3/4	1140	9.6/4.8

st data was obtained in a laboratory registered by AMCA for (AMCA 210 air performance) testing. Data is not certified by AMCA.
Full load amps 115/230 voltage.

eneral Safety Information

WARNING ***Disconnect power source before talling or servicing. Failure to ct power source can result in ck or serious injury.***

1. This fan should be installed by a qualified technician.
2. Follow all local electrical and safety codes, as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
3. Motor must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system, by using a separate ground wire connected to the bare metal of the motor frame, or other suitable means.

Dayton® Hazardous Location Exhaust Fans

Troubleshooting Chart

Symptom	Possible Cause(s)	Corrective Action
Excessive noise	1. Defective motor bearing	1. Replace
	2. Loose fan blade	2. Tighten setscrew
	3. Crooked or damaged fan blade	3. Replace
	4. Motor not securely anchored	4. Secure properly
Fan inoperative	1. Blown fuse or open circuit breaker	1. Repair or replace
	2. Electricity turned off	2. Contact local power company
	3. Defective motor	3. Repair or replace
Insufficient air flow	Blocked intake or exhaust opening	Clear obstruction or increase size of opening

...ited Warranty

Dayton One-Year Limited Warranty. Hazardous Location Exhaust Fans, Models 2C856B, 2C963B, 3C772, 4C020B and 4C369A thru 4C371A, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from state to state.

Limitation of Liability. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.

Warranty Disclaimer. Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.

Product Suitability. Many states and localities have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, please review the product application, and national and local codes and regulations, and be sure that the product, installation, and use will comply with them.

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some states do not allow a limitation on how long an implied warranty lasts, consequentially the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, any implied warranty of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file ...m with carrier.

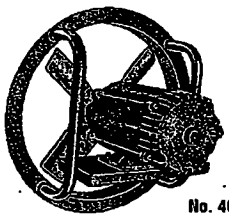
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Niles, Illinois 60714 U.S.A.

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Dayton®

HAZARDOUS LOCATION EXHAUST FANS



No. 4C369

- For heavy duty ventilation of atmospheres containing flammable or explosive vapors, gases, or dusts (per NEC 500).
- Motors only are UL Listed (E62643) 115 VAC, 60 Hz (4C371& 3C772: 115/230 VAC, single-phase I, group D and class II, groups E, F, & G applications.
- Spark resistant cast aluminum fan blades
- Fans have a heavy steel circular frame with ample mounting holes and a fixed position motor base attached to rigid tubular supports.
- All units have 4-blade propelle blade
- Note: Consult local ventilation for local code requirements
- Note: Units are not for use wh blades will accumulate paint
- Note: OSHA complying guards recommended when fan blade within reach of personnel.

Dayton Electric Mfg. Co. certifies that the ventilators shown hereon are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Hazardous Location Exhaust Fan Dimensions			Recommended Accessories*		
Blade Diameter (In.)	Outside Dimensions (In.)	Venturi Clearance Dimensions (In.)	Intake Guard Stock No.	Each	Aluminum Wall Sl Stock No.
12	16¼	13⅛	6D582	$82.95	4C556
16	20¼	17⅛	6D583	89.05	4C557
18	22¼	19⅛	6D584	95.35	4C558
20	24½	21⅛	6D585	141.50	4C559
24	28¼	25⅛	6D586	170.25	3C308
30	33½	30⅛	6D586	170.25	3C309

(*) Electrically ground all components in hazardous location system.

Blade Dia. (In.)	CFM Air Delivery* 0.0" SP	0.125" SP	0.25" SP	0.375" SP	Sones @ 5ft./0.0"SP**	RPM	Motor HP	Full Load Amps	Watts	Stock No. †
12	900	700	585	315	14.2	1725	1/4	4.5	193	4C020
16	1980	1570	1300	1095	22	1725	1/4	4.5	320	4C369
18	2375	1935	1520	1335	23	1725	1/4	4.5	313	4C370
20	2560	2015	1500	1165	23	1725	1/4	4.5	290	2C963
24	3345	2695	2075	1520	29	1725	1/3	6.4	383	2C856
24††	4695	4080	3395	2740	35	1725	1/2	9.0/4.5	667	4C371
30††	7120	6095	5000	3800	28	1140	3/4	9.6/4.8	653	3C772

(*) Performance shown is for installation type A, Free inlet, Free Outlet. Speed (rpm) shown is nominal. Performance is based on actual speed of test. Performance ratings inc guard and shutter in the airstream.
(**) The sound ratings shown are loudness values in fan sones at 5 ft. (1.5 m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for installation sone levels.
(†) Electrically ground all components in Haz Loc system. (††) Units are 115/230 VAC.



No. 4X788

CONDUIT BOX for HAZARDOUS LOCATION FAN MOTORS

For use on Dayton brand hazardous location fan motors above. Has hole for self-tapping grounding screw. Easily installed. UL Listed. Gray finish.

No. 4X788. Shpg. wt. 1.6 lbs. Li
Each.....

6 TO 12" DIAMETER RING FANS

Replacement Parts Available 1-800-323-0620

No. 2C100



- For exhausting and cooling operations
- Totally enclosed, shaded pole, 115V, 60 Hz motor
- Galvanized steel ring on No.'s 2X221, 4C107, and 2C heavy gauge steel angel frame with baked on gray polyester finish
- Fan No.'s 2C221 and 4C107 have wiring junction bo 12" leads; No's 2C107 and 2C100 have wiring junctl and 6" leads

Propeller Dia. (In.)	CFM @ 0.0" SP	HP	Full-Load Amps	Motor Enclosure	Junction Box	Mtg. Holes OC (In.)	Stock No.	List
6	150	1/100	0.73	TE	No	11⅜	2C221	$80.34
9	290	1/70	0.70	TE	No	11¼	4C107	92.25
12	665	1/30	1.20	TE	Yes	13⅜	2C107	109.44
12	1075	1/20	1.50	TE	Yes	14¾	2C100	219.27

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ANS

All units have 4-blade propellers except 3C772 6-blade

Note: Consult local ventilation or fire inspector for code requirements

Motors are not for use where motor or blades will accumulate paint residue

Note: OSHA complying guards are strongly recommended when fan blades are exposed or within reach of personnel.

Recommended Accessories*

Each	Aluminum Wall Shutters Stock No.	Each
$82.95	4C556	$23.43
89.05	4C557	30.40
95.35	4C558	34.05
141.50	4C559	36.50
170.25	3C308	43.90
170.25	3C309	52.30

Watts	Stock No. †	Each
193	4C020	$422.75
320	4C369	457.25
313	4C370	481.25
290	2C963	494.75
383	2C856	616.00
667	4C373	700.50
653	3C772	774.00

† speed of test. Performance ratings include the effect
301. Values shown are for installation type A, free in

OCATION FAN MOTORS

4X788. Shpg. wt. 1.6 lbs. List.....$34.
ch.....$2

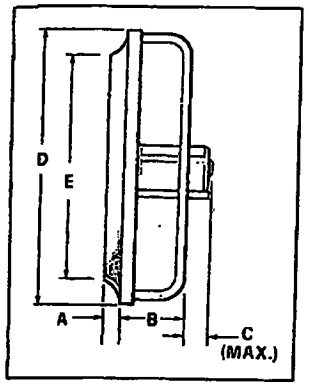
d cooling operations
haded pole, 115V, 60 Hz motor
ng on No.'s 2X221, 4C107, and 2C107;
angel frame with baked on gray

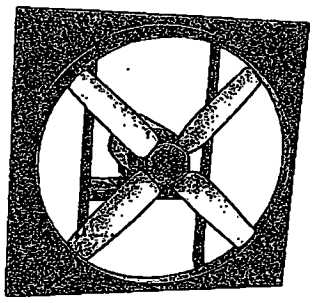
d 4C107 have wiring junction box and
107 and 2C100 have wiring junction bo

Stock No.	List	Each
2C221	$80.34	$49.60
4C107	92.25	56.95
2C107	109.44	67.55
2C100	219.27	135.40

HAZARDOUS CAST ALUMINUM LOCATION PANEL FA

Dayton®





No. 3XK61

- For heavy duty ... containing flar... or dusts. (per ...
- Motors only are UL Listed (B ...) Hz, single-phase hazardous location for class I, group D and class II, groups E, F, & G applications.
- Note: Units are not recommended where motor or blades will accumulate paint.
- Note: Consult local ventilation or fire inspector for code requirements.

Dayton Electric Mfg. Co. certifies that the ventilators shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

CAST ALUMINUM BLADE VENTURI FAN DIMENSIONS

Propeller Diameter (in.)	Dimensions (in.) A	B	C	D	E	Venturi Clearance Dia. (in.)
12	16⅛	13	1⅛	16⅛	12¾	14
16	21⅛	13	1¼	20⅛	16¼	18
18	22⅛	13	1¼	22⅛	18¼	20
20	24⅛	14	1¼	24⅛	20¼	22
24	28⅛	20	1¼	28⅛	23¾	26

RECOMMENDED ACCESSORIES

Intake Guards Stock No.	Each	Aluminum Wall Shutters Stock No.	Each
6D581	$77.00	4C556	$23.43
6D582	82.95	4C557	30.40
6D583	89.05	4C558	34.05
6D584	95.35	4C559	36.50
6D585	141.50	3C308	43.90

ORDERING DATA

Shaft Dia (in.)	CFM Air Delivery* 0.0" SP	0.125" SP	0.250" SP	0.375" SP	0.500" SP	Sones@** 5FL/0.0 SP	RPM	Motor HP	Full Load Amps	Watts	Stock No.	Each	Shpg. Wt.
12	1215	1105	925	625	—	12.1	1725	1/4	3.4	200	3XK51	$406.00	38
16	2545	2150	1680	1340	1065	16.9	1725	1/4	3.9	345	3XK37	435.25	41.0
18	3245	2810	2370	1930	1575	22	1725	1/3	5.0	420	3XK55	487.75	41.0
20	4440	3935	3300	2775	2330	25	1725	1/2	8.8	614	3XK59	551.00	49.0
24	5970	5365	4745	4080	3385	38	1725	1/2	8.8	687	3XK61	561.00	51.0
24	6265	5640	4990	4360	3675	37	1725	3/4	10.6	766	3XK64	619.00	57.0

* Performance shown is for installation type A, free inlet, free outlet. Speed (rpm) shown is nominal. Performance is based on actual speed of test. Performance ratings include the effects of guard and shutter in the airstream.
** The sound ratings shown 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 A, free inlet fan conditions.

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Dayton® Hazardous Location Exhaust Fans

General Safety Information (Continued)

4. Always disconnect power source before working on or near a motor or its connected load. If power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.
5. Guarding is required in accordance with OSHA requirements if fan is mounted less than 7 feet above floor or where workers have access. Dayton intake guard, Models 6D581 thru 6D591 are strongly recommended.
6. Be careful when touching the exterior of an operating motor; it may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load and voltage. Modern motors are built to operate at higher temperatures.
7. Protect power cable from coming into contact with sharp objects.
8. Do not kink power cable and never allow cable to come in contact with oil, grease, hot surfaces, or chemicals.
9. Make certain that the power source conforms to requirements of your equipment.
10. Wiping or cleaning rags and other flammable waste materials must be placed in a tightly closed metal container and disposed of later in the proper fashion.
11. When cleaning electrical or electronic equipment, always use an approved cleaning agent such as dry cleaning solvent.

Installation

⚠WARNING ***Not for use where paint residue can accumulate on motor.***

⚠WARNING ***Disconnect power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.***

1. Mount the fan to a panel securely anchored to studs or wall framing.
2. Connect power leads to motor, using an approved wiring method. (Motor terminal connection data is provided on motor nameplate or on motor terminal box cover plate. Use adequate size wire for all branch and feeder runs). Incorrect motor connections will cause poor fan performance and/or motor failure. Wiring diagrams for Models 2C856A, 2C963B, 4C020B, 4C369A, 4C370A (see Figure 2). Models 4C371A and 3C772 (see Figure 3) for motor wiring diagram.

⚠ CAUTION ***For safety, a lockable disconnect switch should be located near fan so power can be positively disconnected while servicing fan.***

⚠WARNING ***Fan frame and motor must be electrically grounded to a suitable electrical ground such as a grounded water pipe, or properly grounded metallic raceway or ground wire system.***

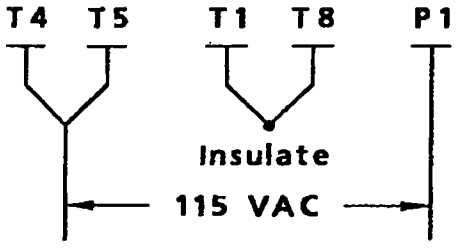
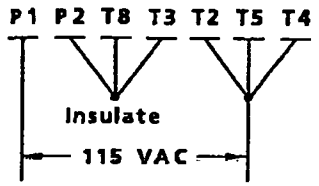


Figure 2 - Wiring Diagram for Single 115V Motor



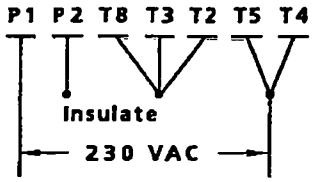


Figure 3 - Wiring Diagram for Dual 115/230V Motor

3. Before applying power to the fan, check for obstructions which would interfere with fan operation.

NOTE: Fan blade must turn clockwise when facing the shaft of the motor. If rotation is incorrect, refer to motor nameplate for reversing instructions.

