OPERATIONS & MAINTENANCE MANUAL

Geothermal
Heating Retrofit
Twin Falls High School
Sawtooth Elementary School

Architect	Heath Engineering Company 377 West 800 North Salt Lake City, Utah 84103 (801)-322-0487
Mechanical Contractor	White Plumbing & Heating P.O. Box 1741 Twin Falls, Idaho 733-4556 733-4556
Electrical Engineer	Hopkins Electric 328 11th Avenue North Buhl, Idaho 83316 (208)-543-5168
Insulation	State Insulation P.O. Box 4478 Boise, Idaho 83704 344-8666

RECEIVED
AUG 14 1985
HEATH ENGINEERING
COMPANY

INDEX

I Pumps	Aurora Pumps P.O. Box 892 Twin Falls, Idaho 83301 (208)-733-4278
II Bondstrand Pipe	Industrial Sales 2719 Lemel Circle Salt Lake City, Utah 84115 (801)-487-9831
III Heat Exchangers	Tranter, Inc. 735 East Hazel Street Lansing, Michigan 48909 (517)-372-8410
IV Balancing	Felts-House Engineering, Inc. 8131 Crestwood Drive Boise, Idaho 83704 (208)-375-6018
V Guages, Thermometers Pressure/Tempature Wells Flow Balancing/Measuring Valves	Midgely-Huber P.O. Box 3005 Boise, Idaho 83703 (208)-336-1919
VI Valves Blow-out-proof Swing Check Valves Gate Valves Non-Slam Check Valves (globe)	Paramount Supply P.O. Box 5628 Boise, Idaho 83705 (800)-632-5911
VII Insulation	State Insulation P.O. Box 4478 Boise, Idaho 83704 (208)-344-8666
VIII Three-Way Valve	Precision Control Service, Inc 562 West Fine Drive, Salt Lake City, Utah 84115 (801)-263-3332

WHITE
PLUMBING-HEATING, INC.

Mechanical Contractor

Post Office Box 1741 | Addison Avenue East, Twin Falls, Idaho 83303-1741 | Telephone (208) 733-4556

Date: October 16, 1985

To: Twin Falls School Administration
201 Main Ave. West
Twin Falls, Idaho 83301

Re: Twin Falls High School Geothermal

Dear Doyt Simcoe :

This letter is written to officially notify T.F. School Adm. that the Mechanical System installed by White Plumbing & Heating, Inc. has been completed and tested and startup accomplished.

The warranty period for all defects in workmanship, including parts and labor to correct same, is from 10/16/85 to 10/16/86. Should you encounter any problems, please ontact us at (208) 733-4556.

We would like to point out that normal maintenance items such as changing filters, tightening belts, greasing and lubrication are not covered under warranty and are the owner's responsibility. Your Operation and Maintenance Manual, prepared by our Company, lists normal maintenance items in detail.

In closing we want to express our appreciation for having been selected to install the Mechanical System for T.F. School Adm. and look forward to a long association.

Sincerely yours,

J. J. White

OPERATION & MAINTENANCE MANUAL

Geothermal
Heating Retrofit
Twin Falls High School
Sawtooth Elementary School
Valves

Tag #1	GTWS	Heat Exchanger	#1-3"	Butterfly Valve
Tag #2	GTWS	Heat Exchanger	#1-2"	Butterfly Valve Processed
Tag #3	GTWS	Heat Exchanger	#2-3"	Butterfly Valve
Tag #4	GTWS	Heat Exchanger	#2-4"	Butterfly Valve Processed
Tag #5	GTWS	Heat Exchanger	#3-3"	Butterfly Valve
Tag #6	GTWS	Heat Exchanger	#3-2½"	Butterfly Valve Processed
Tag #7	GTWS	Heat Exchanger	#4-4"	Butterfly Valve
Tag #8	GTWS	Heat Exchanger	#4-5"	Butterfly Valve Processed
Tag #9	GTWS	Heat Exchanger	#4-5"	Three-Way Valve Processed
Tag #10	GTWS	Pump	#1-4"	Butterfly Valve Suction
Tag #11	GTWS	Pump	#1-4"	Butterfly Valve Discharge
Tag #12	GTWS	Pump	#2-4"	Butterfly Valve Suction
Tag #13	GTWS	Pump	#2-4"	Butterfly Valve Discharge
Tag #14	GTWS	Pump	#3-2"	Ball Valve Domestic Booster Pump Suction
Tag #15	GTWS	Pump	#3-2"	Ball Valve Domestic Booster Pump Discharg
Tag #16	GTWS	Pump	#3-2"	Ball Valve Domestic Booster Pump
Tag #17	GTWS	Pump	#3-1¼"	Gate Valve Dom. Booster Pump Flow Meterin
Tag #18	GTWS	Pump	#3-2"	Tank Shut off Valve Dom. Booster Pump

Tag #1	GTWR	Heat Exchanger	#1-3"	Balance Valve
Tag #2	GTWR	Heat Exchanger	#1-3"	Butterfly Valve
Tag #3	GTWR	Heat Exchanger	#1-2"	Butterfly Valve Processed
Tag #4	GTWR	Heat Exchanger	#2-3"	Balance Vavle
Tag #5	GTWR	Heat Exchanger	#2-3"	Butterfly Valve
Tag #6	GTWR	Heat Exchanger	#2-2"	Butterfly Valve Processed
Tag #7	GTWR	Heat Exchanger	#3-3"	Balance Valve
Tag #8	GTWR	Heat Exchanger	#3-3"	Butterfly Valve
Tag #9	GTWR	Heat Exchanger	#3-2½"	Butterfly Valve Processed
Tag #10	GTWR	Heat Exchanger	#4-4"	Butterfly Valve
Tag #11	GTWR	Heat Exchanger	#4-5"	Butterfly Valve
Tag #12	GTWR	Heat Exchanger	#4-5"	Three-Way Valve Processed

Tag #1	GTW	Heat Exchanger	#4-5"	Butterfly Valve By Pass
Tag #2	GTW	Heat Exchanger	#4-5"	Butterfly Valve By Pass
Tag #3	GTW	By Pass Valve	4"	Butterfly Valve
Tag #4	GTW	By Pass Valve	4"	Butterfly Valve
Tag #5	GTW	By Pass Valve	4"	Butterfly Valve

Tag #1	Cold Water Ball Valve		2"	Feed Valve To Hot Water Heater Exchanger

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT: Geothermal Heating Retrofit

INSTITUTION: Twin Falls High School and Sawtooth Elementary School

The work performed under the subject Contract has been reviewed on this date and found to be substantially completed; that is, the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the Owner can occupy the project or specified area of the project for the use for which it was intended.

The Owner accepts the project or specified area of the project as substantially complete and will assume full possesion of the project or specified area of the project at 12 p.m. on Friday, October 11, 1985.

The user (institution or agency) accepts the project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the project subject to the itemized responsibilities and/or exceptions noted below:

RESPONSIBILITIES AND/OR EXCEPTIONS:

A list of items to be completed or corrected, prepared by the Engineer, Heath Engineering Company, verified by the Owner, Twin Falls School District No. 411, is appended hereto. This "punch list" may not be exhaustive, and the failure to include an item on it does not alter the responsibility of the Contractor to complete all the work in accordance with the Contract Documents, including authorized changes thereof.

Heath Engineering Company
ENGINEER

Samuel D. Stone 10/11/85
AUTHORIZED REPRESENTATIVE / DATE

Twin Falls School Dist. No. 411
OWNER

Carl R. Smoot 11/5/85
AUTHORIZED REPRESENTATIVE / DATE

RECEIVED
NOV 7 1985
[illegible] ENGINEERING CO.

The Contractor will complete or correct the work on the list of items appended hereto within 30 days from the above date of issuance of this Certificate.

WHITE PLBG & HTG INC — CONTRACTOR

J. A. White — AUTHORIZED REPRESENTATIVE

10/11/85 — DATE

PUNCH LIST ITEMS

GEOTHERMAL HEATING PROJECT
OCTOBER 11, 1985

1. Need Balance Report and O & M Manuals.
2. Tag valves and provide schedule.
3. Include fall start-up sequence in O & M Manuals.
4. Need red-line drawings for Record Drawings. Need to be returned to Heath Eng
5. Install grease zerks on Pumps P-1 and P-2 motors.
6. Identify piping for flow direction and contents.
7. Install snubbers on pressure gauges. Protect gauge against shock for rapid changes in pressure
8. Provide wrench for heat exchanger.
9. Increse flow rates on heat exchangers by 10 percent.
10. The domestic water pump has a damaged casing and will be replaced under the warranty of the Contractor when the new casing arrives.

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Mechanical Contractor

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In closing we want to express our appreciation for having been selected to install the Mechanical System for T.F. School Adm. and look forward to a long association.

Sincerely yours,

J. J. White

OPERATING SEQUENCE
GEOTHERMAL HEATING PROJECT
TWIN FALLS HIGH SCHOOL
AND
SAWTOOTH ELEMENTARY SCHOOL

The time clock for the Geothermal Heating System is equipped to turn each pump on and off at different times. However, none of the Pumps P-1, P-2 and P-3 will run unless the well pump is on.

Normal operation during the heating season (Fall, Winter and Spring) will have the well pump run continuously (24 hours/day) along with Pump P-1 for the High School radiation heating. During the Spring and Fall, the Sawtooth Pump (P-2) should be programmed to turn off after the morning warm up period. During the cold part of the winter, the Sawtooth pump should run all the time to provide heat for the Sawtooth School.

The domestic water pump should run only during the daytime when the showers are in use. Other times such as nights and weekends, it should be off.

The three-way control valve should be set to maintain 70° F heat pump system water. A higher temperature setting will cause the cooling tower to operate, which is not an efficient operation during the heating mode.

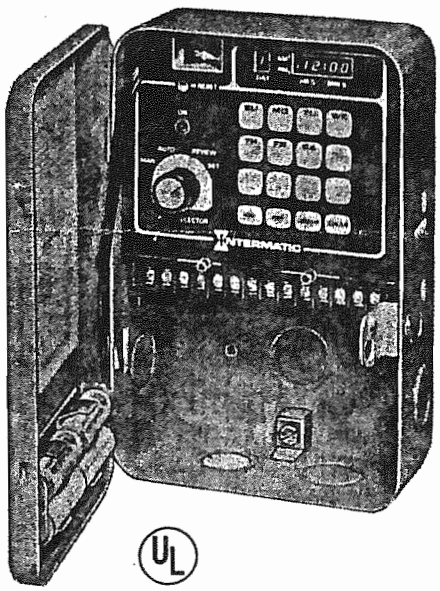
INTERMATIC®
ELECTRONIC SEVEN DAY TIME SWITCH

WITH 4 POLE DOUBLE THROW CONTACTS

ELECTRONIC SEVEN DAY TIME SWITCH

ETA-2
EFFECTIVE FEB. 1984

DISCONTINUED
NOV 21 1985
MAIL ORDER ONLY



(1.) 28 ON/OFF Set Points
(2.) Programmable In One Minute Increments
(3.) DAY REPEAT FEATURE
(4.) Automatic Weekly Schedule
(5.) Controls Four Independent Loads
(6.) Tamper Proof Program
(7.) Easy to Understand and Operate Keyboard
(8.) Digital Display
(9.) 8 Hour Quartz Accuracy Battery Back Up
(10.) Reset Button
(11.) Lockable Steel Case
(12.) Prevents Energy Waste

ELECTRONIC SEVEN DAY TIME SWITCH WITH CARRY-OVER-SERIES ET718C

USE OF TIMER

Recommended for use in churches, schools, hospitals, commercial, industrial and residential buildings where efficient, timed electrical power control is required. The "ON" and "OFF" times may be preset for anytime each day of the week to control air conditioners, electrical pumps, illuminated signs, music systems, various types of lighting and commercial ovens. This easy to use Timer is convenient and reduces your operating costs.

DESCRIPTION OF FEATURES:

This Electronic Timer has 28 ON and OFF set points, which may be set at any time during a seven day week in one minute increments. The Timer automatically turns up to four loads "ON" and "OFF" according to the preset weekly schedule. All of the loads will be turned "ON" at the same time and will be turned "OFF" at the same time as programmed in the time switch.

The DAY REPEAT feature allows you to repeat a days schedule on other days of the week, without using additional set points. Turn the time switch to the set position, push the day to be scheduled, then push the ON keypad, followed by pushing the day whose schedule is to be repeated. Once the entire week's schedule is programmed, it will repeat each week.

The program is tamper proof. It may only be changed when the mode selector switch is put into the proper position. The Keyboard is easy to understand and operate. It has sixteen well defined keypads and easy to operate mode selector.

The Timer is housed in a lockable steel case with the operating instructions affixed to the inside of the door.