Maintenance

⚠WARNING ***Make certain that the power source is disconnected before attempting to service or disassemble any components! If the power disconnect is out-of-sight, lock in open position and tag to prevent application of power.***

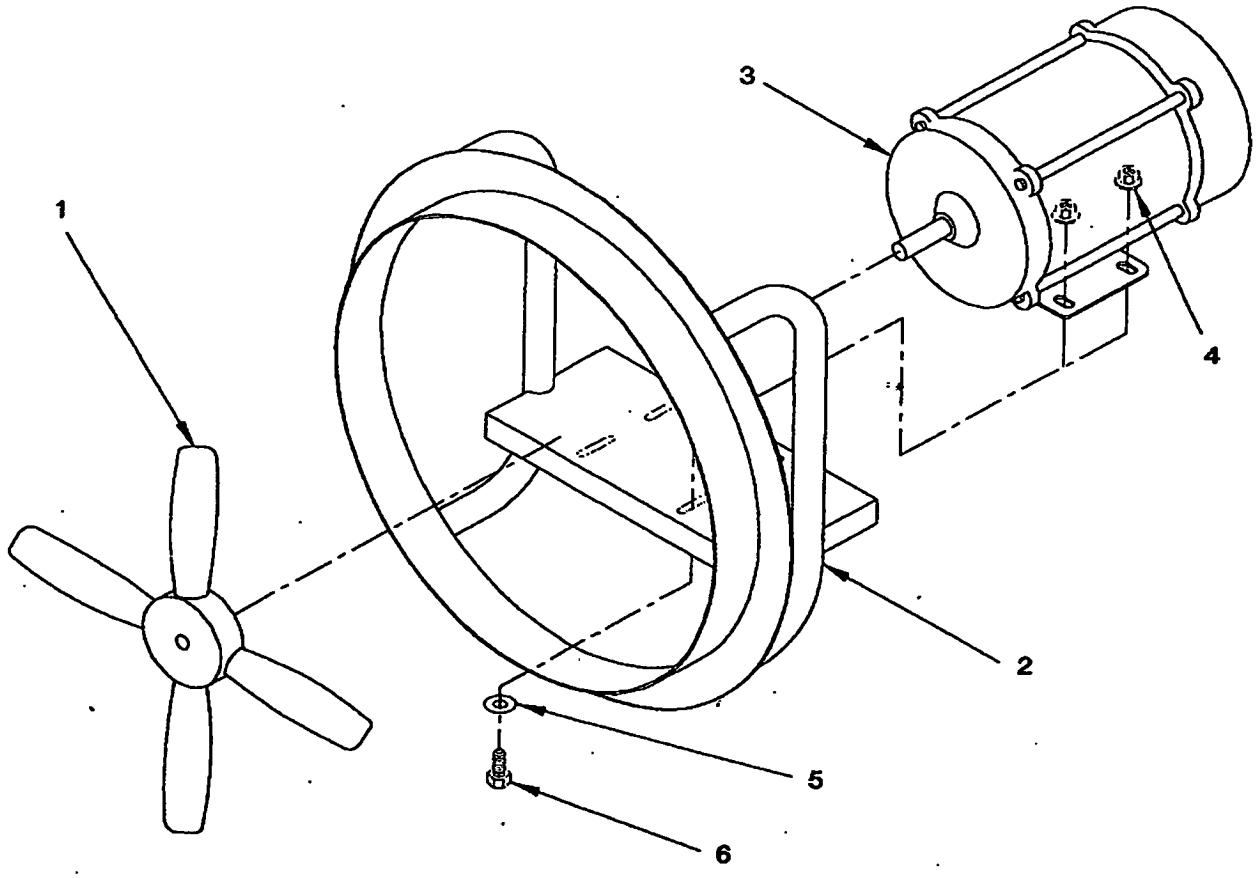
CLEANING:
It is advisable to clean motor and fan blade at regular intervals. This will remove any accumulated dirt which would cause unbalance and result in excessive vibration. If guarding has been added it should be removed and cleaned at regular intervals to maintain power air flow and prevent possible motor overloading.

LUBRICATION:
Motor is prelubricated at factory and will not require any further lubrication.

For Replacement Parts, call 1-800-323-0620

lease provide following information:
Model number
Se imber (if any)
Pa. criptions and number as shown in parts list

ddress parts correspondence to:
arts Company of America
657 Shermer Road
orthbrook, IL 60062-5362



gure 4 — Replacement Parts Illustration.

eplacement Parts List

Description	Part Number For Models: 4C020B	4C369A	4C370A	2C963B	2C856B	4C371A	3C772	Qty.
Fan blade	4C386	4C133A	4C135A	4C139A	4C145A	4C147A	03221001	1
Frame	42083002	42084002	42085002	42086002	42087002	42087002	42153001	1
Motor	6K734	6K734	6K734	6K734	6K738	6K039	13130001	1
5/16-24 Spinlock nut	*	*	*	*	*	*	*	4
5/16" Flat washer	*	*	*	*	*	*	*	4
5/16-24 x 3/4" HHC screw	*	*	*	*	*	*	*	4

St rd hardware items, available locally.

Operating Instructions & Parts Manual — 4YD06 thru 4YD10

Please read and save these instructions. *Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.*

Dayton® Weather Hoods

Description

Dayton weather hoods are designed to shield fan and damper openings in walls from rain and snow. A birdscreen is included. Weather hoods are shipped unassembled.

Dimensions

Model	Fan Dia.	A	B	C	Guard Grid Sections	Side Panel Gage
4YD06	24"	28 1/8"	21"	2"	1	18
4YD07	30	34 1/8	25	2	1	18
4YD08	36	40 1/8	29	2	2	18
4YD09	42	46 1/8	33	2	2	18
4YD10	48	54 1/8	38	2	2	18

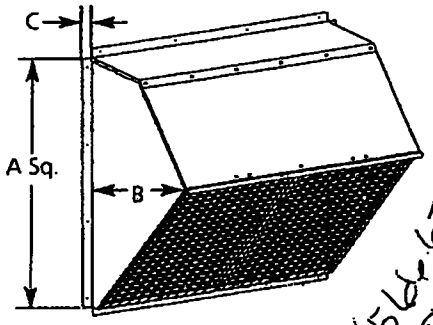


Figure 1 - Dimensions

Installation

WEATHER HOODS FOR SUPPLY FANS

Important: Fan should be securely mounted to wall prior to installation of weather hood.

⚠WARNING ***Weather hoods to be used in conjunction with supply fans. Care should be taken to ensure that power source to fan is locked OFF before weather hood is installed so that the fan creates no hazard to installer.***

1. Fasten front, top, bottom, and side panels together with 1/4 dia. x 1/2" long screws (supplied).
2. Fasten the center support angle to the front and bottom panel with 1/4 dia. x 1/2" long screws (supplied); Models 4YD08, 4YD09, and 4YD10 only.
3. Fasten the bracket(s) to the front panel with 1/4 dia. x 1/2" long screws (supplied).
4. Fasten the screen to the face of the weather hood with the 1/4 dia. x 1/2" long screws and 1.0 dia. washers (supplied).
5. Fasten weather hood directly to the wall (hardware not supplied).
   a. Use 1/4 x 2" masonry anchor for masonry walls.
   b. Use 1/4 x 2" lag screws if fastening to a framed wall.

Maintenance

⚠ CAUTION ***Make certain that the power source is disconnected before attempting to service or disassemble any components! If the power disconnect is out-of-sight, lock it in open position and tag to prevent application of power.***

CLEANING

Clean any accumulated dirt which would restrict air flow.

LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. *Weather Hoods Models covered in this manual, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.*

LIMITATION OF LIABILITY. *To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.*

WARRANTY DISCLAIMER. *Dayton has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are MERCHANTABLE, or FIT FOR A PARTICULAR PURPOSE, or that the products will necessarily conform to the illustrations or descriptions. Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.*

PRODUCT SUITABILITY. *Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Dayton attempts to assure that its products comply with such codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of a product, review the product applications, and all applicable national and local codes and regulations, and be sure that the product, installation, and use will comply with them.*

Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some jurisdictions do not allow a limitation on how long an implied warranty lasts, consequentially the above limitation may not apply to you; and (c) by law, during the period of this limited warranty, any implied warranties of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

PROMPT DISPOSITION. *Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within Limited Warranty. For any product believed to be defective within Limited Warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.*

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 U.S.A.

Form 5S4411

Printed in U.S.A.
05580
0899/389/C1

11601001

Dayton®

For Replacement Parts, call 1-800-323-0620

24 hours a day - 365 days a year

Please provide following information:
-Model number
-Serial number (if any)
-Part description and number as shown in parts list

Address parts correspondence to:
Grainger Parts
P.O. Box 3074
1657 Shermer Road
Northbrook, IL 60065-3074 U.S.A.

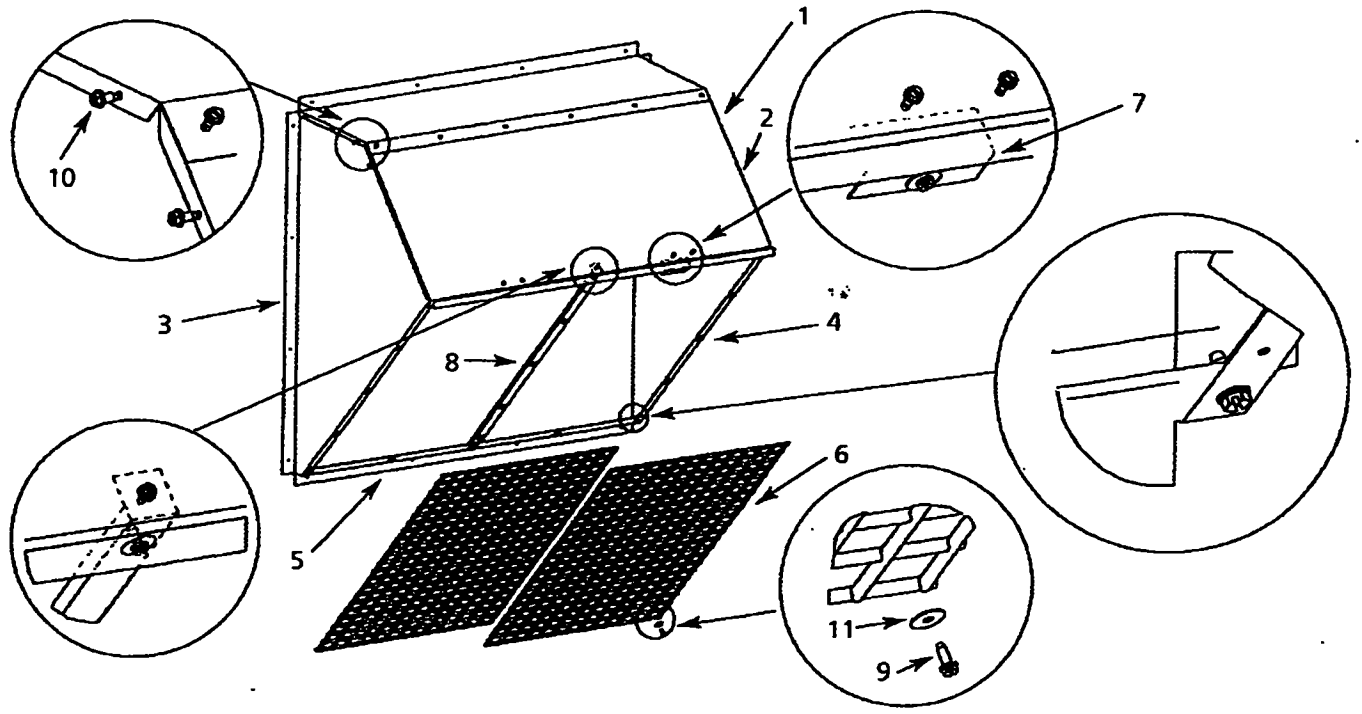


Figure 2 — Replacement Parts Illustration

Replacement Parts List

Ref. No.	Description	Part Number For Models: 4YD06	4YD07	4YD08	4YD09	4YD10	Quantity
1	Top panel	91509001	91510001	91511001	91512001	91513001	1
2	Front panel	91514001	91515001	91516001	91517001	91518001	1
3	Left side panel	91504001	91505001	91506001	91507001	91508001	1
4	Right side panel	91499001	91500001	91501001	91502001	91503001	1
5	Bottom angle	91519001	91520001	91521001	91522001	91523001	1
6	Screen	91694001	91695001	91696001	91697001	911698001	2
7	Bracket	06006001	06006001	06006001	06006001	06006001	2
8	Angle	—	—	91691001	91692001	91693001	1
9	14 - 3/4 HWSL screw	*	*	*	*	*	12-19
10	14 - 1/2 HWSL screw	*	*	*	*	*	27-32
11	.281 x 1.0 Washer	*	*	*	*	*	12-19

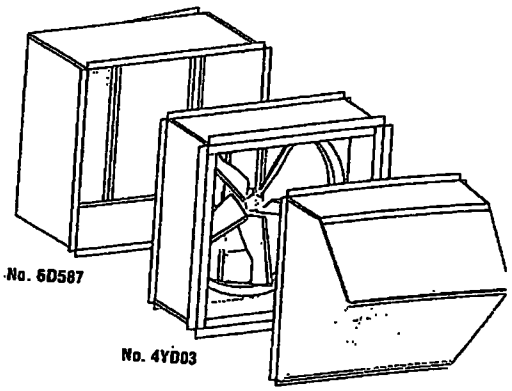
(*) Standard hardware item, available locally.

INTAKE GUARDS FOR EXHAUST FANS

- Intake guards comply with OSHA regulations
- Screens are hinged and removable for easy access
- 20-Gauge galvanized steel construction
- For direct and belt-drive propeller fans
- Shipped knocked down with assembly hardware included

WARNING! OSHA complying guards are required when fan is installed within 7 ft. of floor, working level or within reach of personnel. Review OSHA Codes.

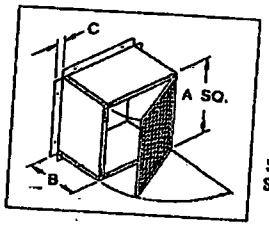
Dayton®



No. 6D587

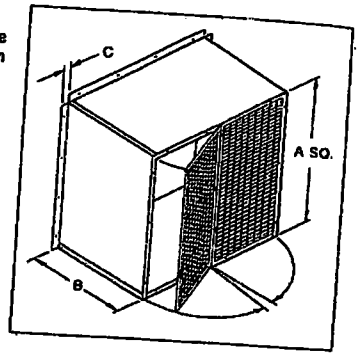
No. 4YD03

No. 4YD08



Single Screen

Double Screen



Replacement Parts Available
1-800-323-0620

SINGLE SCREEN INTAKE GUARDS

Fan Size (In.)	Dimensions (In.) A	B	C	Stock No.	List	Each	Shpg. Wt.
12	16⅛	13	1¼	6D581	$125.94	$77.00	13.0
16	21⅛	13	1¼	6D582	135.72	82.95	15.0
18	22⅛	13	1¼	6D583	145.75	89.05	17.0
20	24⅛	14	1¼	6D584	156.04	95.35	19.0
24	28⅛	20	1¼	6D585	231.59	141.50	35.0
30	34⅛	20	1¼	6D586	278.40	170.25	39.0

DOUBLE SCREEN INTAKE GUARDS

Fan Size (In.)	Dimensions (In.) A	B	C	Stock No.	List	Each	Shpg. Wt.
36	40⅛	27	2	6D587	$338.74	$207.00	61.0
42	46⅛	30	2	6D588	465.17	284.25	61.0
48	54⅛	32	2	6D589	629.10	384.50	120.0
54	60¼	34	2	6D590	753.79	460.75	155.0
60	66¼	37	2	6D591	832.74	509.00	167.0

Need OEM repair and maintenance parts?

Look for this symbol next to a product.
It tells you that Grainger Parts can directly supply you with OEM parts for that item and manufacturer.

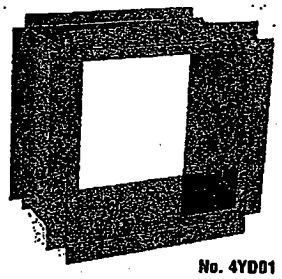
Call 1-800-323-0620
for parts replacement service 24 hours a day.

Accessories for Exhaust/Supply Fans

WALL COLLAR

An easy way to install vertically mounted Dayton supply and exhaust fans. An external flange is provided for shutter mounting. The external flange provides a flashing for the wall opening. For direct and belt drive propeller fans. 16-gauge galvanized steel construction. The wall collar is shipped unassembled with assembly hardware included.

New



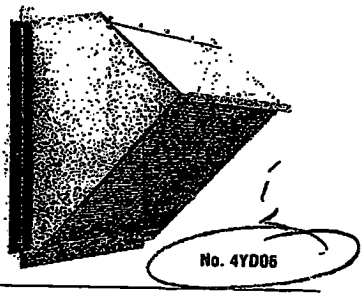
No. 4YD01

Ordering Data

Fan Size (In.)	Dimensions (In.) A	B	C	D	Stock No.	List	Each	Shpg. Wt.
24	28⅛	18½	2¾	2	4YD01	$202.60	$122.80	53.0
30	34⅛	19½	2¾	2	4YD02	270.11	163.75	77.0
36	40⅛	21½	2¾	2	4YD03	315.56	191.25	88.0
42	46⅛	21½	2¾	2	4YD04	342.38	207.50	97.0
48	54⅛	23½	2¾	2	4YD05	416.52	252.50	123.0

WEATHER HOOD

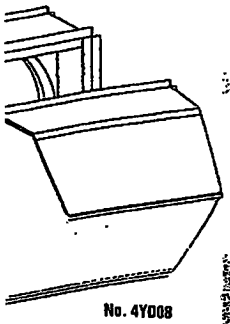
Shield fan and damper openings in walls from rain and snow. For direct and belt drive propeller fans. Sized to easily mount to wall collar. 18-gauge galvanized steel construction. A birdscreen is included. Weather hoods are shipped unassembled with assembly hardware included.



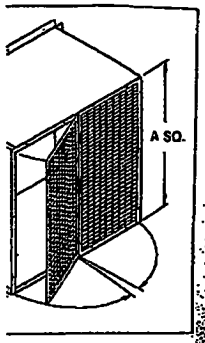
No. 4YD06

Ordering Data

Fan Size (In.)	Dimensions (In.) A	B	C	D	Stock No.	List	Each	Shpg. Wt.
24	28⅛	21	2	—	4YD06	$232.33	$140.85	33.0
30	34⅛	25	2	—	4YD07	349.78	212.00	44.0
36	40⅛	29	2	—	4YD08	403.41	244.50	52.0
42	46⅛	33	2	—	4YD09	516.43	313.00	78.0
48	54⅛	38	2	—	4YD10	590.26	357.75	103.0



No. 4YD08



KI IDS

List	Each	Shpg. Wt.
$338.74	$207.00	67
465.17	284.25	90
629.10	384.50	120
753.79	460.75	150
832.74	509.00	167

New **What's new?**

About **11,000 things.**

Look for the "New Products" header at the top of the page.
The new item stock number will also be highlighted.

Installation Instructions
Instrucciones de instalación
Instructions de montage

1C055B, 1C209B - 1C211B, 1C742B - 1C746B, 2C526B, 3C115B, 3C116B, 4C521B Galv.
3C308B - 3C314B, 4C555B - 4C559B, 4C835B Alum.
4TM08-4TM10 PVC

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future referance.

Dayton® Aluminum/Galvanized/ PVC Wall Shutters

Use Optional Motors: 2C831B on 10 - 36" Single Panel, 2C832B on 36 - 48" Double Panel, 4C885A on 54 - 60" Double Panel

We recommend shutter not be mounted closer to the fan than 1/3 the diameter of fan blade.

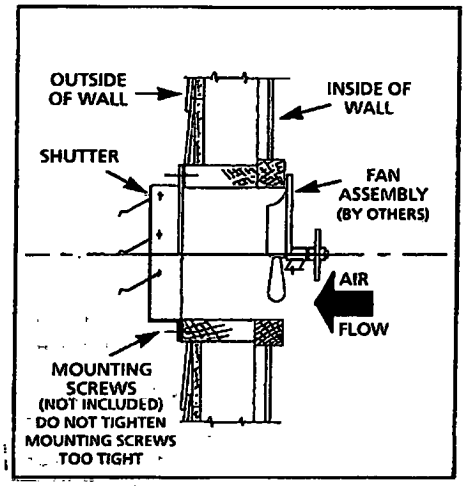
Do not force shutter into opening!

Do not open shutter by lifting individual blades!

Do not install shutter leaning forward or backward!

Installation

1. Shutter frame should be mounted level and squarely on outside wall. Care should be taken not to twist the shutter frame. Never cover shutter with siding or masonry work. Shutter should be mounted so it can be removed any time in case of damage.
2. Shutter should operate as freely after installation as it did before.
3. Caulking compound is recommended between shutter frame edges and the wall.
4. Clean and lubricate shutter at the same time that the fan is lubricated and cleaned.



Por favor lea y guarde estas instrucciones. Léalas cuidadosamente antes de intentar montar, instalar, operar o reparar el producto descrito. Para su propia protección y la de los demás cumpla con lo indicado en la información de seguridad. ¡El no hacerlo podría ocasionar lesiones personales, daños materiales o ambos! Guarde las instrucciones para referencia en el futuro.

Persianas murales Dayton® de aluminio/ galvanizadas/PVC

Usar motores opcionales: 2C831B en el panel simple de 25.4 - 91.4cm, 2C832B en panel doble de 91,4 - 121,9cm, 4C885A en panel doble de 137,2 - 152,4cm

Recomendamos que no se instale a una distancia menor de 1/3 de diámetro de las hojas del ventilador.

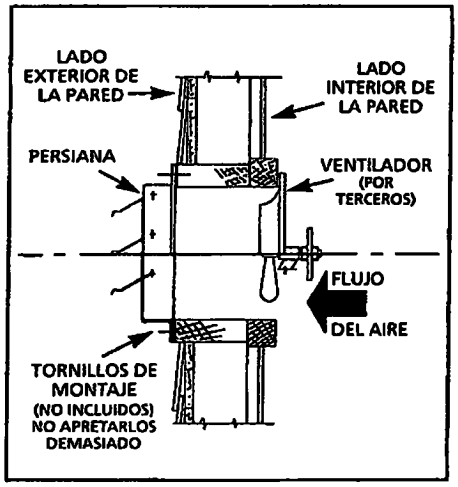
¡No forzar la persiana para abrirla!

¡No abrir la persiana levantando las hojas individualmente!

¡No instalar la persiana inclinada hacia adelante o hacia atrás!

Instalación

1. El marco de la persiana debe instalarse bien nivelado y recto en la pared exterior. Procurar no torcer el marco. Nunca cubrir la persiana con las tablas de revestimiento material de albañilería. La persiana debe instalarse de modo que se puede extraer en cualquier momento en caso de dañarse.
2. La persiana debe funcionar tan libremente después de instalada como antes de instalarse.
3. Se recomienda calafatear el espacio entre el borde del marco de la persiana y la pared.
4. Limpiar y lubricar la persiana al mismo tiempo que el ventilador.



Form 5S4147
Formulario 5S4147
Brochure 5S4147

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Impresso en EE.UU.
Imprimé aux États-Unis d'Amérique
01280
0399/067/C1

Dayton®

Installation Instructions
Instrucciones de instalación
Instructions de montage

1C055B, 1C209B - 1C211B, 1C742B - 1C746B, 2C526B, 3C115B, 3C116B, 4C521B Galv.
3C308B - 3C314B, 4C555B - 4C559B, 4C835B Alum.
4TM08-4TM10 PVC

Veuillez lire ces instructions et les conserver. Lisez-les attentivement avant d'essayer d'assembler, d'installer, d'utiliser ou d'entretenir l'équipement décrit. Protégez-vous et protégez les autres en observant toutes les consignes de sécurité. Ne pas respecter ces instructions peut entraîner des blessures ou des dégâts matériels! Conservez les instructions pour pouvoir les consulter ultérieurement.

Registres muraux Dayton® aluminium/ galvanisé/PVC

Employer les moteurs optionnels 2C831B pour 1 panneau de 25.4 - 91.4cm, 2C832B pour 2 panneaux de 91.4 - 121.9cm et 4C885A pour 2 panneaux de 137.2 - 152.4cm

ENGLISH

Nous recommandons de ne pas monter le volet à moins de 1/3 du diamètre de la pale de ventilateur par rapport au ventilateur.

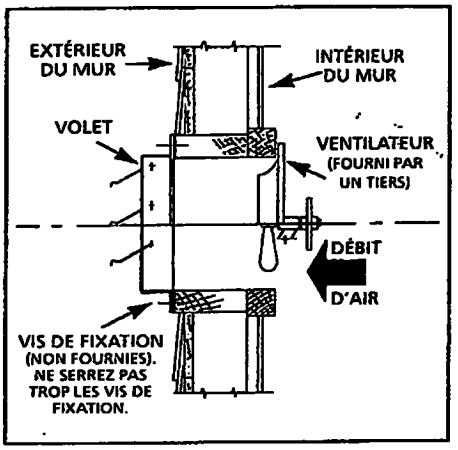
Ne forcez pas le volet dans l'ouverture!

N'ouvrez pas le volet en soulevant les pales individuelles!

N'installez pas le volet penché!

Installation

1. Le cadre du volet doit être monté droit et être bien d'équerre sur le mur extérieur. Il faut faire attention de ne pas tordre le cadre du volet. Ne recouvrez jamais le volet de parement ni de maçonnerie. Le volet doit être monté de manière à pouvoir être retiré à tout moment en cas de détérioration.
2. Le volet doit fonctionner aussi librement après installation qu'avant.
3. Il est recommandé d'appliquer du mastic entre les bords du cadre du volet et le mur.
4. Nettoyez et lubrifiez le volet en même temps que le ventilateur.