The battery back up system has four standard AA size nickel-cadmium rechargeable batteries. These keep the timer operating with correct time to within 0.1% for up to an 8 hour long power outage. Upon power resumption the batteries recharge in approximately 8 hours. The estimated lifetime of the batteries is in excess of five years.

The Reset button may be used to cancel a complete program immediately without calling up each separate time. The Reset button is also used to reset the timer when the batteries have been completely discharged.

INTERMATIC INCORPORATED, SPRING GROVE, IL 60081
PISCATAWAY: 262 Old New Brunswick Road, Piscataway, NJ 08854/LOS ANGELES: 1117 Pico Blvd., Los Angeles, CA 90021
Printed in U.S.A.

WHITE PLUMBING & HEATING, Inc.

P.O. BOX 1741 — TWIN FALLS, ID 83303-1741 — PHONE 208-733-4556

SHOP DRAWING FOR APPROVAL

TO: Heath Engineering Company DATE 3/22/85

377 West 800 North

Salt Lake City, Utah 84103

CONTRACT NO. J-501 TRANSMITTAL NO. 1 NEW SUBMITTAL XX

RESUBMITTAL ..... TRANSMITTAL NO. ..... P. O. NO. 1222

PROJECT Geothermal T.F.H.S./Sawtooth LOCATION Twin Falls, Idaho

SPECIFICATIONS SECTION ..... FOR BUILDING .....

PAR NO	DESCRIPTION OF EQUIPMENT	MANUFACTURER	PUB. NO.	COPIES SUB'M.	ACTION TAKEN	COPIES RET'D.
	P-1, P-2, P-3, Pumps	Aurora		8		
	Submersible Well Pump	Aurora		8		

Please return 6 approved copies to this office.

File w/copy

CC: Field

CONTRACTOR WHITE PLUMBING & HEATING, Inc.

MAILING ADDRESS P.O. Box 1741, Twin Falls, ID 83303-1741

By J. J. White

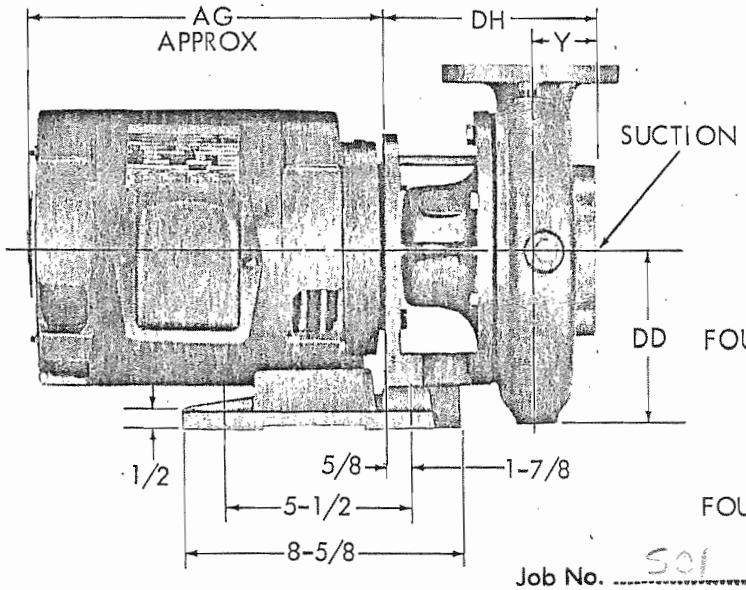
Supplier: Aurora Pump

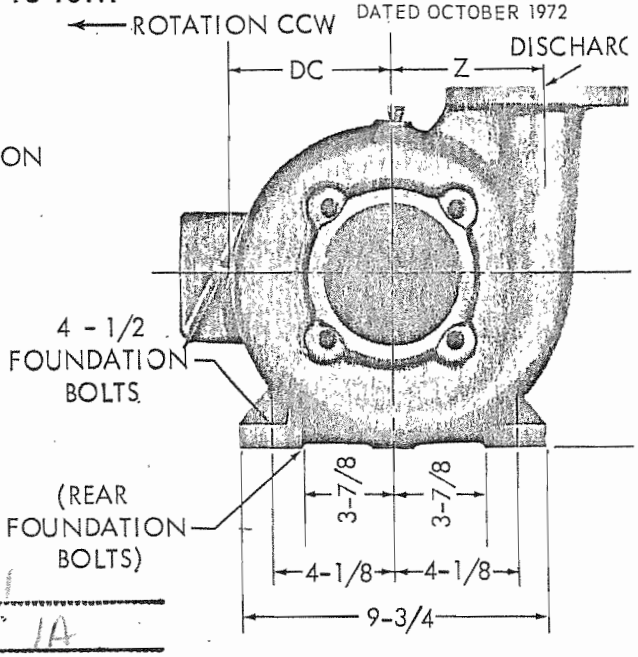
P.O. Box 892
Twin Falls, Idaho 83303

Bob Bingham (208) 733-4278

JM MOTOR FRAME
143JM THRU 184JM

DATED MARCH 1975
SUPERSEDES PAGE 201
DATED OCTOBER 1972





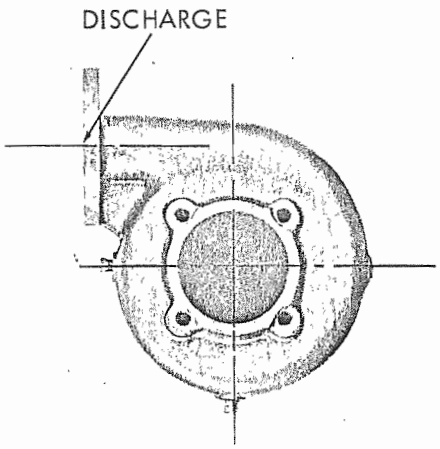
STANDARD POSITION (1)

Job No. 501
Submittal No. 1A
P.O. No. 1222
Date 4/19
Spec. Section

NOTES

1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. CHECK DISCHARGE POSITION, CASING DIMENSIONS WHICH EXCEED 5-1/4" HEIGHTH MAY REQUIRE PADS FOR THE SUPPORT.
5. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.

* 6-1/4" FOR 9" CASE BORE PUMPS.



POSITION (4)

PUMPS WITH THREADED CONNECTIONS								
DISCHARGE	SUCTION	CASE BORE	X	Y	Z	DC	DD	DH
1 1/4	1 1/2	7	5 1/4	2 7/16	4 3/16	4 15/16	5 3/16	7 3/16
1 1/4	1 1/2	9	6 5/8	2 9/16	5 3/8	6 3/16	6 3/8	7 1/4
1 1/2	2	7	5 3/8	2 1/2	4 5/16	5 1/8	5 3/8	7 5/16
1 1/2	2	9	6 3/4	2 5/8	5 1/2	6 5/16	6 9/16	7 3/8
PUMPS WITH AM. STD. 125 LB. FLANGED CONNECTIONS								
2	2 1/2	7	5 5/8	1 7/8	4 9/16	5 3/8	5 13/16	6 13/16
2	2 1/2	9	7	1 7/8	5 11/16	6 1/2	6 7/8	6 3/4
2 1/2	3	7	5 7/8	2	4 13/16	5 13/16	6 1/4	7 1/16
2 1/2	3	9	7 1/4	2	5 15/16	6 3/4	7 1/4	7
3	4	9	7 1/2	2 1/8	6 1/8	6 7/8	7 7/16	7 1/4
4	4	7	6 1/2	2 1/2	5 1/2	6 7/16	7 5/16	7 15/16

FRAME	AG
143JM	10
145JM	11
182JM	11
184JM	12

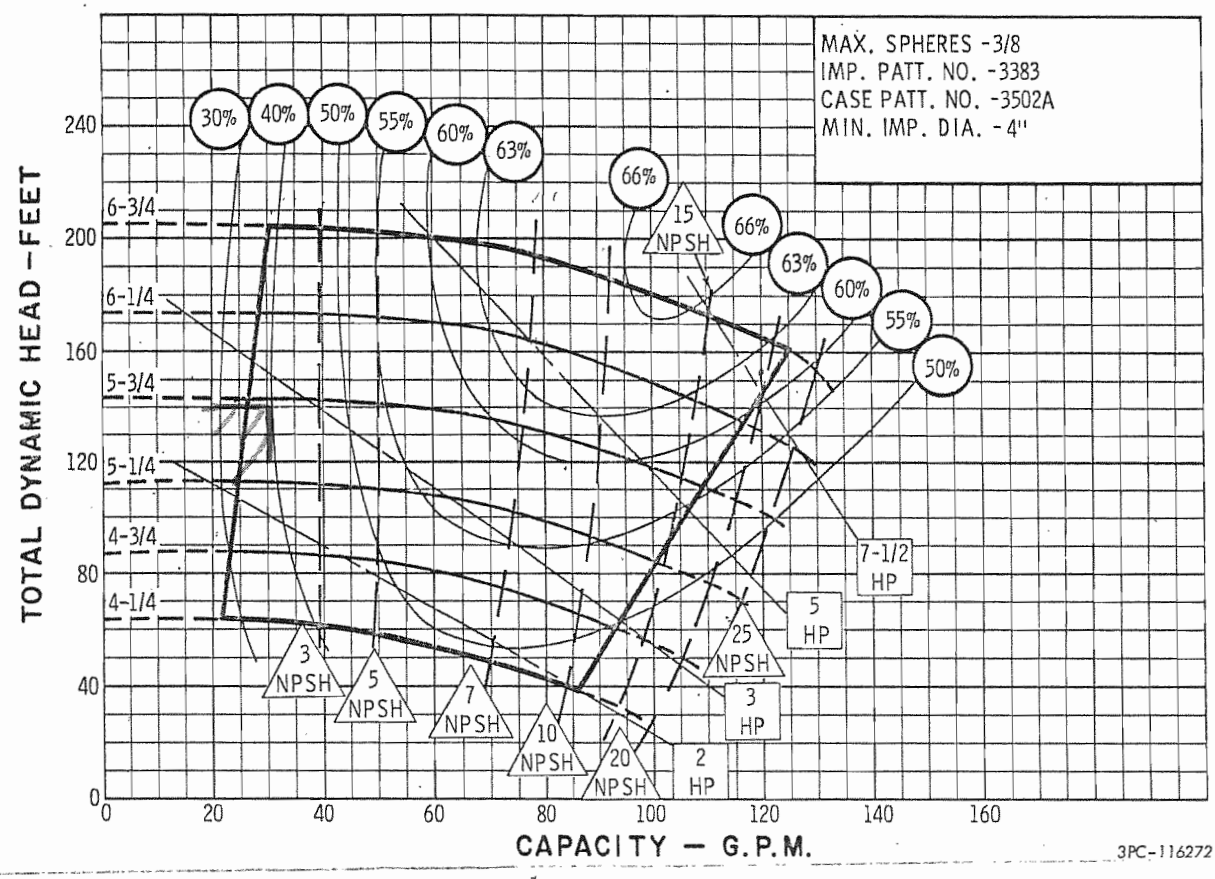
AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD · NORTH AURORA, ILLINOIS · 60542

AURORA MODELS 341A & 342A
60 HERTZ MOTOR DATA SHEET
1 PHASE: NOT AVAILABLE
3 PHASE: 200 (ONLY) OR 230/460 OR 575 VOLTS

JM MOTOR FRAMES

P-3

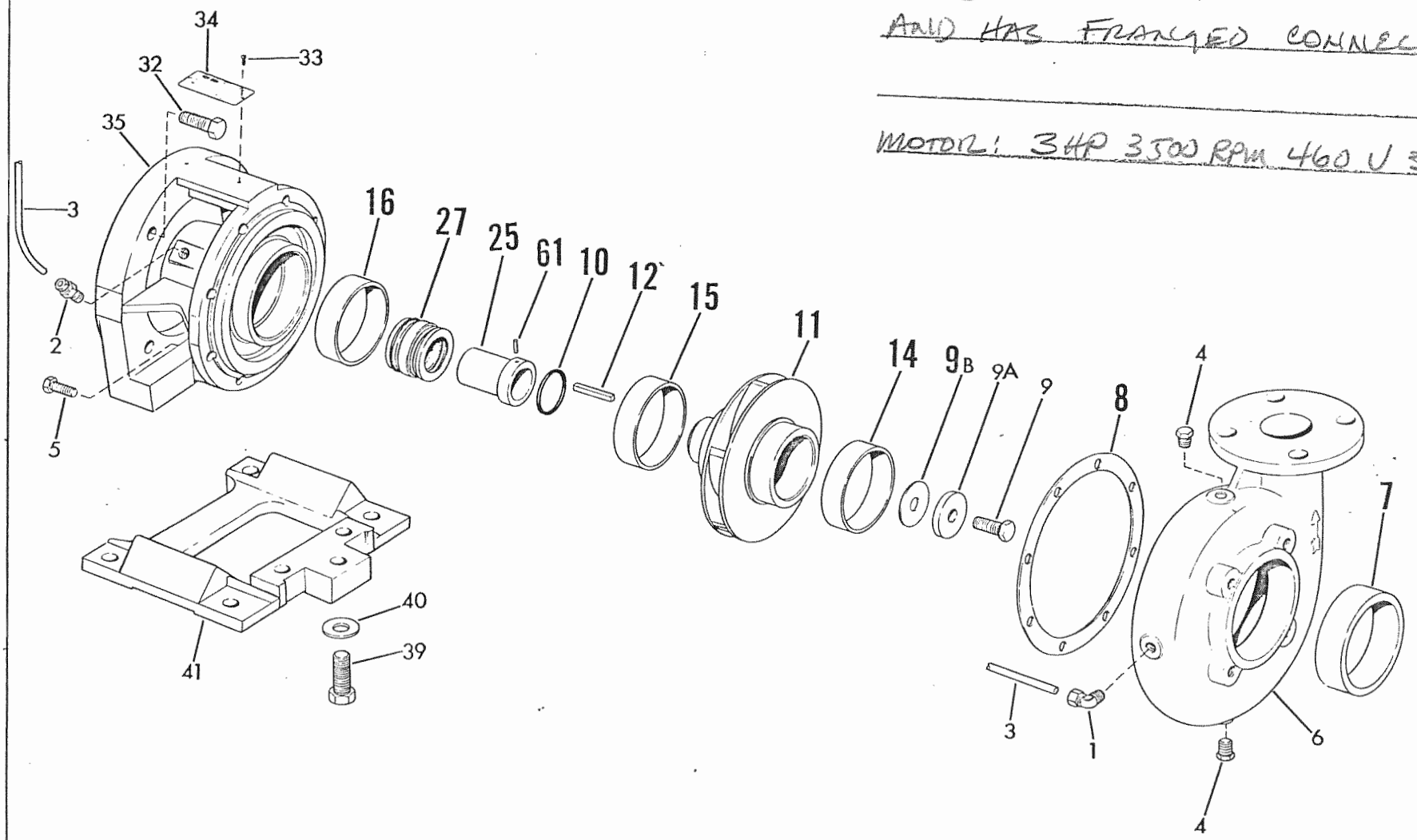
HP	RPM	C FLANGE MOTORS HORIZONTAL FOOT MOUNTED 143-184JM ONLY-SUPPORT FOOT MOUNTED ON PUMP O.D.P. - TOTALLY ENC. - EXP. PROOF				MAGNETIC STARTER SIZE REQ'D NEMA 1 ENCLOSURE			APPROXIMATE FULL LOAD AMPS.			
		OPEN DRIPPROOF FRAME	SERVICE FACTOR O.D.P.	TEFC & EXP. PROOF FRAME	SERVICE FACTOR TEFC & EXP. PROOF	200V & 230V	460V	575V	200V	230V	460V	57
1	1750	143JM	1.15	143JM	1.0	00	00	00	3.9	3.5	1.8	1
	1150	145JM		145JM								
1-1/2	3500	143JM	1.15	143JM	1.0	00	00	00	4.9	4.7	2.4	2
	1750	145JM		145JM								
	1150	182JM		182JM								
2	3500	145JM	1.15	145JM	1.0	0	00	00	6.2	5.6	2.8	2
	1750	145JM		145JM								
	1150	184JM		184JM								
3	3500	145JM	1.15	182JM	1.0	0	0	0	10.3	9	4.5	3
	1750	182JM		182JM								
	1150	213JM		213JM								
5	3500	182JM	1.15	184JM	1.0	1	0	0	15.8	14.3	7.2	6
	1750	184JM		184JM								
	1150	215JM		215JM								
7-1/2	3500	184JM	1.15	213JM	1.0	1	1	1	23.4	21.1	10.5	9
	1750	213JM		213JM								
	1150	254JM		254JM								
10	3500	213JM	1.15	215JM	1.0	2	1	1	29.8	27	13.5	11
	1750	215JM		215JM								
	1150	256JM		256JM								
15	3500	215JM	1.15	254JM	1.0	2	2	2	43.0	38.6	19.3	17
	1750	254JM		254JM								
20	3500	254JM	1.15	256JM	1.0	3	2	2	56.5	51	25.5	22
	1750	256JM		256JM								
25	3500	256JM	1.15	N/A	1.0	3	2	2	71.0	64.3	32.2	27
	1750	284JM		284JM					73.5	64	32	25
30	1750	286JM	1.15	286JM	1.0	3.5 3	2.5	2.5	85	74	37	30
40	1750	324JM	1.15	324JM	1.0	4 3.5	3	3	120	104	52	42
50	1750	326JM	1.15	326JM	1.0	4.5 4	3	3	143	124	62	50


MAX. SPHERES -3/8
IMP. PATT. NO. -3383
CASE PATT. NO. -3502A
MIN. IMP. DIA. -4"
3500 R.P.M.
TOTAL DYNAMIC HEAD - FEET
CAPACITY — G.P.M.
0
40
80
120
160
200
240
0
20
40
60
80
100
120
140
160
6-3/4
6-1/4
5-3/4
5-1/4
4-3/4
4-1/4
30%
40%
50%
55%
60%
63%
66%
15 NPSH
66%
63%
60%
55%
50%
7-1/2 HP
5 HP
3 HP
2 HP
25 NPSH
3 NPSH
5 NPSH
7 NPSH
10 NPSH
20 NPSH
3PC-116272

AURORA # 341 1¼ x 1½ x 7

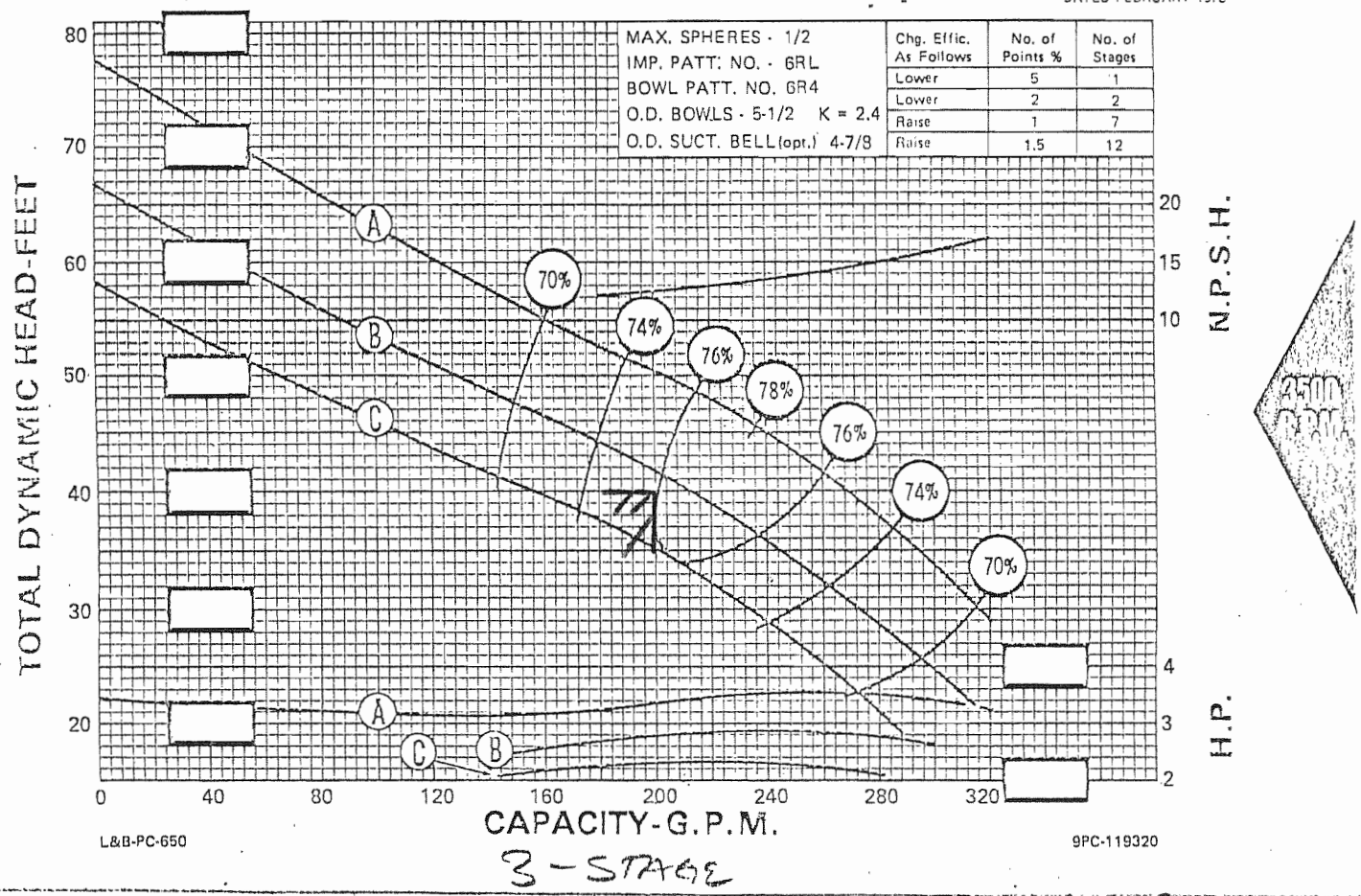
DISCRIPTION: P-3 BOOSTER IS BRONZE FITTED, C.I VOLUTE AND HAS FRANGED CONNECTIONS

MOTOR: 3HP 3500 RPM 460 V 3d



MODEL 341

6RL SERIES 1110
Verti-Line PUMP



3-STAGE

WITH STAINLESS STEEL SAND SHROUD (FLOW INDUCER OVER SUCTION AND MOTOR.

Job No. 501
Submittal No. 1-A
P.O. No. 1222
Date 4-19-85
Section

Approved 4/2 S. Stone

AURORA 1150 SERIES PUMPS
SUBMERSIBLE
BOWL ASSEMBLY
DIMENSIONS

BOWL SIZE	DISCH. COLUMN SIZE	FIRST STAGE LENGTH AA (NOTE 4)	ADD STAGE LENGTH CC (NOTE 5)	DD NOMINAL BOWL OR SUCTION CASE DIAMETER			MAX. NO. OF STAGES
				STANDARD	REINFORCED	MIN. (NOTE 6)	
6T	3" & 4"	14-3/4	3-1/2	5-3/8	5-3/4	5-5/16	25
	5"	17-1/2					
6EH	3" & 4"	15-5/8	4-1/2	5-3/8	NA	5-3/8	25
	5"	18-1/2					
6R	4"	16-3/8	5-1/8	5-1/2	5-3/4	5-1/2	25
	5"	19-1/4					
7R	5"	23-3/8	7-1/4	7-1/16	7-1/16	7	40
	6"	21					
8 ED (6" MOTOR)	4"	24-1/4	5	7-1/2	7-3/4	7-1/2	30
	5"	21-1/2					
	6"	24-7/8					
8ED (8" MOTOR)	4"	26-1/4					
	5"	23-1/2					
	6"	26-7/8					
8R (6" MOTOR)	4"	25-3/4	6-1/2	7-1/2	8	7-7/16	30
	5"	23-3/8					
	6" & 8"	26-3/4					
8R (8" MOTOR)	4"	27-3/4					
	5"	25-3/8					
	6" & 8"	28-3/4					
8FH (6" MOTOR)	4" & 5"	25-1/4	7-1/2	7-1/2	8	7-1/2	30
	6"	22-3/4					
	8"	26-1/2					
8FH (8" MOTOR)	4" & 5"	27-1/4					
	6"	24-3/4					
	8"	28-1/2					
10EXL	4" & 5"	34	7-1/16	9-7/16	10-1/16	9-1/4	20
	6	31-3/4					
	8	34-3/4					
10EH	5"	36-1/2	7-1/16	9-5/16	9-9/16	9-5/16	20
	6"	34-3/8					
	8" & 10"	38					
10R	5"	39-1/4	8-3/8	9-3/8	9-7/8	9-3/8	20
	6"	37-1/4					
	8" & 10"	40-3/4					

NOTES:
1. All dimensions in inches.
2. Component dimensions may vary ± 1/8".
3. Not for construction purposes unless certified.
4. Dim. "A" is the overall length for a complete bowl assembly for a single stage pump less the driver.
5. Dimension "C" is the overall length which must be added for each "additional" stage required.
6. This is the minimum dimension possible and each application requiring this reduced diameter must have prior factory approval, with a potential resulting efficiency reduction.
7. The minimum opening must be greater than the largest component dimension. That may be the motor, the column pipe, or the combination bowl diameter and cable guard.
8. The well-to-bowl assembly selection will have to include room for passage of the power cable and cable guard along the bowl assembly length. For purposes of making this allowance, refer to the O.D. of the proposed bowl unit and add to this the dimension shown opposite the motor proposed:
   6" Motor - 3/4", 8" Motor - 1", 10" Motor - 1", 12" Motor - 1", 14" Motor - 2"
   It may be possible to lessen these dimensions slightly. Check with the factory if this is necessary.