ESPAÑOL

FRANÇAIS

Limited Warranty
Dayton One-Year Limited Warranty. Dayton® Wall Shutter. Models covered in this manual, are warranted by Dayton Electric Mfg. Co. (Dayton) to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Dayton designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Dayton's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.

Limitation of Liability. To the extent allowable under applicable law, Dayton's liability for consequential and incidental damages is expressly disclaimed. Dayton's liability in all events is limited to and shall not exceed the purchase price paid.

Warranty Disclaimer. Dayton has made a diligent effort to provide product information and illustrate the products in this literature accurately; however, such information and illustrations are for the sole purpose of identification, and do not express or imply a warranty that the products are MERCHANTABLE, OR FIT FOR A PARTICULAR PURPOSE, or that the products will necessarily conform to the illustrations or descriptions.

Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Dayton.

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Prompt Disposition. Dayton will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 U.S.A.

Garantía Limitada
La garantía limitada Dayton por un año en los modelos de persianas murales de aluminio Dayton®, están cubiertas en este manual por Dayton Mfg. Co. (Dayton), garantizado al comprador original por defectos en la mano de obra o materiales, bajo un uso normal de un año después de la fecha de compra. Cualquier parte que se encuentre defectuosa, tanto en el material como en la mano de obra, y sea devuelta a un lugar de servicio autorizado designado por Dayton, con los costos de envío pagados por adelantado, será reparada o reemplazada a la discreción de Dayton como remedio exclusivo. Para obtener la información sobre los procedimientos de reclamo cubiertos en la garantía limitada vea ATENCION OPORTUNA a continuación. Esta garantía limitada confiere a los compradores derechos legales específicos que varían de jurisdicción a jurisdicción.
Límites de Responsabilidad. Hasta el punto que las leyes aplicables lo permitan, la responsabilidad de Dayton por los daños emergentes o incidentales está expresamente excluida. La responsabilidad de Dayton expresamente está limitada y no puede exceder el precio de compra pagado por el artículo.
Exclusión de Responsabilidad de la Garantía. Dayton se ha esforzado diligentemente para proporcionar información sobre el producto en esta literatura en forma apropiada; sin embargo, tal información y las ilustraciones y descripciones tienen como único propósito la identificación del producto y no expresan ni implican garantía de que los productos son VENDIBLES O ADECUADOS PARA UN PROPÓSITO EN PARTICULAR o que se ajustan necesariamente a las ilustraciones o descripciones.
Con excepción de lo que se establece a continuación, Dayton no hace ni autoriza ninguna garantía o afirmación de hecho, expresa o implícita, que no sea estipulada en la GARANTÍA LIMITADA anterior.
Adaptación del Producto. Muchas jurisdicciones tienen códigos o reglamentos que rigen las ventas, la construcción, la instalación y/o el uso del producto para ciertos propósitos que pueden variar con respecto a los aplicables a las zonas vecinas. Si bien Dayton trata de que sus productos cumplan con dichos códigos, no puede garantizar su conformidad y no puede hacerse responsable por la forma en que su producto se instala o usa. Antes de comprar y usar el producto, revise su aplicación y todos los códigos y regulaciones nacionales y locales aplicables y asegúrese que el producto, la instalación y el uso los cumplan.
Ciertos aspectos de limitación de responsabilidad no se aplican a los productos del consumidor; es decir (a) algunas jurisdicciones no permiten la exclusión o la limitación de daños incidentales o emergentes, de modo que las limitaciones o exclusiones anteriores puede que no se apliquen en su caso; (b) también, algunas jurisdicciones no permiten limitar el tiempo que una garantía implícita dura, por lo tanto, la limitación anterior puede que no se aplique en su caso; y (c) por ley, durante el período que dura esta Garantía Limitada, las garantías implícitas de comercialización o de adecuación para un propósito en particular aplicables a los productos del consumidor comprados por consumidores no pueden ser excluidas o no pueden excluirse de la responsabilidad en alguna otra forma.
Atención Oportuna. Dayton hará un esfuerzo de buena fe para corregir puntualmente, o hacer otros ajustes, con respecto a cualquier producto que resulte defectuoso dentro de los términos de esta garantía limitada. En el caso de que encuentre un producto defectuoso y que esté cubierto dentro de los límites de esta garantía haga el favor de escribir primero, o llame, al distribuidor de quien compró el producto. El distribuidor le dará las instrucciones adicionales. Si no puede resolver el problema en forma satisfactoria, escriba a Dayton a la dirección a continuación, dando el nombre del distribuidor, su dirección, la fecha y el número de la factura del distribuidor y describa la naturaleza del defecto. La propiedad del artículo y el riesgo de pérdida pasan al comprador en el momento de la entrega del artículo a la compañía de transporte. Si el producto se daña durante el transporte debe presentar su reclamo a la compañía de transporte.
Fabricado para Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714 EE.UU.

Garantie limitée
Garantie Dayton limitée à 1 an. Les modèles de registre Dayton® contenus dans le manuel sont garantis par Dayton Mfg. Co. (Dayton) en faveur du premier utilisateur contre tout défauts de maind'oeuvre ou de matériaux lors d'un usage normal pour 1 an après la date d'achat. Toute pièce qui est déclarée défectueuse en matière première ou en manutention et qui est renvoyée à un lieu de service autorisé, désigné par Dayton, en port payé sera, en seule option, réparée ou remplacée au choix de Dayton. Pour le procédé de réclamation sous garantie limitée, voir DISPOSITION RAPIDE ci-dessous. Cette garantie limitée donne aux acheteurs des droits légaux spécifiques qui varient de juridiction à juridiction.
Limites de responsabilité. La responsabilité de Dayton, dans les limites permises par la loi, pour les dommages indirects ou fortuits est expressement déniée. Dans tous les cas la responsabilité de Dayton est limitée et ne dépassera pas la valeur du prix d'achat payé.
Désistement de garantie. Dayton a fait de diligents efforts pour fournir avec précision les informations et illustrations des produits décrits dans cette brochure ; cependant, de telles informations et illustrations sont pour la seule raison d'identification, et n'expriment ni n'impliquent que les produits sont COMMERCIALISABLES, OU ADAPTABLES À UN BESOIN PARTICULIER, ni que ces produits sont nécessairement conformes aux illustrations ou descriptions
Sauf pour ce qui suit, aucune garantie ou affirmation de fait, énoncée ou impliquée, autre que ce qui est énoncé dans la "GARANTIE LIMITÉE" ci-dessus n'est faite ou autorisée par Dayton.
Conformité du produit. De nombreuses juridictions ont des codes et règlements qui gouvernent les ventes, constructions, installation et/ou usage de produits pour certains usages qui peuvent varier par rapport à une zone voisine; Pendant que Dayton essaie de s'assurer que ses produits s'accordent avec ces codes, il ne peut pas garantir cet accord, et ne peut pas être responsable de la façon dont le produit est installé ou utilisé. Avant l'achat et l'usage d'un produit, revoir les applications de ce produit, ainsi que tous les codes et réglements nationaux et locaux applicables, et s'assurer que le produit, son installation et son usage sont en accord avec eux.
Certains aspects de désistement ne sont pas applicables aux produits pour comommateur ; ex. (a) certaines juridictions ne permettent pas l'exclusion ou la limitation des dommages indirects ou fortuits et dont la limitation ou exclusion ci-dessus peut ne pas s'appliquer dans le cas présent ; (b) également, certaines juridictions n'autorisent pas de limitations de durée de la garantie implicite. en conséquence, la limitation ci-dessus peut ne pas s'appliquer dans le cas présent ; et (c) par force de loi, pendant la période de cette Garantie Limitée, toutes garanties impliquées de commerciabilité ou d'adaptabilité à un besoin particulier applicables aux produits de comommateurs achetés par des consommateurs, peuvent ne pas être exclues ni autrement désistées.
Disposition rapide. Dayton fera un effort de bonne foi pour corriger ou ajuster rapidement tout produit prouvé défectueux pendant la période de la garantie limitée. Pour tout produit considéré défectueux pendant la période de garantie limitée, écrire ou appeler tout d'abord le concessionnaire où l'appareil a été acheté. Le concessionnaire doit donner des instructions supplémentaires. S'il est impossible de résoudre le problème de façon satisfaisante, écrire à Dayton à l'adresse ci-dessous, en indiquant le nom et l'adresse du concessionnaire, la date et le numéro de la facture du concessionnaire, et en décrivant la nature du défaut. Le titre et le risque de perte passent à l'acheteur au moment de la livraison par le transporteur. Si le produit a été endommagé pendant le transport, une reclamation doit être faite auprès du transporteur.
Fabriqué pour Dayton Electric Mfg.Co., 5959 W. Howard St., Niles, Illinois 60714 États-Unis

Manufactured for:
Fabricado para:
Fabriqué pour:

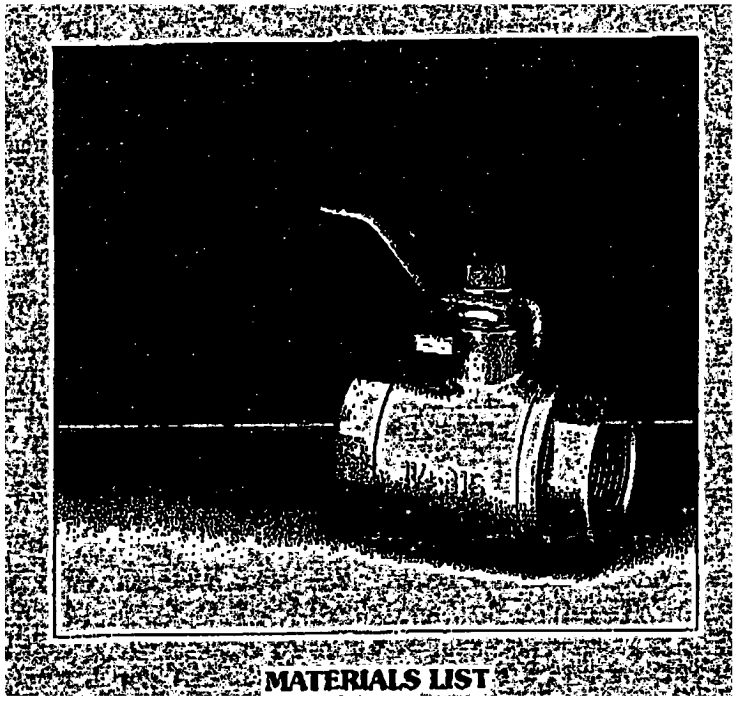
Dayton Electric Mfg. Co.
Niles, Illinois 60714 U.S.A.

Dayton®

Appendix B.9

Stainless Steel Ball Valve Information

TC-02TA 2PC FULL PORT 1000 WOG BALL VALVE, THREADED



APPLICATIONS:

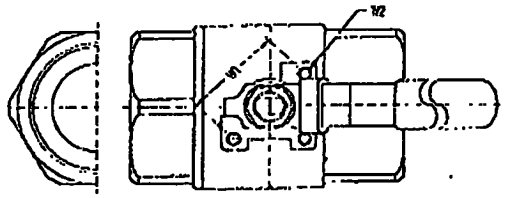
- FOR GENERAL CHEMICAL AND INDUSTRIAL SERVICES
- PRESSURE RATING: 1000 PSI WOG (NON-SHOCK)
- STEAM RATING: 150 PSI WSP
- TEMPERATURE RANGE: -29°C – +200°C

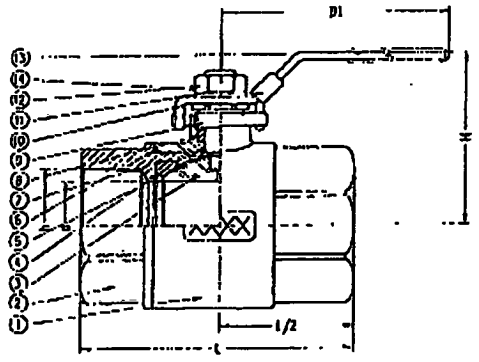
SPECIFICATIONS:

- INVESTMENT CAST BODY & CAP
- END TYPE: THREADED BSP OR NPT
- BOTTOM-LOADED, BLOW-OUT-PROOF STEM
- ADJUSTABLE STEM PACKING
- EASY ACTUATOR MOUNTING
- STAINLESS STEEL HANDLE WITH VINYL GRIP
- OPTION: LOCKING DEVICE

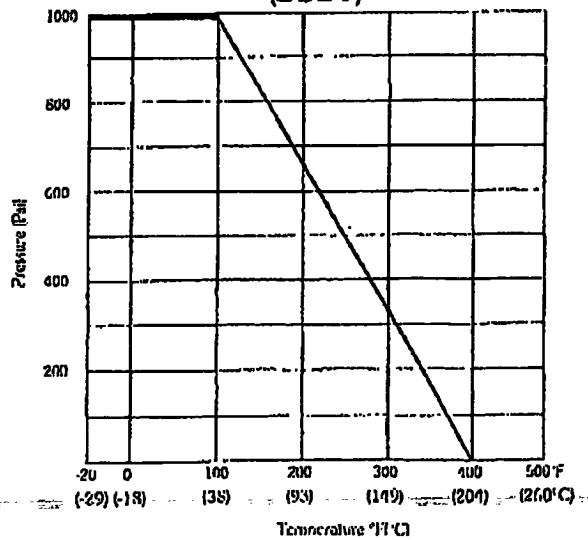
MATERIALS LIST

NO.	PART NAME	SPECIFICATION
1	BODY	ASTM A351 GR.CF8M
2	END CAP	ASTM A351 GR.CF8M
3	BALL	ASTM A351 GR.CF8M
4	BALL SEAT	PTFE
5	STEM	S.S.316
6	END SEAL	PTFE
7	THRUST WASHER	PTFE
8	STEM PACKING	PTFE
9	GLAND	S.S 304
10	HANDLE	S.S.304
11	HANDLE WASHER	S.S.304
12	HANDLE NUT	S.S.304
13	HANDLE SLEEVE	VINYL GRIP
14	LOCKING PLATE	S.S.304