TYPICAL OPERATING CHARACTERISTICS
3600 RPM
3 PHASE - 60 HERTZ
230 OR 460 VOLTS (4)

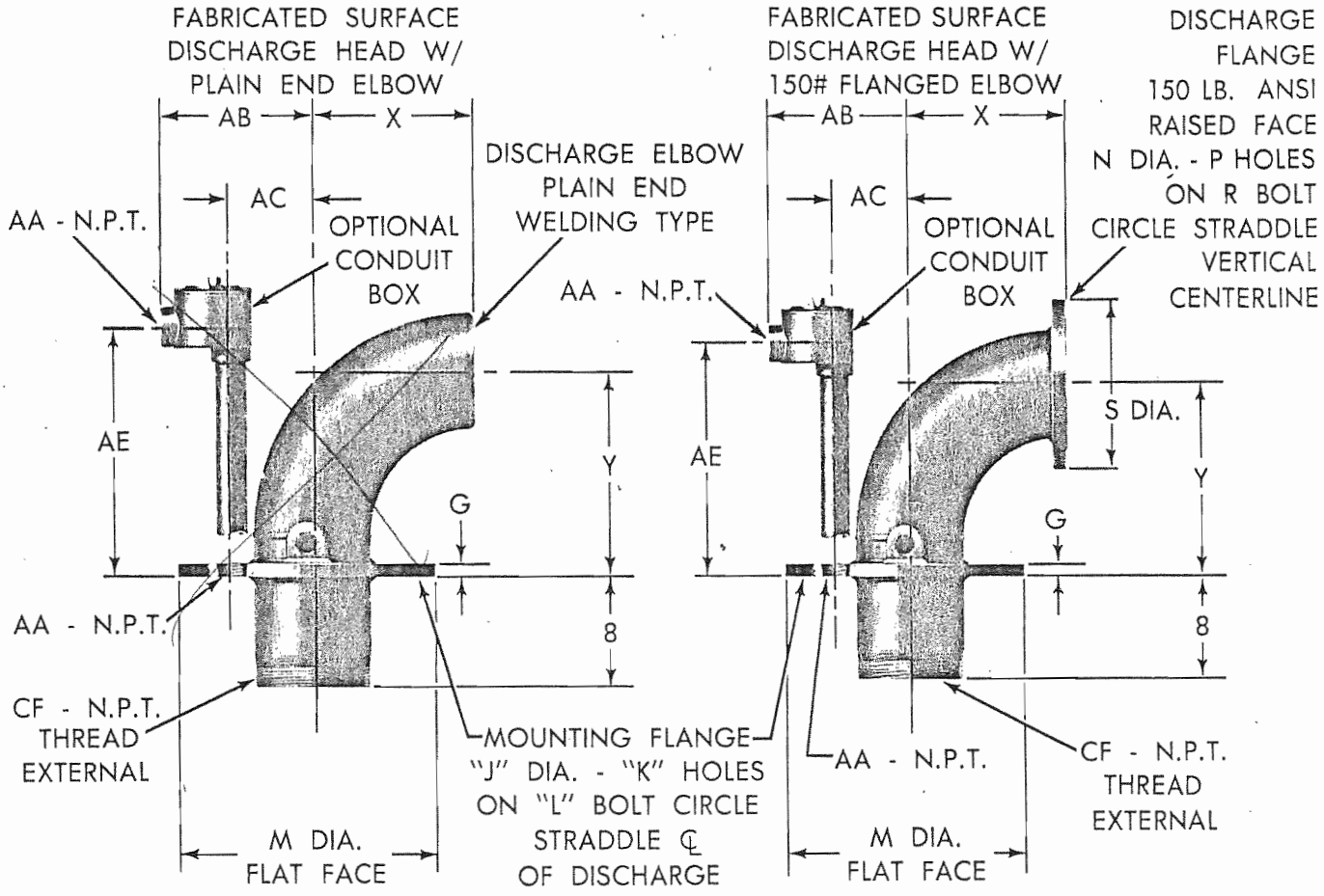
HP	MOTOR SIZE (1)	MAKE	SPEED FULL LOAD RPM	EFFICIENCY % (3)			POWER FACTOR %			CURRENT - AMPS (4)		THRUST CAPACITY LBS (2)
				FULL LOAD	3/4	1/2	FULL LOAD	3/4	1/2	FULL LOAD	LOCKED ROTOR	
5	6	CENTURY	3480	82.0	78.0	74.0	86.0	78.0	68.0	7.4	59.0	1500
		FRANKLIN	3450	78.5	77.0	73.0	83.5	79.5	70.0	7.2	45.3	1500
		MITSUBISHI	3460	74.0	70.8	68.3	87.0	84.2	76.1	7.6	45.0	1500
7.5	6	CENTURY	3470	82.0	79.0	73.0	90.0	84.0	74.0	10.9	84.0	1500
		FRANKLIN	3450	80.5	79.2	75.4	82.5	78.0	70.8	10.5	68.5	1500
		MITSUBISHI	3430	75.0	72.5	70.7	89.0	83.2	75.1	10.5	63.0	1500
10	6	CENTURY	3460	83.0	82.0	78.0	88.0	83.0	74.0	14.2	105.0	3500
		FRANKLIN	3450	78.5	76.2	71.5	86.5	82.5	73.5	13.8	101.7	3500
		MITSUBISHI	3440	78.0	75.9	70.6	89.0	82.1	74.7	14.0	80.0	3500
15	6	CENTURY	3470	87.0	82.0	76.0	88.0	80.0	70.0	19.3	170.0	3500
		FRANKLIN	3450	80.2	78.0	73.5	85.5	82.0	73.5	20.5	133.2	3500
		MITSUBISHI	3490	80.0	76.6	71.7	86.0	80.3	71.0	21.0	138.0	3500
20	6	CENTURY	3460	84.0	70.8	74.0	81.0	76.0	67.0	27.7	223.0	3500
		FRANKLIN	3450	81.3	79.8	76.0	88.3	85.3	77.5	26.2	137.2	3500
		MITSUBISHI	3480	80.0	78.3	73.4	87.0	82.2	73.4	28.0	175.0	3500
25	6	CENTURY	3425	81.0	80.0	76.0	82.0	76.0	66.0	32.3	265.0	4500
		FRANKLIN	3450	82.5	81.3	72.5	88.3	81.3	77.5	32.5	260.0	3500
		MITSUBISHI	3470	81.0	77.5	72.0	87.0	79.5	75.5	34.0	176.0	3500
30	6	CENTURY	3415	79.0	79.0	76.0	85.0	79.0	68.0	39.0	289.0	4500
		FRANKLIN	3450	83.0	81.0	78.0	85.0	81.8	72.0	40.0	288.0	3500
		MITSUBISHI	3450	81.0	80.0	76.0	88.0	85.0	78.5	40.0	200.0	3500
40	6	MITSUBISHI	3460	80.0	79.0	74.0	87.0	84.5	77.0	54.0	250.0	3500
	8	MITSUBISHI	3450	83.0	80.5	75.8	88.0	85.5	79.0	52.0	250.0	4400
	8	FRANKLIN	3525	81.5	79.4	74.8	86.5	82.8	74.8	43.0	342.0	10,000

NOTES:
(1) FOR MINIMUM DIAMETER WELL DIMENSIONS REFER TO PRICING SECTION.
(2) Thrust capacities listed are maximum allowable and must not be exceeded under any conditions including shut off.
(3) Efficiency values are for motors with no thrust load. Thrust loads cause losses in the thrust bearing which will affect the overall pump motor efficiency. These losses are:
(4) VALUES ARE FOR 460 VOLTS. FOR 230 VOLTS, MULTIPLY BY 2.0.

HORSEPOWER LOSS PER 1000 LBS. THRUST

CENTURY	3 TO 40 HP	0.10 HP
MITSUBISHI	5 TO 7-1/2 HP	0.16 HP
MITSUBISHI	10 TO 60 HP	0.21 HP
MITSUBISHI	MOTORS 10"	0.29 HP
MITSUBISHI	MOTORS 12" AND 14"	0.37 HP
MITSUBISHI	MOTORS 16"	0.41 HP
FRANKLIN	1500 AND 3500 LB THRUST MOTORS	0.15 HP
FRANKLIN	10,000 LBS THRUST MOTORS	0.13 HP

AURORA 1150 SERIES PUMPS
SUBMERSIBLE MOTOR DRIVE
ABOVE SURFACE
DISCHARGE ELBOW



		FABRICATED																	
WELL SIZE (I.D.)	COLUMN & DISCH. SIZE	G		J	K		L	M	N	P	R	S	X		Y	AA	AB	AC	AE	CF
		STD.	150#		STD.	150#							STD.	150#						
8	3	3/4	1-1/8	7/8	4	8	11-3/4	13-1/2	3/4	4	6	7-1/2	4-1/2	5	7	1-1/2	8	3-1/4	10-1/4	3
	4	3/4	1-1/8	7/8	4	8	11-3/4	13-1/2	3/4	8	7-1/2	9	6	6-1/2	8	1-1/2	9	3-3/4	11-1/2	4
	5	3/4	1-1/8	7/8	4	8	11-3/4	13-1/2	7/8	8	8-1/2	10	7-1/2	8	9	1-1/2	9	3-3/4	11-1/2	5
10	4	1	1-3/16	1	4	12	14-1/4	16	3/4	8	7-1/2	9	6	6-1/2	8	1-1/2	9	3-3/4	12	4
	5	1	1-3/16	1	4	12	14-1/4	16	7/8	8	8-1/2	10	7-1/2	8	9	1-1/2	9-1/2	4-1/4	12-1/2	5
	6	1	1-3/16	1	4	12	14-1/4	16	7/8	8	9-1/2	11	9	9-1/2	12	1-1/2	9-1/2	4-1/4	15-1/2	6
12	5	1	1-1/4	1	4	12	17	19	7/8	8	8-1/2	10	7-1/2	8	9	2	9-1/2	4-1/2	12-1/2	5
	6	1	1-1/4	1	4	12	17	19	7/8	8	9-1/2	11	9	9-1/2	12	2	10	5	15-1/4	6
	8	1	1-1/4	1	4	12	17	19	7/8	8	11-3/4	13-1/2	12	12-1/2	15	2	10-1/2	5-1/2	18	8
14	8	1	1-3/8	1-1/8	4	12	18-3/4	21	7/8	8	11-3/4	13-1/2	12	12-1/2	15	2	11	6	18	8
16	10	1-1/4	1-7/16	1-1/8	4	16	21-1/4	23-1/2	1	12	14-1/4	16	15	15-1/2	18	2-1/2	11	7	19-1/4	10
18	10	1-1/4	1-9/16	1-1/4	4	16	22-3/4	25	1	12	14-1/4	16	15	15-1/2	18	2-1/2	11-1/2	7-1/2	19-1/4	10
	12	1-1/4	1-9/16	1-1/4	4	16	22-3/4	25	1	12	17	19	18	18-1/2	22	2-1/2	11-1/2	7-1/2	20-3/4	12
20	14	1-1/4	1-11/16	1-1/4	4	20	25	27-1/2	1-1/8	12	18-3/4	21	21	21-1/2	25	2-1/2	12-1/4	8-1/4	22-1/4	14

NOTES:
1. All dimensions in inches.
2. Component dimensions may vary ± 1/8.
3. Not for construction purposes unless certified.

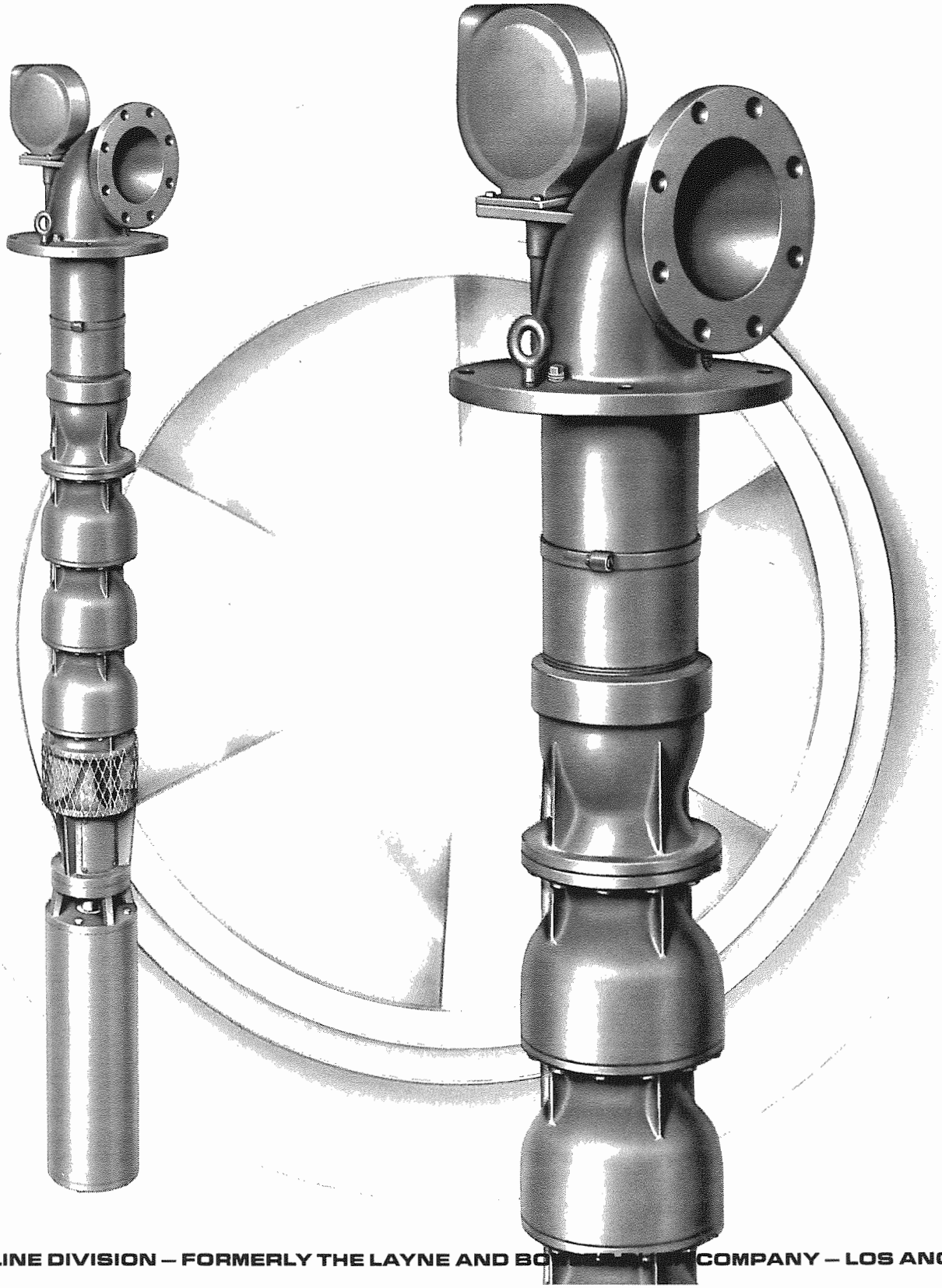
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A UNIT OF GENERAL SIGNAL
P. O. BOX 1300 • CITY OF INDUSTRY, CA • 91749

BULLETIN 1150C

1150 SERIES SUBMERSIBLE MULTI-STAGE DIRECT COUPLED

CAPACITIES TO 7000 G.P.M.
HEADS TO 1000 FEET
TEMPERATURES TO 150°F.

AURORA PUMP



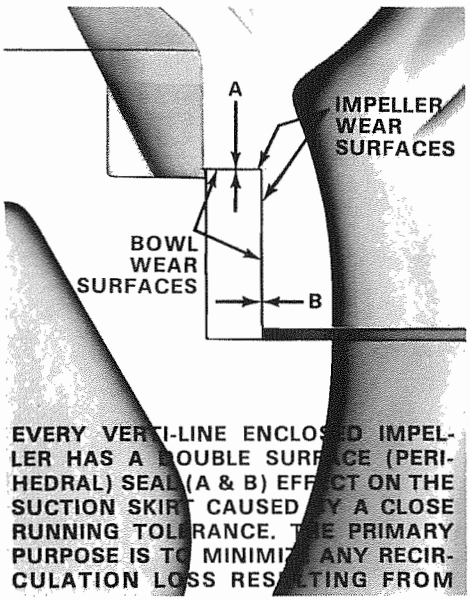
A.I.A. FILE NO. 29-D-5

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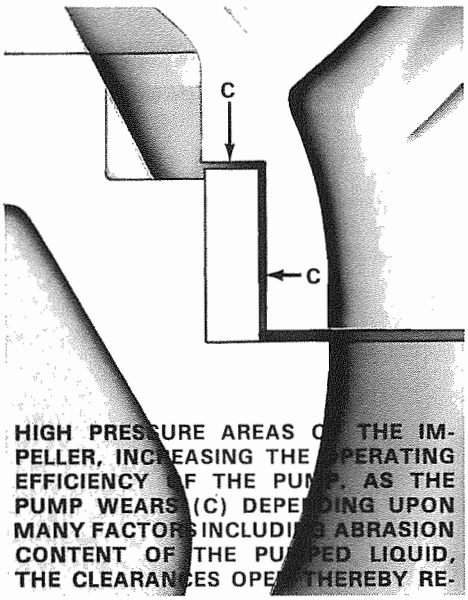
VERTI-LINE DIVISION – FORMERLY THE LAYNE AND BO[illegible] COMPANY – LOS ANGELES

INTRODUCTION
1150 SERIES PUMPS

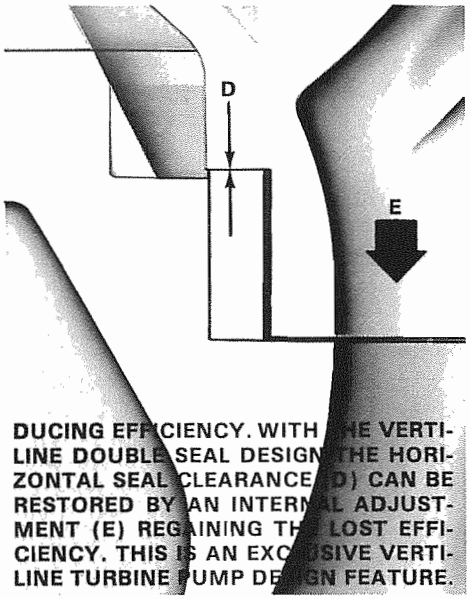
Mechanically powered turbine pumps were first developed and manufactured in 1908 by the Layne & Bowler Pump Company. That same company, which in 1972 became a division of Aurora Pump, has produced many thousands of vertical pumps. Altogether, since the original founding, Aurora Pump vertical turbines have pumped billions of gallons of liquids. Because of this established industry leadership billions of gallons more will be pumped by Aurora pumps in the future. The vertical turbine pump has, from its inception, been specified for difficult or unusual applications. Among these are limited floor space, reduced operating noise levels, high efficiency, high discharge pressures and unusual suction conditions — such as required for low NPSH. All vertical turbines look quite similar. In fact, most manufacturers have designed their pumps, when practical, to allow installation within a range of standard well casing pipe sizes. Beyond external appearances, the pumps reflect a more unique character when considering applications. Some are designed only for wells, some for short settings, others for low pressure, some for high pressure, etc. The vertical turbine is one of three basic pump designs which also includes mixed flow and propeller types. Standard *Francis Vane impeller* type turbine pumps described in this bulletin produce low to medium volumes of water at high pressure. Aurora vertical pumps are designed primarily for heavy duty, continuous operation, industrial applications. As a result, Aurora vertical pumps are unique when compared to the rest of the pump industry for normal, less demanding applications. The average installation can expect extra-long trouble-free pump life. This bulletin on submersible pumps explains how one variation of the basic vertical design can best suit your specific application. A review of this bulletin will show you why Aurora Pump offers the most value in vertical turbine pumps. A local sales office is listed in the yellow pages.



EVERY VERTI-LINE ENCLOSED IMPELLER HAS A DOUBLE SURFACE (PERIHEDRAL) SEAL (A & B) EFFECT ON THE SUCTION SKIRT CAUSED BY A CLOSE RUNNING TOLERANCE. THE PRIMARY PURPOSE IS TO MINIMIZE ANY RECIRCULATION LOSS RESULTING FROM



HIGH PRESSURE AREAS OF THE IMPELLER, INCREASING THE OPERATING EFFICIENCY OF THE PUMP. AS THE PUMP WEARS (C) DEPENDING UPON MANY FACTORS INCLUDING ABRASION CONTENT OF THE PUMPED LIQUID, THE CLEARANCES OPEN THEREBY RE-



DUCING EFFICIENCY. WITH THE VERTI-LINE DOUBLE SEAL DESIGN THE HORIZONTAL SEAL CLEARANCE (D) CAN BE RESTORED BY AN INTERNAL ADJUSTMENT (E) REGAINING THE LOST EFFICIENCY. THIS IS AN EXCLUSIVE VERTI-LINE TURBINE PUMP DESIGN FEATURE.

QUICK REFERENCE 1150 SERIES FEATURE SELECTOR

STANDARD

Submersible motor (wet type)
Fabricated head
Plain end discharge elbow
Above surface discharge
Threaded column pipe
Pump setting increments of 6"
Bronze fitted bowl assembly
Bronze bowl bearings
Perihedral seal/enclosed impeller
Tapered impeller collets
Deep set
Stainless steel bowl shaft
Galvanized strainer
Painted

OPTIONAL

Submersible motor (hermetical seal)
Cast head
125 F.F., 150 R.F., 300 R.F. flange
Below surface discharge
Flanged column pipe
Special pump setting increments
Various bowl mat'ls. of construction
Various bearing mat'ls. of const.
Bowl and impeller wear rings
Keyed tapered impellers and collets
Deep set modifications
Special alloy bowl shaft
Stainless steel strainer
Special paints and coatings

1150 SERIES
SUBMERSIBLE TURBINE PUMP
ABOVE SURFACE DISCHARGE ELBOW

1 CONDUIT BOX is provided with a large diameter gasket sealed cover. The box is elevated to aid the terminal wiring of the submersible motor cable. Added protection is provided when marginal flooding of the installation is possible. This option satisfies watertight construction industry standards.

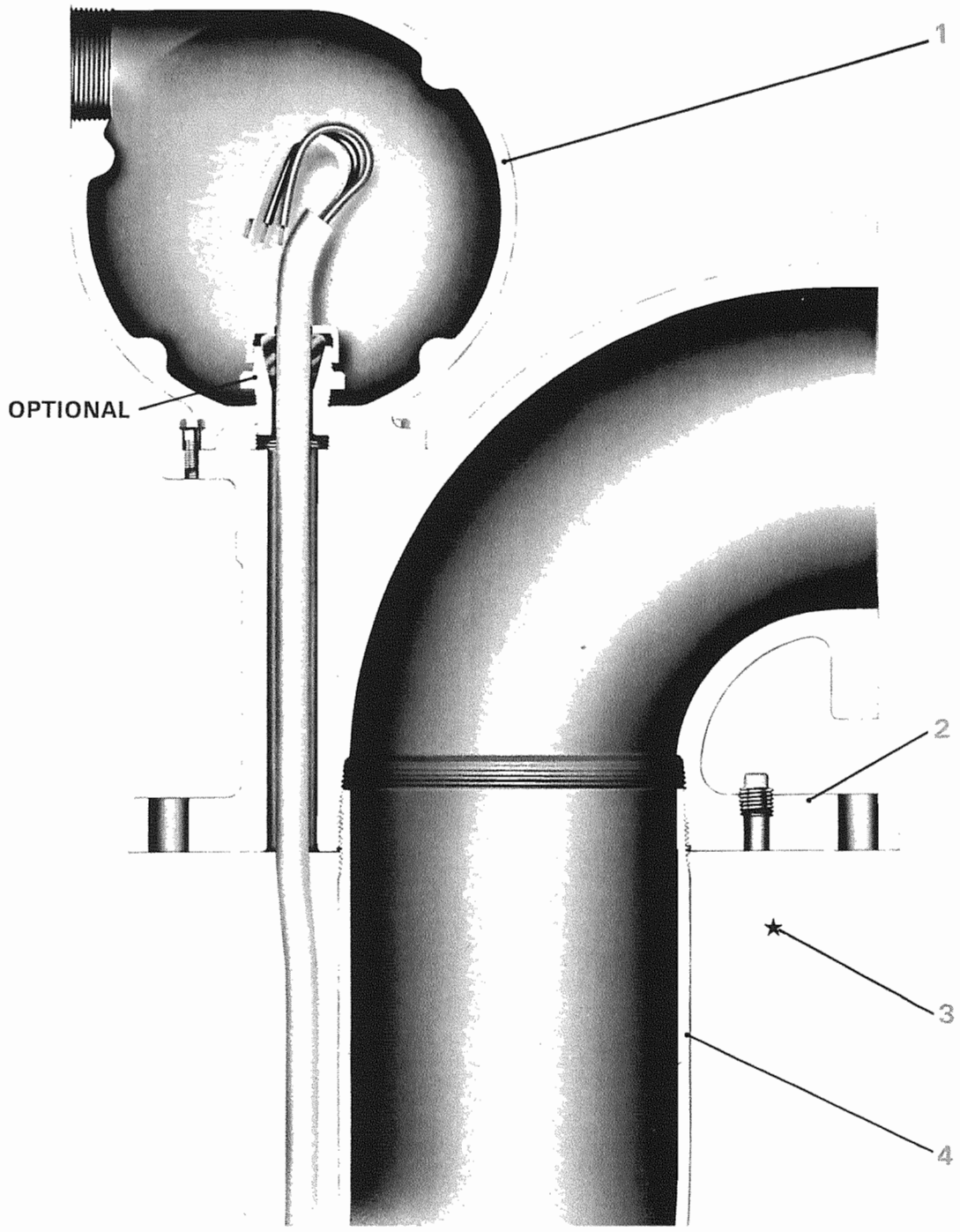
2 SURFACE PLATE supports the column, pump assembly and submersible motor and is provided as standard in fabricated steel. Close grained, minimum 30,000 P.S.I. tensile strength cast iron is optional. A design safety factor of 5 to 1 provides maximum strength. Lifting bolts simplify installation. Alternate pipe connections, optionally available, provide for several discharge arrangements.