PRESSURE TEMPERATURE RATINGS (BODY)



DIMENSIONS (mm)

SIZE	d	L	H	D1	W1	W2	Cv FACTOR
1/4"	11.0	60.0	53.5	102	36	M4xp0.7	6.0
3/8"	12.5	60.0	56.4	102	36	M4xp0.7	12.0
1/2"	15.0	61.0	58.0	102	36	M4xp0.7	19.0
3/4"	20.0	77.0	68.0	123	36	M4xp0.7	37.0
→ 1"	25.0	90.8	72.0	123	36	M4xp0.7	61.0
→ 1 1/4"	32.0	98.3	89.0	153	50	M6xp1.0	103.0
1 1/2"	38.0	117.5	92.0	153	50	M6xp1.0	143.0
2"	50.8	136.0	103.0	191	50	M6xp1.0	360.0
2 1/2"	65.0	165.0	119.0	191	70	M8xp1.25	440.0
3"	80.0	191.0	131.0	303	70	M8xp1.25	520.0
4"	100.0	216.0	171.0	380	102	M10xp1.5	650.0

Appendix B.10

Zoeller Pump Information

SECTION: 2.20.035
FM0973
0198
Supersedes
0997

"Quality Pumps Since 1939"

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.

http://www.zoeller.com

ZOELLER® PUMP CO.

MAIL TO: P.O. BOX 16347 • Louisville, KY 40256-0347
SHIP TO: 3649 Cane Run Road • Louisville, KY 40211-1961
(502) 778-2731 • 1 (800) 928-PUMP • FAX (502) 774-3624

COMPARE THESE FEATURES

- Non-clogging engineered plastic vortex impeller design.
- Durable cast construction. Cast switch case, motor and pump housing and base. No sheet metal parts to rust or corrode.
- Castings - All cast iron class 25-30 25000# tensile strength.
- Bearings - Upper & lower oil fed cast iron.
- Stainless steel screws, guard, handle and arm and seal assembly.
- Float operated submersible (NEMA 6) 2 pole mechanical switch.
- Oil filled motor—hermetically sealed.
- Permanent split capacitor motor
- Entire unit pressure tested after assembly.
- Automatic reset thermal overload protection.
- Carbon and ceramic shaft seal.
- Watertight neoprene "□" ring between motor and pump housing.
- Maximum temperature for effluent or dewatering 130° F. - 54° C.
- 60 cycles, 1725 RPM.
- Passes ½ inch solids (sphere).
- No screens to clog.
- Standard cord length 15' (UL listed).
- 1½" NPT Discharge (1½" X 2" PVC Adapter included with BN & BE Models).
- On point - 9½"
- Off point - 3"
- Major width - 10 ⅛".
- Height - 12"

SIMPLEX AND DUPLEX SYSTEMS AVAILABLE

PACKAGED SYSTEMS AVAILABLE

Note: The sizing of effluent systems normally requires variable level float(s) controls and properly sized basins to achieve required pumping cycles.

98 Cast Iron Series

"FLOW-MATE"

(FOR PUMP PREFIX IDENTIFICATION SEE NEWS & VIEWS 0052)

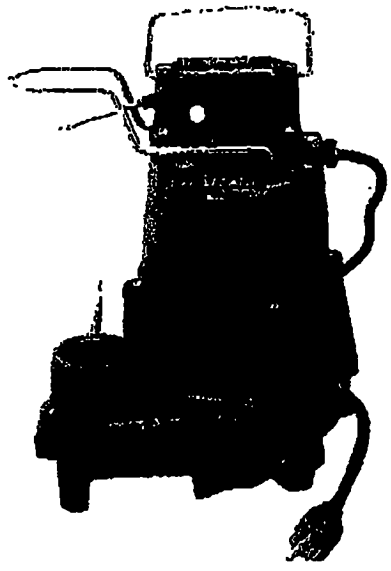
FOR SEPTIC TANK
LOW PRESSURE PIPE (LPP)
AND ENHANCED FLOW STEP SYSTEMS

EFFLUENT

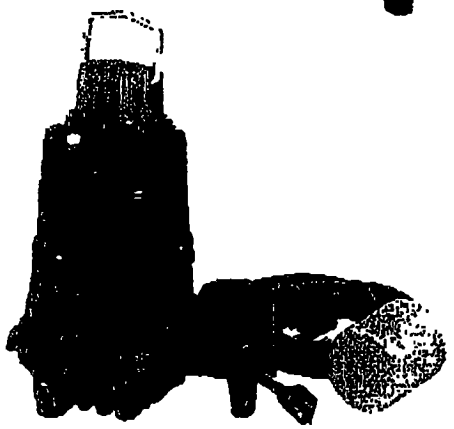
OR DEWATERING PUMP
SUBMERSIBLE
1½" NPT DISCHARGE

SSPMA MEMBER

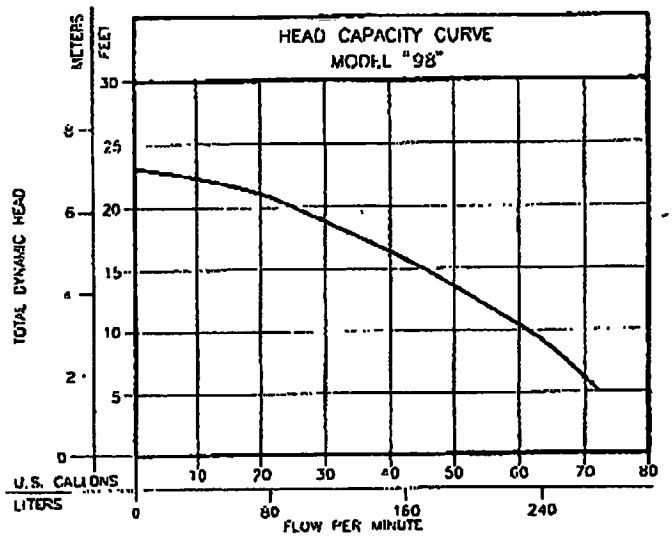
MODELS AVAILABLE
- Automatic or Non-Automatic
- ½ H.P., 1 Ph., 115V or 230V
- Available with Piggyback Variable Level Float Switch.



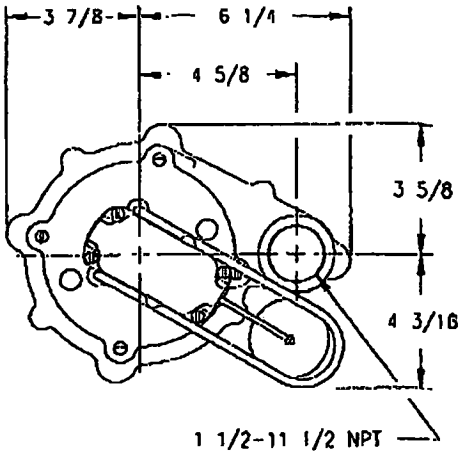
MODEL 98

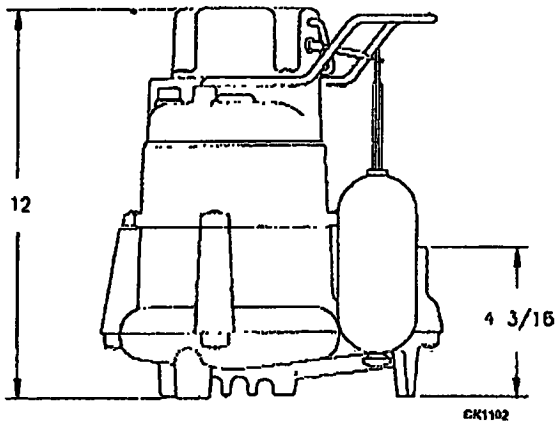


MODEL 98BE



MODEL 98 60 CYCLE			
Feet	Gallons	Meters	Liters
5	72	1.5	273
10	61	3.1	231
15	45	4.6	170
20	25	6.1	95
Lock Valve 25'			





CONSULT FACTORY FOR SPECIAL APPLICATIONS

Electrical alternators, for duplex systems, are available and supplied with an alarm.
Mechanical alternators, for duplex systems, are available with or without alarm switches.

- Variable level float switches are available for controlling single and three phase systems.
- Double piggyback variable level float switches are available for variable level long cycle controls.

Standard all models • Weight 33 lbs. • ½ H.P.

98 Series				Control Selection	
Model	Volts-Ph	Mode	Amps	Simplex	Duplex
M98	115 1	Auto	9.4	1 or 1 & 7	—
N98	115 1	Non	9.4	2 or 2 & 6	3 or 4 & 5
D98	230 1	Auto	4.7	1 or 1 & 7	—
E98	230 1	Non	4.7	2 or 2 & 6	3 or 4 & 5

SELECTION GUIDE

1. Integral float operated 2 pole mechanical switch, no external control required.
2. Single piggyback variable level float switch or double piggyback variable level, float switch. Refer to FM0477.
3. Mechanical alternator 10-0072 or 10-0075.
4. See FM0712, for correct model of Electrical Alternator.
5. Control switch 10-0225 used as a control activator, specify duplex (3) or (4) float system.
6. Four (4) hole J-Pak, junction box, for watertight connection or wired-in simplex or duplex operation, 10-0002.
7. Two (2) hole J-Pak, for watertight connection or splice.

For information on additional Zoeller products refer to catalog on Piggyback Variable Level Switches, FM0477; Electrical Alternator, FM0486; Mechanical Alternator, FM0495, Sump/Sewage Basins, FM0487; Single Phase Simplex Pump Control, FM1596; Alarm Systems, FM0732.

For unusual conditions a reserve safety factor is engineered into the design of every Zoeller pump.

http://www.zoeller.com

ZOELLER PUMP CO.

MAIL TO: P.O. BOX 16347
Louisville, KY 40256-0347
SHIP TO: 3649 Cane Run Road
Louisville, KY 40211-1961
(502) 778-2731 • 1 (800) 928-PUMP
FAX (502) 776-3624

Manufacturers of
"Quality Pumps Since 1939"

Appendix B.11

Solenoid Check Valve Information

2 WAY PILOT OPERATED
General Service Solenoid Valves

Brass or Stainless Steel Bodies • ⅛" to 2½" N.P.T.

ASCO
Red-Hat · Red-Hat II
8210
SERIES



Specifications

Solenoid Enclosures: Valves listed in this series have either Red-Hat metal solenoid enclosures or Red-Hat II molded epoxy solenoids. Red-Hat II valves are identified by the change letter "G" in their catalog numbers, e.g., 8210G1, and are shown in red.

Standard Enclosures:
Red-Hat — Type 1 General Purpose
Red-Hat II — Types 1, 2, 3, 3S, 4 and 4X Combination General Purpose and Watertight.

Optional Enclosures:
Red-Hat — Types 3, 7 and 9 Combination Explosionproof and Raintight. To order, add prefix "EF" to catalog number. (Except Catalog Numbers 8210B57, 8210B58 and 8210B59)©
Red-Hat II — Types 3, 3S, 4, 4X, 6, 6P, 7 and 9 Combination Explosionproof and Watertight. To order, add prefix "EF" to catalog number.
Additional constructions are available. The Optional Electrical Features Section, page 11, contains descriptions and ordering information for: Open Frame Solenoids • Junction Box Enclosures • Panel Mount Constructions.

Electrical: Standard Voltages:
24, 120, 240, 480 volts, AC, 60 Hz
(or 110, 220 volts, AC, 50 Hz)
6, 12, 24, 120, 240 volts, DC
Other voltages are available when required.

Coil: Continuous duty molded Class F or H, as listed.

Nominal Ambient Temperature Ranges: Red-Hat and Red-Hat II Valves/AC Construction: 32°F to 125°F
Red-Hat Valves/DC Construction: 32°F to 77°F (104°F occasionally).
Red-Hat II Valves/DC Construction: 32°F to 104°F.
Refer to Engineering Section for details.

Valve Parts in Contact with Fluids:
Body — Brass or Stainless Steel, as listed
Seals and Discs — Buna "N" or Teflon*, as listed
Disc Holder — Nylon, as listed
Core Tube — 305 s.s.
Core and Plugnut — 430F s.s.
Springs — 302 s.s.
Shading Coil — Copper (brass body); Silver (stainless steel body)

Approvals: CSA certified.
UL listed as indicated. Refer to Engineering Section for details.

Ordering Information:
Important: We must have catalog number, voltage and Hertz, operating pressure and fluid handled. Use strainers with solenoid valves.