3 BASEPLATE is optional and can be sized to fit the supporting structure. Available in fabricated steel and in round, square or special shapes. The discharge head can be unbolted and the pump assembly removed without disturbing the position of the baseplate. Not illustrated.

4 STEEL DISCHARGE COLUMN is provided for surface or below surface discharge heads. Below surface discharge column includes a pipe tee for the discharge connection. Larger than standard sizes are available to minimize friction losses, etc. Pipe ends have N.P.T. tapered threads to provide a tight fit between pipe sections. Column pipe conforms to ASTM A53 Standards. Each section is pressure-tested, varying from a minimum of 1900 P.S.I. for 4" diameter to a minimum of 1000 P.S.I. for 12" diameter.

5 COLUMN PIPE COUPLING is high tensile steel. Coupling threads are machine turned for ease of installation and servicing.

6 DISCHARGE CASE CAP seals off the end of the pump shaft from cascading abrasives entrained in the pumped liquid when the power is turned off. Additional



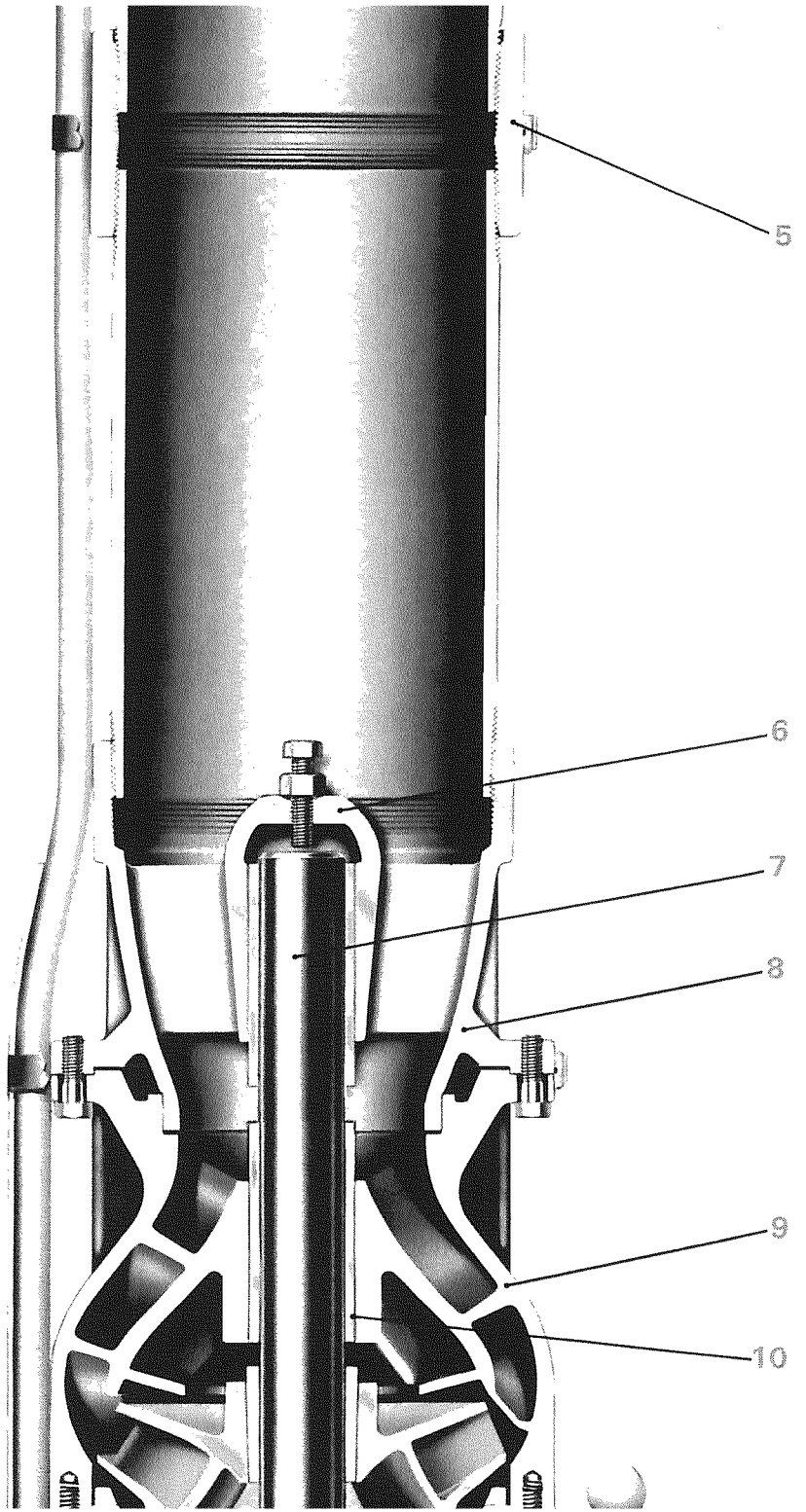
system applications is provided.

7 STAINLESS STEEL PUMP SHAFT is made of 410 A.I.S.I. alloy, nominal 100,000 P.S.I. tensile, pump shaft quality, Medart passed and precision straightened. High torsional strength and exceptional corrosion resistance are inherent. Shaft diameters vary depending on pump size. There are no stepped diameters within the bowl assembly or keyways to weaken the shafting. Horsepower rating, machining and straightness tolerances conform to ANSI /AWWA E101 Standards. These factors, combined with extra large cross-sectional areas, provide greater rigidity to the rotating element thus assuring long life.

8 CAST DISCHARGE CASE includes vanes to guide the pump discharge into the column pipe with minimum fluid friction. Adapters are available to increase the column pipe diameters to suit application requirements. High pressure castings are available.

9 INTERMEDIATE BOWLS feature cast diffuser vanes that support the impeller shaft bearing housing and conduct the fluid flow from the impeller discharge to additional stages. The vanes are hydraulically compatible with the impeller designs and convert velocity head into pressure head in each stage. Friction losses are kept to a minimum while maintaining maximum efficiency. Discharge pressure is equal in all directions radially, eliminating any radial load. Bowl castings are of iron to ASTM A-48 Class 30 Standards. Optional Vitreous enamel linings available for all popular sizes protect against erosion and scaling. The lining also provides higher efficiencies and is recommended for most ordinary water applications. High pressure castings are optionally available for difficult applications.

10 DISCHARGE CASE BEARING assures shaft alignment and stabilization immediately above the impeller. This bearing is approximately 5 shaft diameters in length to provide support. The bearing surface is of bronze and is amply lubricated for long periods of service by a large grease chamber above the bearing with a special water resistant bearing grease.



11 BOWL BEARINGS are provided with each intermediate stage. Each bearing is sized to assure alignment and to stabilize the bowl shaft at each impeller. The bowl bearing lengths vary by individual pump size and are determined by a combination of factors including maximum horsepower, operating speed, shaft diameter and bowl size. The bearing surface is lubricated by the pumped liquid. The standard bearings are made from bronze alloy. However, special materials can be provided for special applications. Contact your local sales office representative for assistance.

12 ABRASION WEBS are cast into the bowls on all popular bowl sizes to minimize the erosive action of entrained abrasives due to the vortex action and rotation of liquid between the individual pump stages.

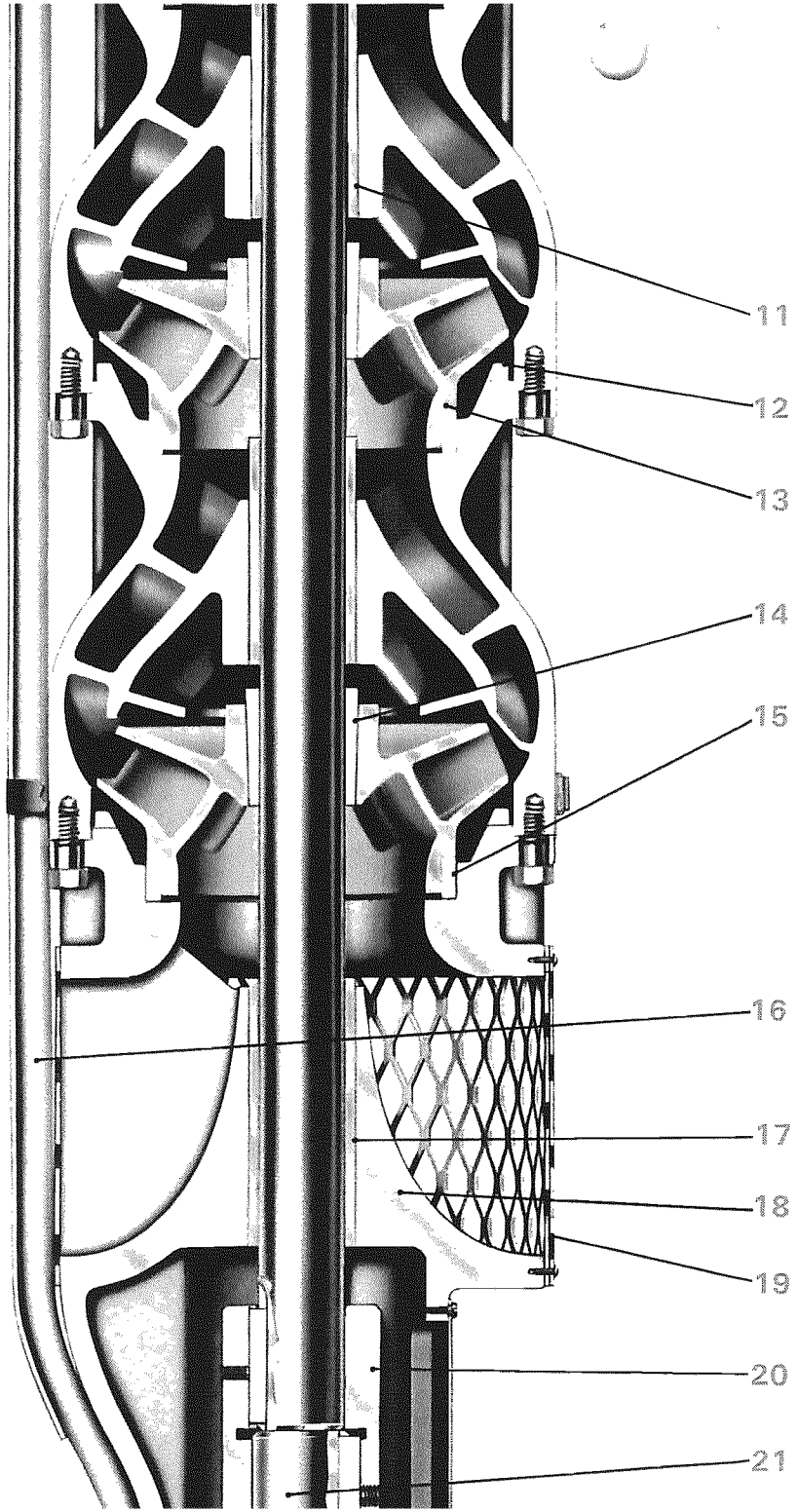
13 ENCLOSED BRONZE IMPELLER is precision cast and statically balanced to provide highest efficiency and vibration free operation. Dynamic balancing is optionally available. Radial vane of modified Francis type designs, optional premium finishes and the ability to multi-stage, assures a pump selection to meet most application requirements. Various alloys and modifications are available.

14 TAPERED IMPELLER COLLET securely locks the impeller to the pump shaft. The steel collet is split to simplify installation and provide a positive lock.

15 BOWL WEAR RING is optional, prevents wear on the bowl and is replaceable. Normal material is cast iron, bronze is available. Impeller wear rings are available.

16 CONDUCTOR GUARD protects the motor leads from possible damage during and after installation. The guard forms a protective channel over the cable between the motor and the discharge column.

17 SUCTION CASE BEARING made of bronze alloy



imum of 3 shaft diameters in length.