*DuPont Co. trademark

SPECIFICATIONS

Pipe Size (Ins.)	Orifice Size (Ins.)	Cv Flow Factor	Operating Pressure Differential (psi) Min.	Max. AC Air-Inert Gas	Max. AC Water	Max. AC Light Oil @ 300 SSU	Max. DC Air-Inert Gas	Max. DC Water	Max. DC Light Oil @ 300 SSU	Max. Fluid Temp.°F. AC	Max. Fluid Temp.°F. DC	Standard Solenoid Enclosures Red-Hat–Type 1 Red-Hat II–Types 1,2,3,3S,4 and 4X Brass Body Catalog Number	Brass Body Constr. Ref. No. ⑨	Brass Body UL Listing	S.S. Body Catalog Number	S.S. Body Constr. Ref. No. ⑨	S.S. Body UL Listing	Watt Rating/ Class of Coil Insulation ⑫ AC	Watt Rating/ Class of Coil Insulation ⑫ DC
NORMALLY CLOSED (Closed when de-energized), Buna "N" or Teflon® Seating																			
⅜	⅜	1.5	①	150	125	—	40	40	—	180	150	8210G73⑥	1P	•	8210G36⑥	1P	•	6.1/F	11.6/F
⅜	⅜	3	0	150	150	—	40	40	—	180	150	8210G93	5D	o	—	—	—	10.1/F	11.6/F
⅜	⅜	3	5	200	150	135	125	100	100	180	150	8210G1	6D	o	—	—	—	6.1/F	11.6/F
⅜	⅜	3	5	300	300	300	—	—	—	175	—	8210G6	5D	o	—	—	—	17.1/F	—
½	7/16	2.2	①	150	125	—	40	40	—	180	150	8210G15⑥	2P	•	8210G37⑥	2P	•	6.1/F	11.6/F
½	⅜	4	0	150	150	—	40	40	—	180	150	8210G94	5D	o	—	—	—	10.1/F	11.6/F
½	⅜	4	0	150	150	125	40	40	—	175	150	—	—	—	8210G87	7D	•	17.1/F	11.6/F
½	⅜	4	5	200	150	135	125	100	100	180	150	8210G2	6D	o	—	—	—	6.1/F	11.6/F
½	⅜	4	5	300	300	300	—	—	—	175	—	8210G7	5D	o	—	—	—	17.1/F	—
¾	⅝	5	0	150	150	125	40	40	—	175	150	—	—	—	8210G88	7D	•	17.1/F	11.6/F
¾	¾	5	5	125	125	125	100	90	75	180	150	8210G9	9D	o	—	—	—	6.1/F	11.6/F
¾	¾	5	0	150	150	—	40	40	—	180	150	8210G95	8D	o	—	—	—	10.1/F	11.6/F
¾	¾	6.5	5	250	150	100	125	125	125	180	150	8210G3	11D	o	—	—	—	6.1/F	11.6/F
¾	¾	6	0	350	300	200	200	180	180	200	77	8210B26⑥	10P	⑤	—	—	—	15.4/F	30.6/H
1	1	13	0	150	125	125	100	100	80	180	77	8210B54	31D	⑤	8210D89	15D	⑤	15.4/F	30.6/H
1	1	13	5	150	150	100	125	125	125	180	150	8210G4	12D	o	—	—	—	6.1/F	11.6/F
1	1	13.5	0	300	225	115	—	—	—	200	—	8210B27	14P	•	—	—	—	20/F	—
1¼	1⅛	15	0	150	125	125	100	100	80	180	77	8210B55	32D	⑤	—	—	—	15.4/F	30.6/H
1¼	1⅛	15	5	150	150	100	125	125	125	180	150	8210G8	16D	⑩	—	—	—	6.1/F	11.6/F
1½	1¼	22.5	0	150	125	125	100	100	80	180	77	8210B56	33D	⑤	—	—	—	15.4/F	30.6/H
1½	1¼	22.5	5	150	150	100	125	125	125	180	150	8210G22	18D	•	—	—	—	6.1/F	11.6/F
2	1¾	43	5	150	125	90	50	50	50	180	150	8210G100	20P	—	—	—	—	6.1/F	11.6/F
2½	1¾	45	5	150	125	90	50	50	50	180	150	8210G101	21P	—	—	—	—	6.1/F	11.6/F

SPECIFICATIONS (continued)

Pipe Size (ins.)	Orifice Size (ins.)	Cv Flow Factor	Operating Pressure Differential (psi) Min.	Max. AC Air-Inert Gas	Max. AC Water	Max. AC Light Oil @ 300 SSU	Max. DC Air-Inert Gas	Max. DC Water	Max. DC Light Oil @ 300 SSU	Max. Fluid Temp.°F. AC	Max. Fluid Temp.°F. DC	Standard Solenoid Enclosures Red-Hat-Type 1 Red-Hat II-Types 1, 2, 3, 3S, 4 and 4X — Brass Body Catalog Number	Brass Body Constr. Ref. No.	Brass Body UL Listing	S.S. Body Catalog Number	S.S. Body Constr. Ref. No.	S.S. Body UL Listing	Watt Rating/ Class of Coil Insulation AC	Watt Rating/ Class of Coil Insulation DC
NORMALLY OPEN (Open when de-energized), Buna "N" Seating (Nylon Disc Holder, except as noted)																			
3/8	5/8	3	0	150	150	125	125	125	80	180	150	8210G33	23D	•	—	—	—	10.1/F	11.6/F
3/8	3/8	3	5	250	200	200	250	200	200	180	180	8210G11⑥⑨	39D	•	—	—	—	10.1/F	11.6/F
1/2	3/8	4	0	150	150	125	125	125	80	180	150	8210G34	23D	•	—	—	—	10.1/F	11.6/F
1/2	5/8	3	0	150	150	100	125	125	80	180	150	—	—	—	8210G30	37D	•	10.1/F	11.6/F
1/2	5/8	4	5	250	200	200	250	200	200	180	180	8210G12⑥⑤	39D	•	—	—	—	10.1/F	11.6/F
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G35	25D	•	—	—	—	10.1/F	11.6/F
3/4	5/8	3	0	150	150	100	125	125	80	180	150	—	—	—	8210G38	38D	•	10.1/F	11.6/F
3/4	3/4	6.5	5	250	200	200	250	200	200	180	180	8210C13	24D	•	—	—	—	15.4/F	16.8/F
1	1	13	0	125	125	125	—	—	—	180	—	8210B57⑥⑩	34D	•	—	—	—	20/F	—
1	1	13	5	150	150	125	125	125	125	180	180	8210D14	26D	•	—	—	—	15.4/F	16.8/F
1 1/4	1 1/8	15	0	125	125	125	—	—	—	180	—	8210B58⑥⑩	35D	•	—	—	—	20/F	—
1 1/4	1 1/8	15	5	150	150	125	125	125	125	180	180	8210D18	28D	—	—	—	—	15.4/F	16.8/F
1 1/2	1 1/4	22.5	0	125	125	125	—	—	—	180	—	8210B59⑥⑩	36D	•	—	—	—	20/F	—
1 1/2	1 1/4	22.5	5	150	150	125	125	125	125	180	180	8210D32	29D	—	—	—	—	15.4/F	16.8/F
2	1 3/4	43	5	125	125	125	125	125	125	180	150	8210103	30P	—	—	—	—	15.4/F	16.8/F
2 1/2	1 3/4	45	5	125	125	125	125	125	125	180	150	8210104	27P	—	—	—	—	15.4/F	16.8/F

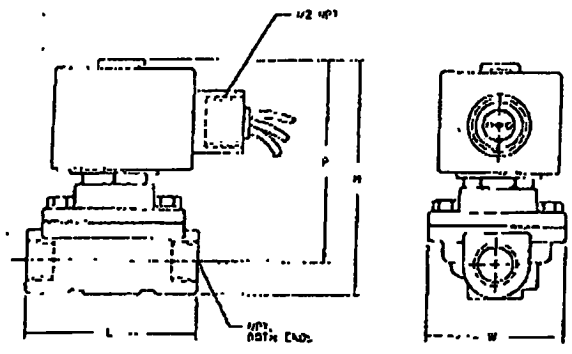
Notes:
- ① 5 psi on Air; 1 psi on Water.
- ② Valve provided with Teflon main seal.
- ③ Valve includes Ultem (G.E. trademark) piston.
- ④ Letter "D" denotes diaphragm construction; "P" denotes piston construction.
- ⑤ UL listed as General Purpose Valve on AC voltage only.
- ⑥ Valves not available with Explosionproof enclosures.
- ⑦ On 50 Hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
- ⑧ AC Construction also has nylon seating.
- ⑨ No disc holder.
- ⑩ Stainless Steel disc holder

ELECTRICAL INFORMATION

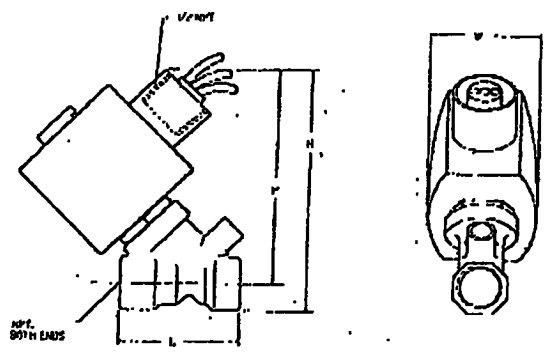
Standard Coil and Class of Insulation	Watt Rating and Power Consumption DC Watts	AC Watts	AC VA Holding	AC VA Inrush	Spare Coil Part No. General Purpose AC	General Purpose DC	Explosionproof AC	Explosionproof DC
F	—	6.1	16	40	238210	—	238214	—
F	11.6	10.1	25	70	238610	238710	238614	238714
F	16.8	15.4	27	160	99257	97617	99257	97617
F	—	17.1	40	93	238610	—	238614	—
F	—	20	43	240	99257	—	99257	—
H	30.6	—	—	—	—	74073	—	74073

DIMENSIONS (in inches)

Constr. Ref. 5, 6, 7, 8, 9, 11, 12, 16, 18, 20, 21, 23, 25, 37, 38



Constr. Ref. 1, 2



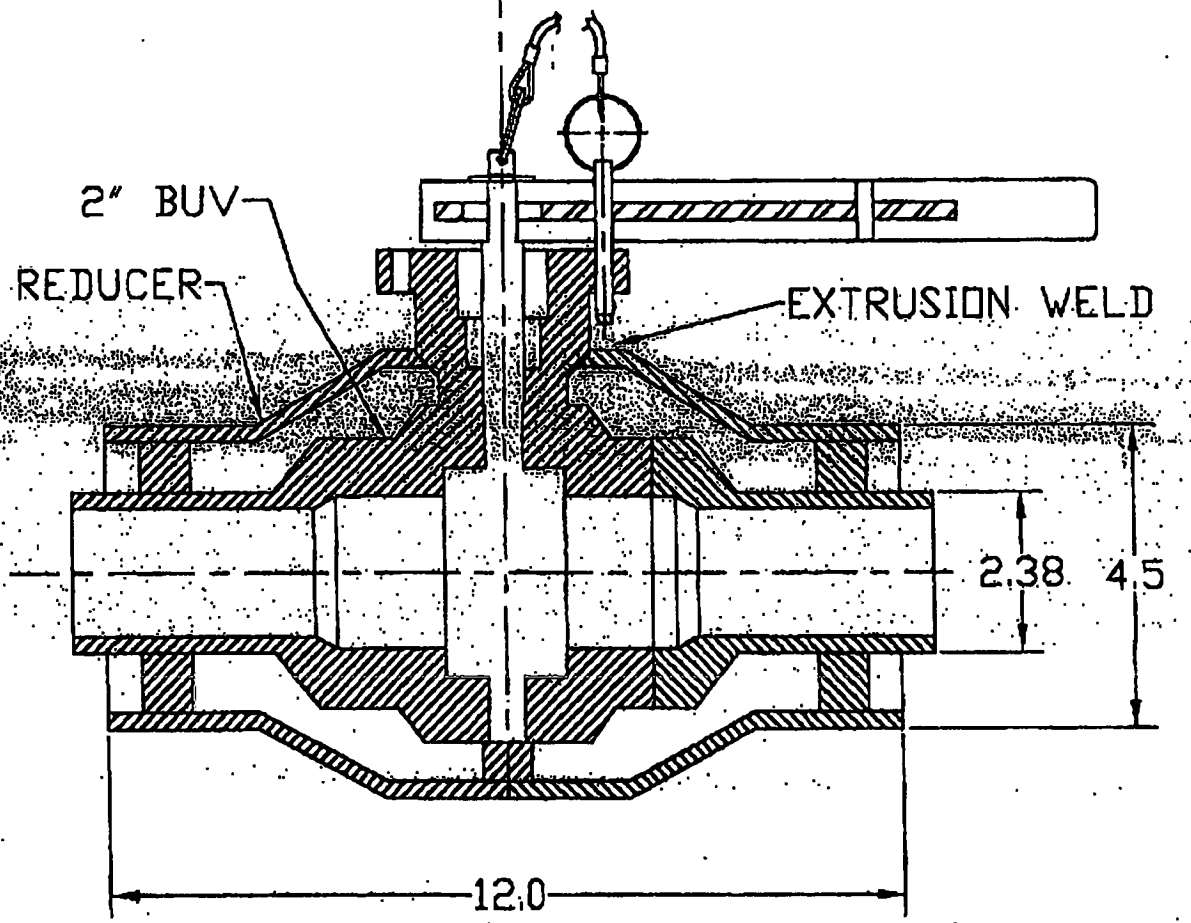
Appendix B.12

Dual-Contained Valve Information

CSR PolyPipe Fax:940-668-2704 Mar 10 '00 11:46 P.01

NOTE: DC VALVE NOT PRESSURE RATED, GRAVITY FLOW ONLY

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



TOL'S: "0" ±1/2; 0.0" ±1/2; 0.00" ±1/16 ANGLES ±5°

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CSR PolyPipe

TITLE: 2" x 4" DUAL WALL VALVE

DRAWN BY: C. HOFFNER DATE: 3/9/00

APP'D BY: DATE:

DWG NO. 10084 REV

APPENDIX C

APPENDIX C

Air Pressure Test Results

WEAVER BOOS & GORDON, INC.