18 CAST SUCTION CASE incorporates vanes to guide intake fluid and has a "flare" to minimize shock and entrance losses. Register fits assure motor alignment.

19 GALVANIZED STRAINER is corrosion-resistant and constructed of heavy gauge expanded metal. The open area is in excess of four times the throat area of the suction case. Flow to the pump is not restricted, but solids are kept out of the pump.

20 PUMP MOTOR COUPLING machined from A.I.S.I. 416 alloy is secured to butt fitted shaft ends. Alloy keys and setscrews secure the coupling.

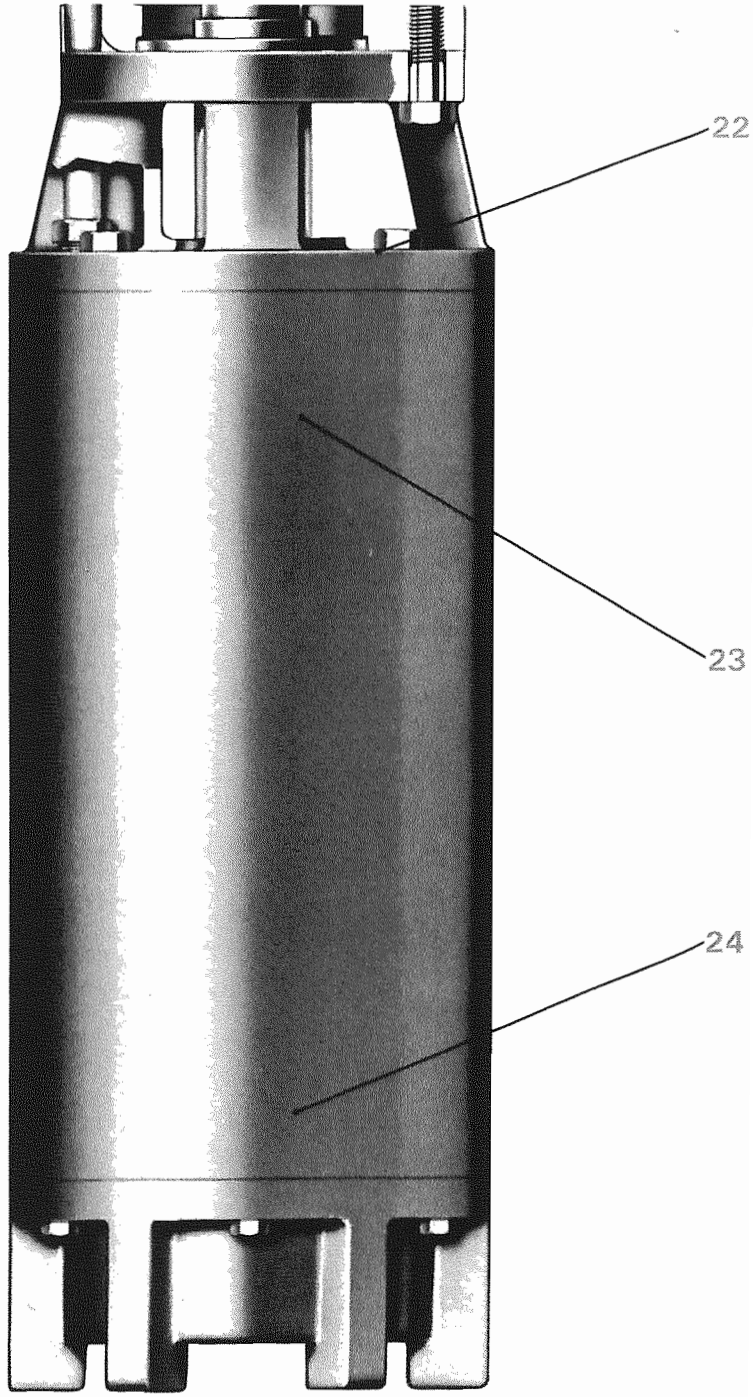
21 MOTOR SHAFT EXTENSION is precisely machined from stainless steel A.I.S.I. alloy, 75,000 P.S.I. tensile having high torsional strength and corrosion resistance. Shaft diameters vary by horsepower.

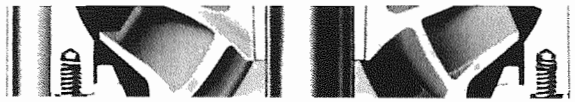
22 MECHANICAL SEAL furnished by the motor manufacturer prevents contamination of the inner motor fluid and keeps abrasives out of the motor. A water slinger is provided above the seal for added protection.

23 UPTHRUST BEARING provided with some motors absorbs momentary upward thrust during start-up and is of the spring mounted self-leveling collar type.

24 DOWNTHRUST BEARING is self-aligning and absorbs thrust loads imposed by the pump shaft, impellers and hydraulics. Tilting shoe bearing design is standard. Thrust loads are equally distributed over the shoes. Rotational backspin due to water receding in the column when the motor operation stops does not affect the bearing.

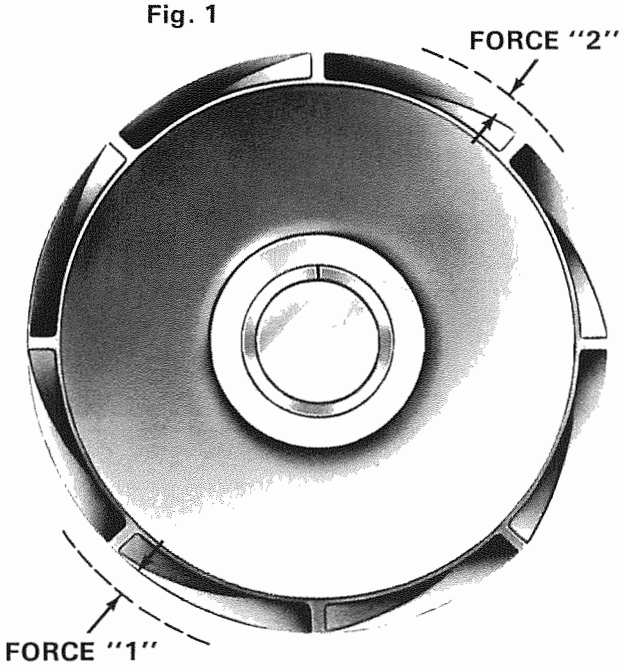
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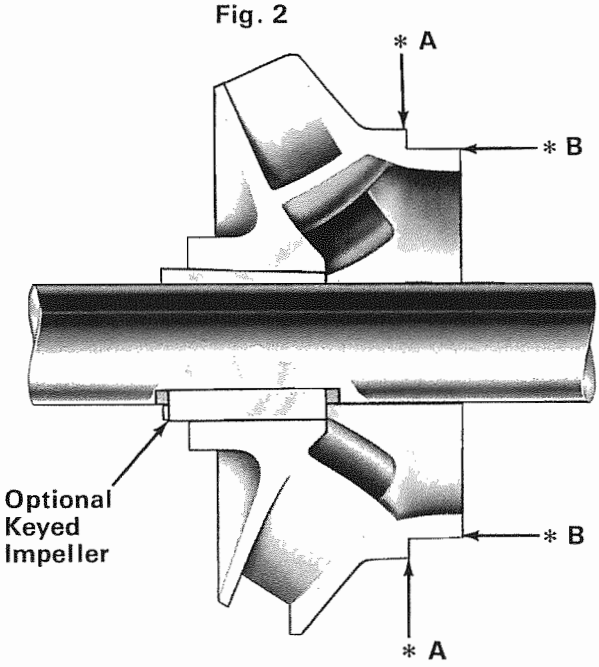
BALANCED DESIGN AND PERIHEDRAL SEAL

Fig. 1

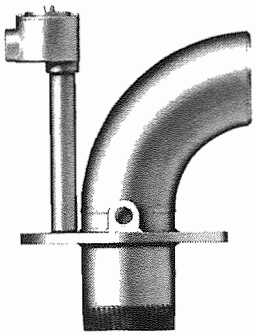


FORCE "1" = FORCE "2" (Balanced design)

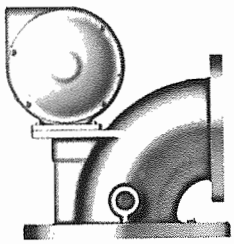
Fig. 2



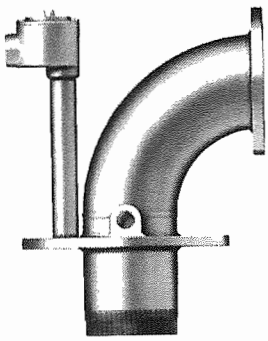
*EXCLUSIVE VERTI-LINE FEATURE



AN OPTIONAL FABRICATED DISCHARGE HEAD WITH A PLAIN END ELBOW IS PROVIDED AS STANDARD *WITHOUT* A CONDUIT BOX. A 150 POUND ANSI MOUNTING BASE AND/OR CONDUIT BOX IS ALSO OPTIONALLY AVAILABLE. TWO LIFTING LUGS ARE PROVIDED.



AN OPTIONAL CAST TYPE DISCHARGE HEAD WITH A FLANGED ELBOW IS PROVIDED AS A STANDARD *WITH* A CONDUIT BOX. A 125 POUND ASA MOUNTING BASE AND/OR CABLE SEAL IS ALSO OPTIONALLY AVAILABLE. TWO LIFTING LUGS ARE AVAILABLE.



AN OPTIONAL FABRICATED DISCHARGE HEAD WITH A FLANGED ELBOW IS PROVIDED AS STANDARD *WITHOUT* A CONDUIT BOX. A 150 POUND ANSI MOUNTING BASE AND/OR CONDUIT BOX IS ALSO OPTIONALLY AVAILABLE. TWO LIFTING LUGS ARE PROVIDED.

Due to the arrangement permitting impeller discharge into a diffuser type casing, radial loads due to hydraulic forces are practically nonexistent. The relationship could be likened to an impeller operating in a volute with seven or eight cutwaters, thus balancing out hydraulic side loading. With all rotating parts in mechanical balance, the shaft/bearing system is simplified to the point of mere guidance. Energy is imparted to the liquid as it is impelled through the impeller's passageways. At the same time, a greater horizontal plane area of the impeller is exposed to discharge head than to suction head. These two factors produce an axial force in a downward direction, called hydraulic downthrust. The resulting load is carried on the driver thrust bearing. Figure 1 and Figure 2 illustrate a typical Verti-Line (12R) enclosed impeller. Figure 1 is a top view. Figure 2 is a side view sectional modified for an optional keyed construction. Figure 1 emphasizes that forces working against an impeller 180° (opposite each other) apart are always equal. As an example, if pressure force 1 is 50 pounds, then pressure force 2 will also be 50 pounds. This is common to all Verti-Line pumps.

BALANCED DESIGN ASSURES LONG LIFE

ENGINEERING SPECIFICATIONS

The vendor (contractor) shall furnish (and install), as shown on the plans, ... Aurora Model ..... stage, size ..... x ..... x ....., Electric Motor driven, bronze fitted (all iron) (stainless steel) (.....), vertical turbine pump. The pump shall be capable of delivering ..... USGPM against a total discharge head, [exclusive of all pump losses] of ..... feet, operating at ..... RPM when pumping water (.....), with a temperature of .....° Centigrade (Celsius) ..... (Fahrenheit) and a specific gravity of ..... The pump shall have a minimum guaranteed field efficiency, including all pump losses, of .....% at the rated condition and also shall deliver ..... USGPM minimum, against a discharge head of ..... feet. The minimum (maximum) shut off head acceptable will be ..... feet. The pump rotation shall be counter-clockwise when viewed from the top of the vertical pump.

MOTOR — The electric motor shall be a ..... HP, full voltage, squirrel cage, induction, permanently (.....) sealed, oil (.....) filled, pressure compensated, suitable for continuous operation in any position under water at a maximum synchronous speed of ..... RPM at no load. A unit operating at a lesser rotative speed may be considered, but in no event will a pump operating at more than the maximum speed specified be acceptable. The pump horsepower requirements shall be such that at no point on the pump performance curve will the nameplate rating of the driver be exceeded. The motor shall be rated at ..... phase, 60 (50) Hertz, ... volts. At the specified total dynamic pumping head, the driver shall be capable of operating continuously with a temperature rise that does not exceed 40° .....° Centigrade (Celsius) (104° .....° Fahrenheit) above a 30° .....° Centigrade (Celsius) (86° .....° Fahrenheit) maximum ambient temperature, with a 1.15 (1.00) service factor. The motor shall be equipped with a high thrust bearing capable of accepting the total unbalanced hydraulic and mechanical thrust load (weight of rotating element) imposed by the pump. The motor shaft and shaft coupling shall be a 410/416 AISI alloy or better. All fasteners exposed to the pumped liquid shall be stainless steel. The coupling shall transmit total torque in either direction. When operating normally, the motor thrust bearing shall have a 5 year average and 1 year minimum bearing life. (Optional inherent protective devices shall be provided in the windings.) The motor shall be built and operated per the current NEMA standards.