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☐ 415 Taft Avenue, Glen Ellyn, IL 60137 • (630) 858-2490 ☐ 213 S. Camino del Pueblo, Bernalillo, NM 87004 • (505) 867-6990

AIR PRESSURE TEST REPORT

PROJECT NAME/NO.: Zion Site 1A 0120-37-25	**TIME:** 1812
CONTRACTOR: --	**DATE:** 8/25/00
PERSON PERFORMING TESTS: JKL	
DESCRIPTION/LOCATION OF TEST SEGMENT (Pipe Diameter, Length, and SDRs): 3" HDPE leachate forcemain on west side of Site 1A	

T_I = Initial temperature in °C = ___°C

P_1 = Initial test pressure in psig = ____ psig

P_c = Initial pressure in psig corrected for temperature (T) at time 't'

T = Time in minutes from initiation of test

T_t = Temperature in °C at time 't'

P_t = Test pressure in psig at 't'

$$P_c = \frac{(P = 14.7)(T_i = 273)}{(T_I = 273)} - 14.7$$

$$\text{Percent Pressure Drop} = \frac{P_t - P_i}{P_c} \times 100$$

TIME (min)	T_t TEMP READING (°C)	P_t GAUGE READING (psgi)	P_c CORRECTED PRESSURE (psig)	ΔP PRESSURE DROP (%)
0	°C	50		0
780	°C	50		0
	°C			
	°C			
	°C			
	°C			

PASS/FAILURE: PASS	**RETEST (*yes/no*):** NO

DESCRIPTION/NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

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AIR PRESSURE TEST REPORT

PROJECT NAME/NO.: Zion Site 1A 0120-37-25	**TIME:** 1200
CONTRACTOR: --	**DATE:** 8/30/00
PERSON PERFORMING TESTS: AAH	

DESCRIPTION/LOCATION OF TEST SEGMENT (Pipe Diameter, Length, and SDRs):

6" HDPE SDR 17 containment pipe for new 3"x6" leachate forcemain on west side of Site 1A

T_I = Initial temperature in °C = ___°C

P_I = Initial test pressure in psig = ____ psig

P_c = Initial pressure in psig corrected for temperature (T) at time 't'

T = Time in minutes from initiation of test

T_t = Temperature in °C at time 't'

P_t = Test pressure in psig at 't'

$$P_c = \frac{(P = 14.7)\,(T_i = 273)}{(T_I = 273)} - 14.7$$

$$\text{Percent Pressure Drop} = \frac{P_t - P_i}{P_c} \times 100$$

TIME (min)	T_t TEMP READING (°C)	P_t GAUGE READING (psgi)	P_c CORRECTED PRESSURE (psig)	ΔP PRESSURE DROP (%)
0	°C	10		0
300	°C	9.5		-5%
	°C			
	°C			
	°C			
	°C			

PASS/FAILURE: PASS	**RETEST (*yes/no*):** NO

DESCRIPTION/NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

WEAVER BOOS & GORDON, INC.

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AIR PRESSURE TEST REPORT

PROJECT NAME/NO.: Zion Site 1A 0120-37-25 **TIME:** 1700

CONTRACTOR: **DATE:** 8/30/00

PERSON PERFORMING TESTS: AAH

DESCRIPTION/LOCATION OF TEST SEGMENT (Pipe Diameter, Length, and SDRs):

4" HDPE SDR 17 containment pipe for new 2"x4" leachate forcemain from EW-21 on Site 1A southwest to manhole

T_I = Initial temperature in °C = ___°C

P_I = Initial test pressure in psig = ____ psig

P_c = Initial pressure in psig corrected for temperature (T) at time 't'

T = Time in minutes from initiation of test

T_t = Temperature in °C at time 't'

P_t = Test pressure in psig at 't'

$$P_c = \frac{(P = 14.7)(T_i = 273)}{(T_I = 273)} - 14.7$$

$$\text{Percent Pressure Drop} = \frac{P_t - P_i}{P_c} \times 100$$

TIME (min)	T_t TEMP READING (°C)	P_t GAUGE READING (psgi)	P_c CORRECTED PRESSURE (psig)	ΔP PRESSURE DROP (%)
0	°C	10		0
60	°C	9.7		-3%
	°C			
	°C			
	°C			
	°C			

PASS/FAILURE: PASS **RETEST (*yes/no*):** NO

DESCRIPTION/NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

WEAVER BOOS & GORDON, INC.

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AIR PRESSURE TEST REPORT

PROJECT NAME/NO.: Zion Site 1A 0120-37-25 | **TIME:** 1000

CONTRACTOR: -- | **DATE:** 8/31/00

PERSON PERFORMING TESTS: LGM/MJJ

DESCRIPTION/LOCATION OF TEST SEGMENT (Pipe Diameter, Length, and SDRs):

2" HDPE SDR 11 leachate forcemain from EW-21 on Site 1A southwest to manhole

T_I = Initial temperature in °C = ___°C

P_I = Initial test pressure in psig = ____ psig

P_c = Initial pressure in psig corrected for temperature (T) at time 't'

T = Time in minutes from initiation of test

T_t = Temperature in °C at time 't'

P_t = Test pressure in psig at 't'

$$P_c = \frac{(P = 14.7)\,(T_t = 273)}{(T_I = 273)} - 14.7$$

$$\text{Percent Pressure Drop} = \frac{P_t - P_i}{P_c} \times 100$$

TIME (min)	T_t TEMP READING (°C)	P_t GAUGE READING (psgi)	P_c CORRECTED PRESSURE (psig)	ΔP PRESSURE DROP (%)
0	°C	50		0
480	°C	50		0
	°C			
	°C			
	°C			
	°C			

PASS/FAILURE: PASS | **RETEST (*yes/no*):** NO

DESCRIPTION/NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

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☐ 415 Taft Avenue, Glen Ellyn, IL 60137 • (630) 858-2490 ☐ 213 S. Camino del Pueblo, Bernalillo, NM 87004 • (505) 867-6990

AIR PRESSURE TEST REPORT

PROJECT NAME/NO.: Zion Site 1A 0120-37-25	**TIME:** 0700
CONTRACTOR: --	**DATE:** 9/2/00

PERSON PERFORMING TESTS: JKL

DESCRIPTION/LOCATION OF TEST SEGMENT (Pipe Diameter, Length, and SDRs):

2" HDPE SDR 11 air supply piping over entire Site 1A

T_I = Initial temperature in °C = ___°C

P_I = Initial test pressure in psig = _____ psig

P_c = Initial pressure in psig corrected for temperature (T) at time 't'

T = Time in minutes from initiation of test

T_t = Temperature in °C at time 't'

P_t = Test pressure in psig at 't'

$$P_c = \frac{(P = 14.7)(T_i = 273)}{(T_I = 273)} - 14.7$$

$$\text{Percent Pressure Drop} = \frac{P_t - P_i}{P_c} \times 100$$

TIME (min)	T_t TEMP READING (°C)	P_t GAUGE READING (psgi)	P_c CORRECTED PRESSURE (psig)	ΔP PRESSURE DROP (%)
0	°C	50		0
480	°C	49		-2%
	°C			
	°C			
	°C			
	°C			

PASS/FAILURE: PASS **RETEST (*yes/no*):** NO

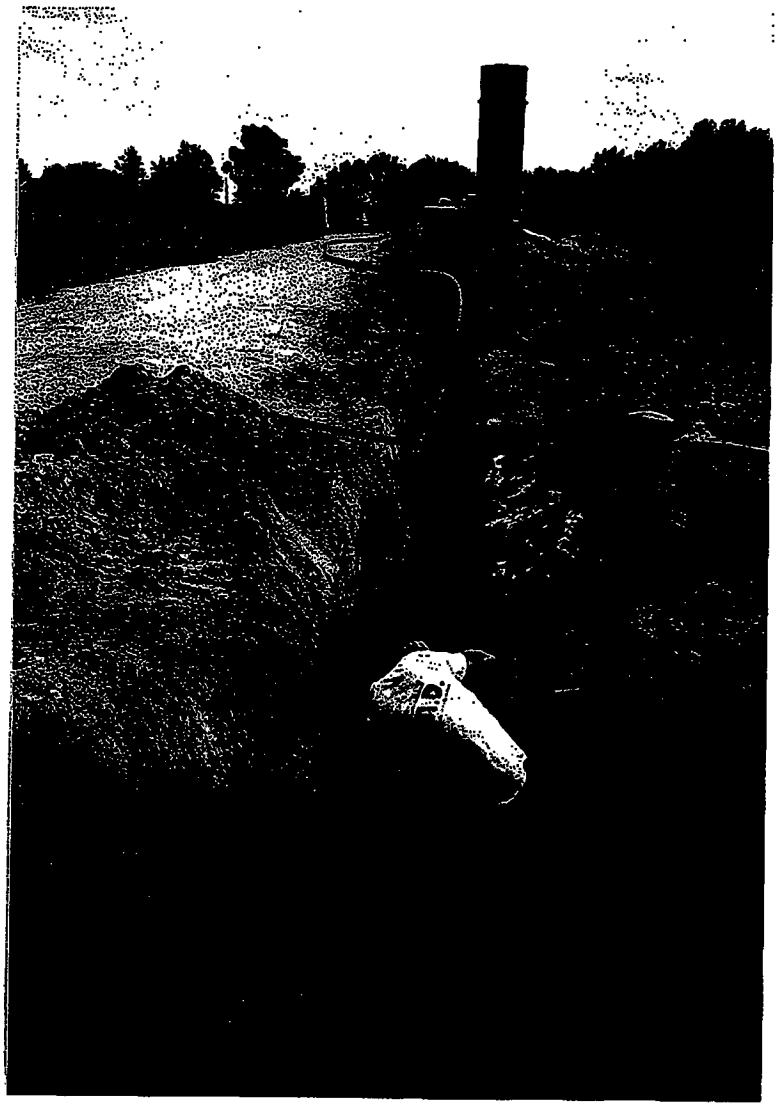
DESCRIPTION/NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:

R 00201

APPENDIX D

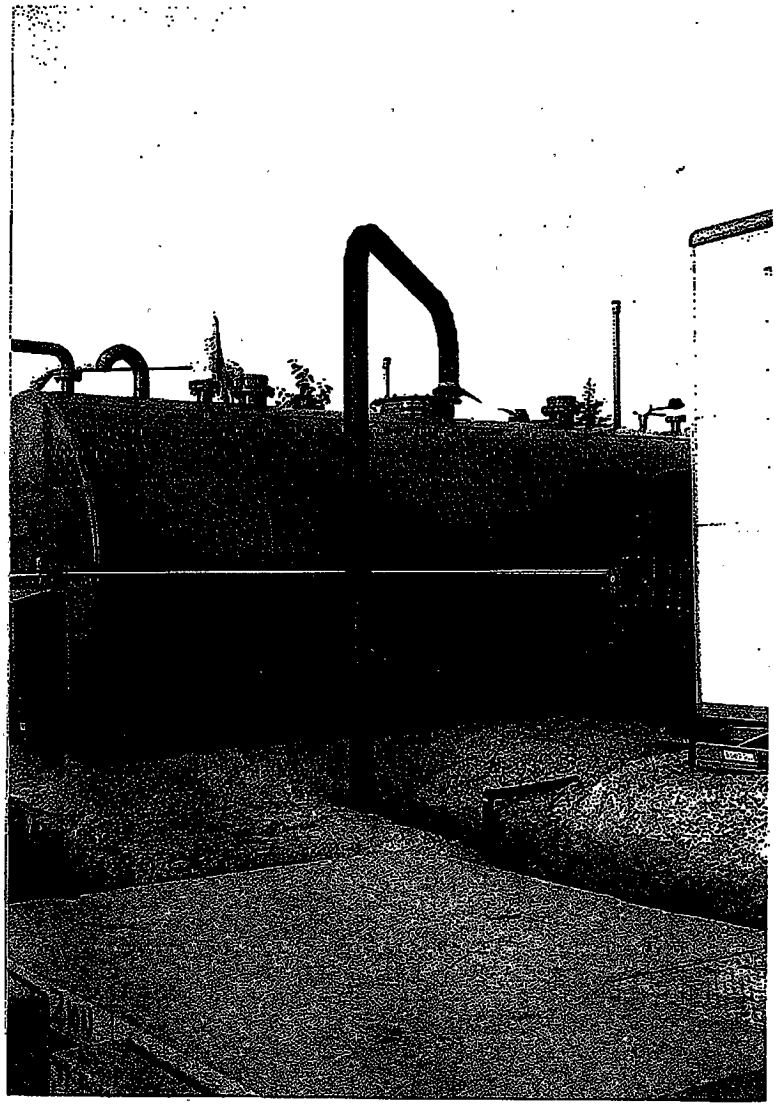
Construction Photographs

By:	**Megan J. Jewett**	Subject:	**Zion Site 1A**	Sheet No:	**1 of 5**
Date:	**September 15, 2000**		**Gas/Leachate System**	Job No:	**0120-37-25**



Photograph # 1
Constructing leak detection riser for new Site 1A 3" x 6" leachate forcemain.

By:	**Megan J. Jewett**	Subject:	**Zion Site 1A**	Sheet No:	**2 of 5**
Date:	**September 15, 2000**		**Gas/Leachate System**	Job No:	**0120-37-25**



Photograph # 2

New 3" x 6" leachate forcemain connection to Site 1A tank at load-out pad.

By: Megan J. Jewett Subject: Zion Site 1A Sheet No: 3 of 5

Date: September 15, 2000 Gas/Leachate System Job No: 0120-37-25



Photograph # 3
Tie-in of new 2" x 4" airline at EW-21.

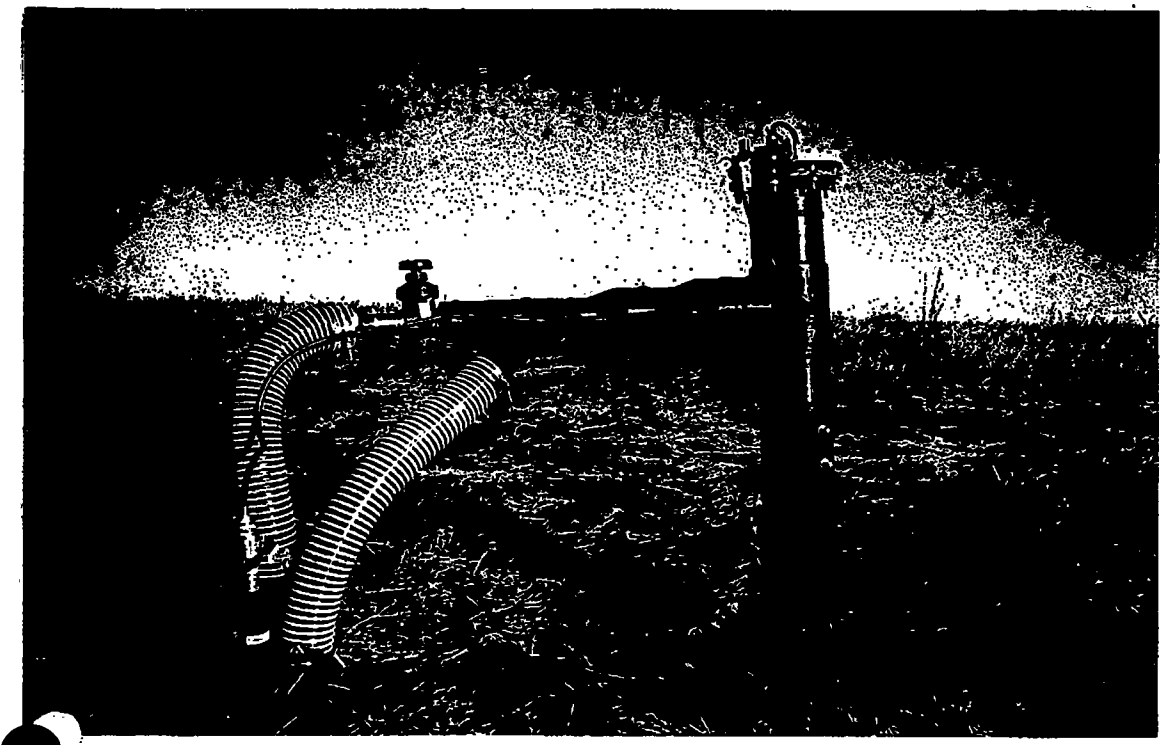


Photograph # 4
2" x 4" leachate forcemain and 2" airline at Site 1A manhole.

By:	Megan J. Jewett	Subject:	Zion Site 1A	Sheet No:	4 of 5
Date:	September 15, 2000		Gas/Leachate System	Job No:	0120-37-25



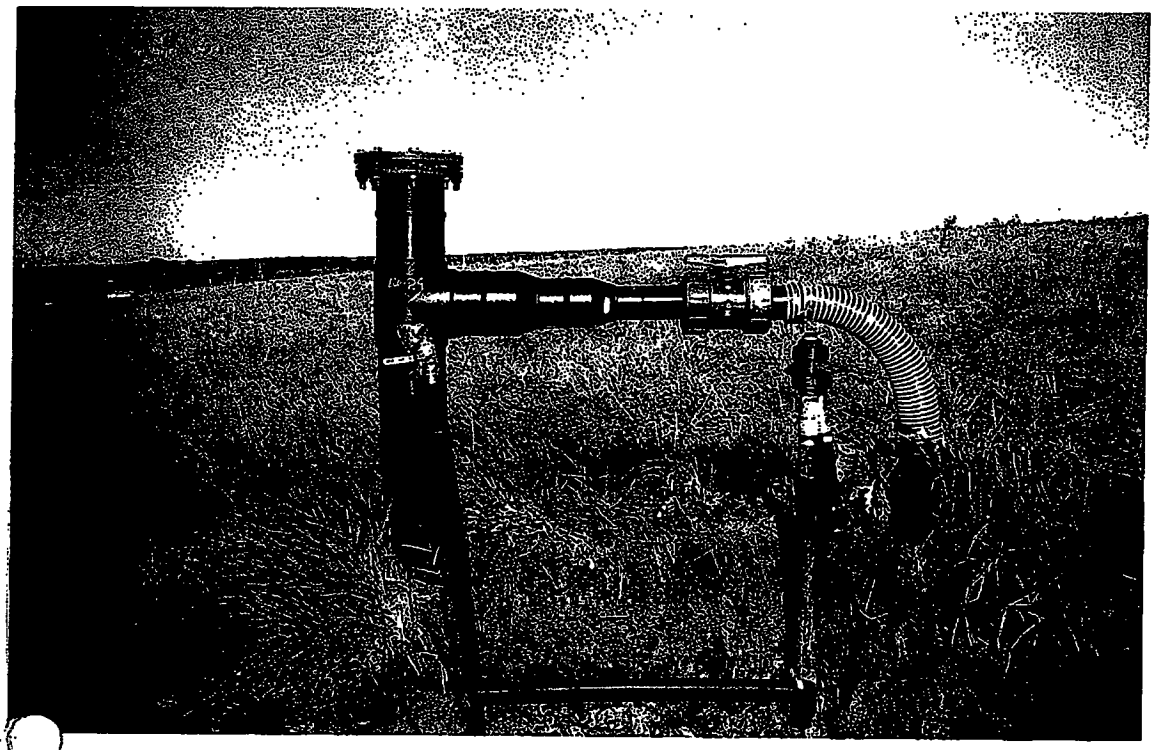
Photograph # 5
Wellhead prior to modification.



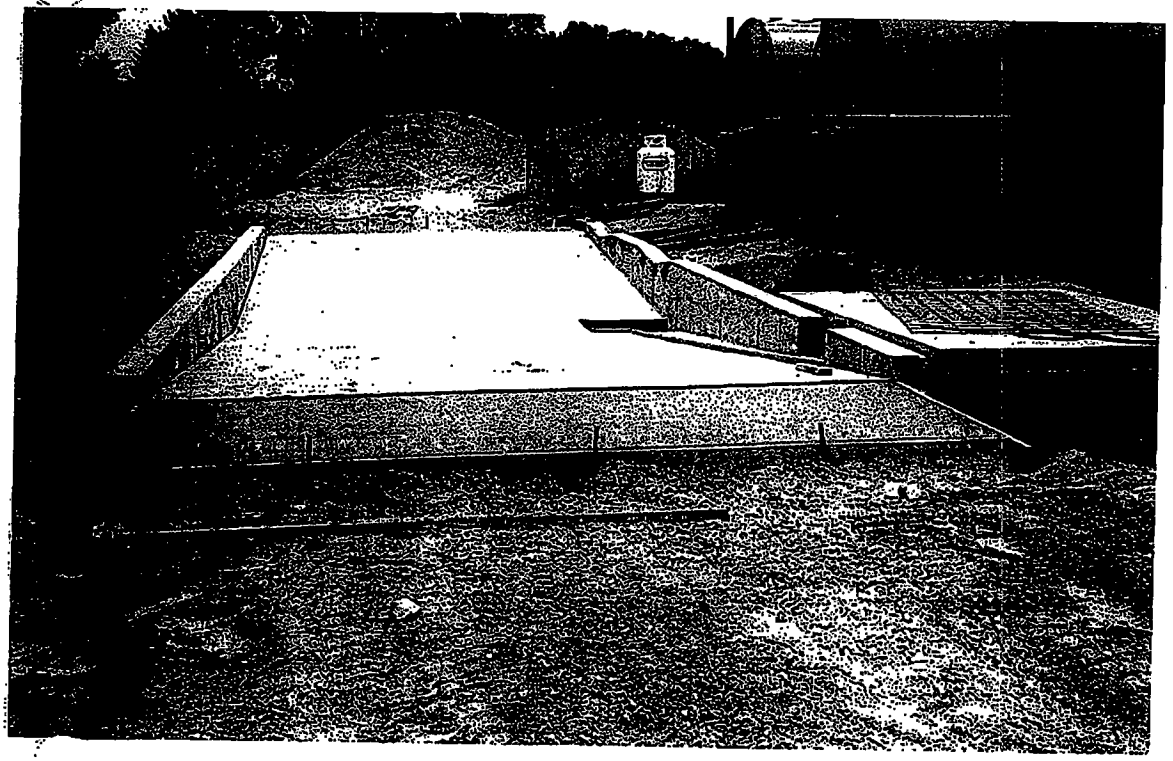
Photograph # 6
Wellhead after modification and pump installation.

By: Megan J. Jewett Subject: Zion Site 1A Sheet No: 5 of 5

Date: September 15, 2000 Gas/Leachate System Job No: 0120-37-25



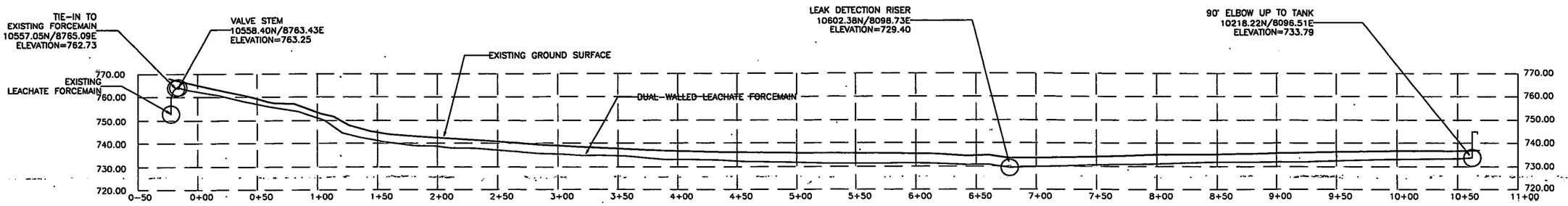
Photograph # 7
Connecting new 2" airline at EW-24.



Photograph # 8
Construction on leachate load-out pad.

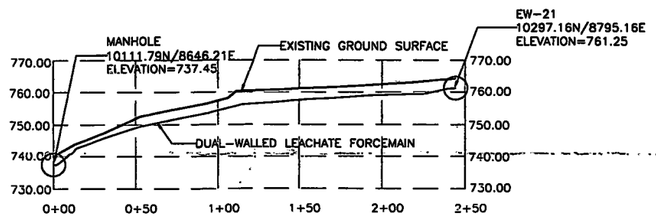
Appendix E-8

Forcemain Profile and Details, 2000 Manhole Upgrades



1/2 SITE 1A 3"X6" LEACHATE FORCEMAIN

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 20'



2/2 SITE 1A 2"X4" LEACHATE FORCEMAIN

HORIZONTAL SCALE: 1" = 40'
VERTICAL SCALE: 1" = 20'

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

JUN 27 2025

REVIEWER: MED

- [ ] DRAFT
- [x] PERMIT APPLICATION
- [ ] APPROVED FOR CONSTRUCTION
- [ ] CLIENT APPROVAL BY: _____

DATE: 9/27/00
FILE: 0120-37-25
CAD: 2K000022.DWG
DRAWN BY: MAJ
DESIGN BY: AAH
REVIEWED BY: AAH

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REVISIONS

NO.	DATE	DESCRIPTION

SITE 1A
NEW FORCEMAIN PROFILES

ONYX ZION LANDFILL
ZION, ILLINOIS

Weaver Boos & Gordon, Inc.

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DRAWING 2 OF 4

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