SUBMERSIBLE CABLE — The cable shall be protected by a formed metal guard the full length of the bowl assembly. The cable will consist of a single jacketed, three conductor assembly or separate multiple conductors. Each conductor shall be oil and water resistant and insulated for continuous immersion in the pumped liquid. Maximum voltage loss of 5% at motor terminals will determine size of cable. Stainless steel clamps will secure cable to column pipe.

DISCHARGE HEAD — The surface (below base) discharge head shall function as a discharge elbow (tee) and support base, and shall be constructed of (cast iron) (fabricated steel) (.....). Lifting lugs shall be provided. Foundation bolt holes shall be provided. A stainless steel nameplate shall include pertinent data, manufacturers name, serial number, and a rotation arrow. A (....." square) ....." dia. round base shall be provided. The head (below surface tee) discharge termination shall be flanged 125 lb. flat face (150 lb. raised face) (300 lb. raised face) ANSI rated. (Below base discharge center line shall be ..... inches below the bottom of the discharge head [baseplate], an automatic air release valve shall be provided to eliminate air above the discharge tee.) Fabricated steel heads shall meet welding standards.

COLUMN — The column pipe shall be steel [conforming to the American Water Works Association (AWWA) Standard E101-77 up to 12" and schedule 20 on all larger sizes], (.....), with a ..... inch nominal inside diameter. The overall length of the column, from the bottom of the discharge head (baseplate) to the bowl discharge case shall be ..... feet. The pipe shall be sized so that the friction losses shall not exceed 5 feet per 100 feet. Column pipe shall have a minimum wall thickness of at least ..... inch, and shall have threaded tapered fit connections for precise alignment during assembly. The threaded column shall include sleeve type threaded coupling connectors. No column section shall exceed 10 (20) feet in length.

BOWL ASSEMBLY — The pump bowls, suction case and discharge case shall be of the vertical multi-stage design constructed of "Apco-Loy 30" cast iron (.....), having a minimum tensile strength of 30,000 psi. They shall be of sufficient thickness to withstand stresses and strains at full operating pressures. The bowls shall be subjected to a hydrostatic test at 150% of that specified at the rated duty point. The bowls and impellers shall be designed and manufactured with open and smooth water passages to assure efficient, reliable operation, and to discourage air or sand locking. Each bowl shall be fitted with a perihedral seal, combining vertical and horizontal wearing surface impeller sealing. Impellers shall be of the enclosed, single suction, modified Francis vane type and shall be of cast bronze (.....). Impellers shall be statically (dynamically) balanced, and securely fastened to the shaft by split tapered steel (.....) collets (key locked). The impeller and bowl vanes shall be designed to reduce noise. The bowl shaft shall be made of high grade 410 (.....) AISI alloy with a 11-13% chrome content or equal, accurately machined to provide a true running rotating element. The minimum bowl shaft diameter acceptable shall be ..... inches. The assembly shall be optionally equipped with easily renewable bronze (.....) bowl wearing rings (impeller wearing rings), so designed that the rings will be seated against a shoulder in each bowl around the full periphery of the wearing ring. The rotating element shall be mounted in a heavy duty, extra length sleeve bearing in the suction case. Bowl bearings shall be so designed to allow the pumped liquid to continuously lubricate the bearing wear surfaces and provide maximum protection against wear. Bowl bearings for each stage shall be manufactured from leaded bronze. The threaded suction case shall be fitted with a galvanized (.....) conical strainer. The bowl assembly shall include an acid etched nameplate secured with stainless steel pins and shall include pertinent data, and manufacturers name and serial number.

COATING — All internal water passages, excluding shafting and noncorrosive components, shall be coated with .... Impellers shall be coated with ..., except for running surfaces. Exterior of all parts in contact with liquid shall be coated with ....

INSTALLATION — The pump shall be mounted on a heavy (cast iron) steel baseplate. The pump shall be checked for alignment after the pump has been installed and grouted in place, in accordance with the standards of the Hydraulic Institute. There shall be no strain transmitted to the pumps by the piping or mounting structure.

WATER LEVEL INDICATOR — A suitable air line and direct reading [in feet] altitude gauge complete with fittings shall be furnished to determine the water level in the well. The air line shall be a minimum ¼" galvanized steel (copper tubing) (polyethylene tubing), ... feet in length.

NOTE: Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information without notice.

AURORA PUMP

BOX 1300 • CITY OF INDUSTRY, CA • 91749

SALES OFFICES: ALL MAJOR CITIES AND COUNTRIES
Refer to "Pumps" in the yellow pages of phone directory

MANUFACTURING FACILITIES LOCATED IN N. AURORA, IL • CITY OF INDUSTRY (GREATER LOS ANGELES), CA

Export Dept.: City of Industry, California, Telex 67-0462
Trade-Mark AURORA is registered in U.S. Patent Office

A DIVISION OF AURORA PUMP
VERTI-LINE

WHITE PLUMBING & HEATING, Inc.

P.O. BOX 1741 | TWIN FALLS, ID 83303-1741 | PHONE 208-733-4556

SHOP DRAWING FOR APPROVAL

TO: Heath Engineering Company DATE 4/19/85

377 West 800 North

Salt Lake City, Utah 84103

CONTRACT NO. J-501 TRANSMITTAL NO. 1A NEW SUBMITTAL

RESUBMITTAL XX TRANSMITTAL NO. P. O. NO. 1222

PROJECT Geothermal T.F.H.S./Sawtooth LOCATION Twin Falls, Idaho

SPECIFICATIONS SECTION FOR BUILDING

PAR NO.	DESCRIPTION OF EQUIPMENT	MANUFACTURER	PUB. NO.	COPIES SUB'M.	ACTION TAKEN	COPIES RET'D.
	P-1 & P-2 Pumps	Aurora		8		

Please return ..... approved copies to this office.

cc: File w/copy
Field

CONTRACTOR **WHITE PLUMBING & HEATING, Inc.**

MAILING ADDRESS **P.O. Box 1741, Twin Falls, ID 83303-1741**

By J. J. White

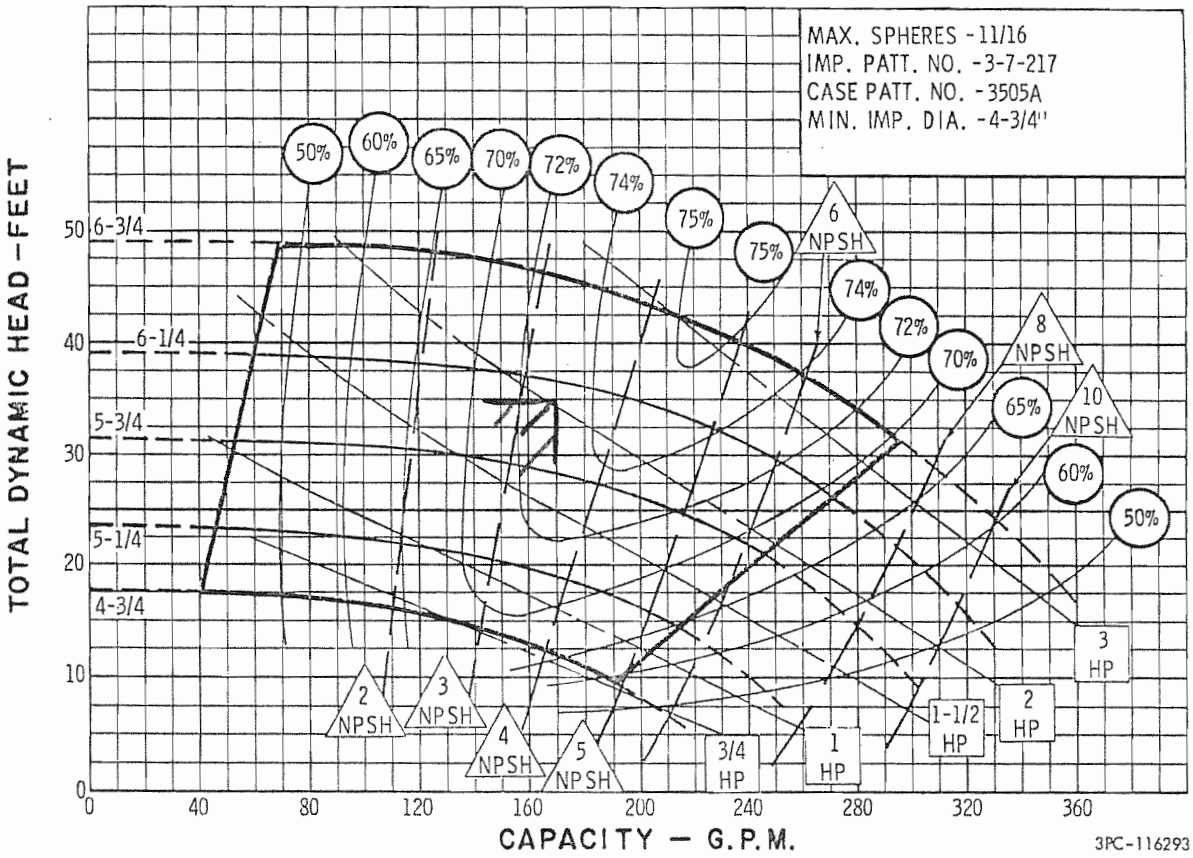
STANDARD TWIN FALLS

Supplier: Aurora Pumps

P.O. Box 892
Twin Falls, Idaho 83303

Bob Bingham (208) 733-4278

P-1



AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD · NORTH AURORA, ILLINOIS · 60542

P-1

Job No. 501

Submittal No. 1-A

P.O. No. 1222

Date 4-19-85

Spec. Section

☑ NO EXCEPTIONS TAKEN ☐ REJECTED

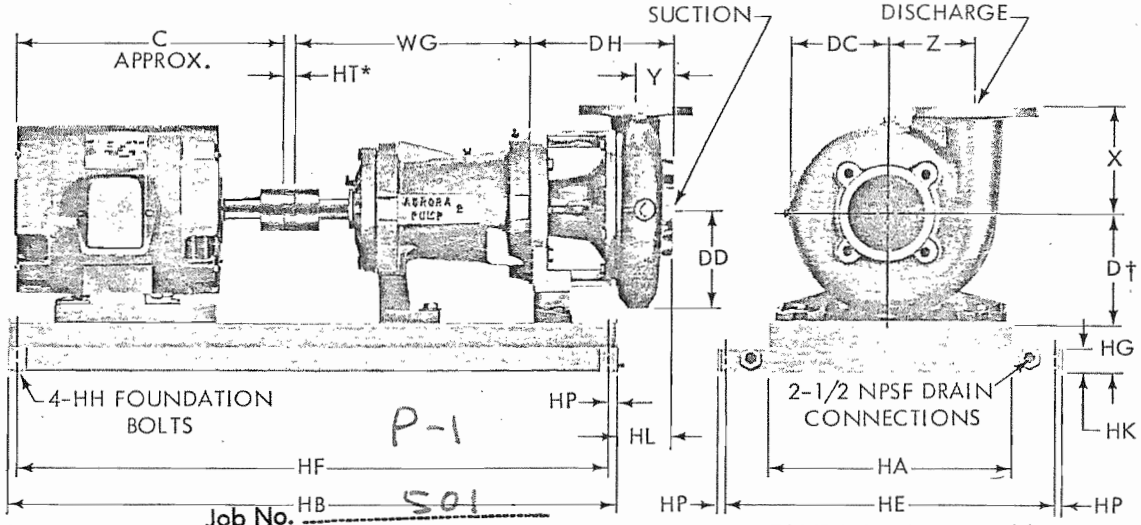
☐ EXCEPTIONS AS NOTED ☐ REVISE AND RESUBMIT

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any corrections or comments are subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction coordination of his work with that of all other trades; and the satisfactory performance of his work.

HEATH ENGINEERING COMPANY

Date APR 2 9 1985 By Samuel D. Stone

AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD · NORTH AURORA, ILLINOIS · 60542



Job No. 501

Submittal No. 1-A

P.O. No. 1222

Date 4-19-84

Spec Section

BASE	SIZE	HA	HB	HE	HG	HH	HP	HK	HF
4	11 x 30	11	30-1/2	15-7/8	3	1/2	11/16	1-1/2	29-1/8
5	11 x 36	11	36-1/2	15-7/8	3	1/2	11/16	1-1/2	35-1/8
7	14 x 36	14	36-1/2	19	3	5/8	3/4	1-1/2	35
8	14 x 42	14	42-1/2	19	3	5/8	3/4	1-1/2	41
11	18 x 46	18	46-1/2	25-1/8	4	3/4	13/16	2	44-7/8

NOTES:

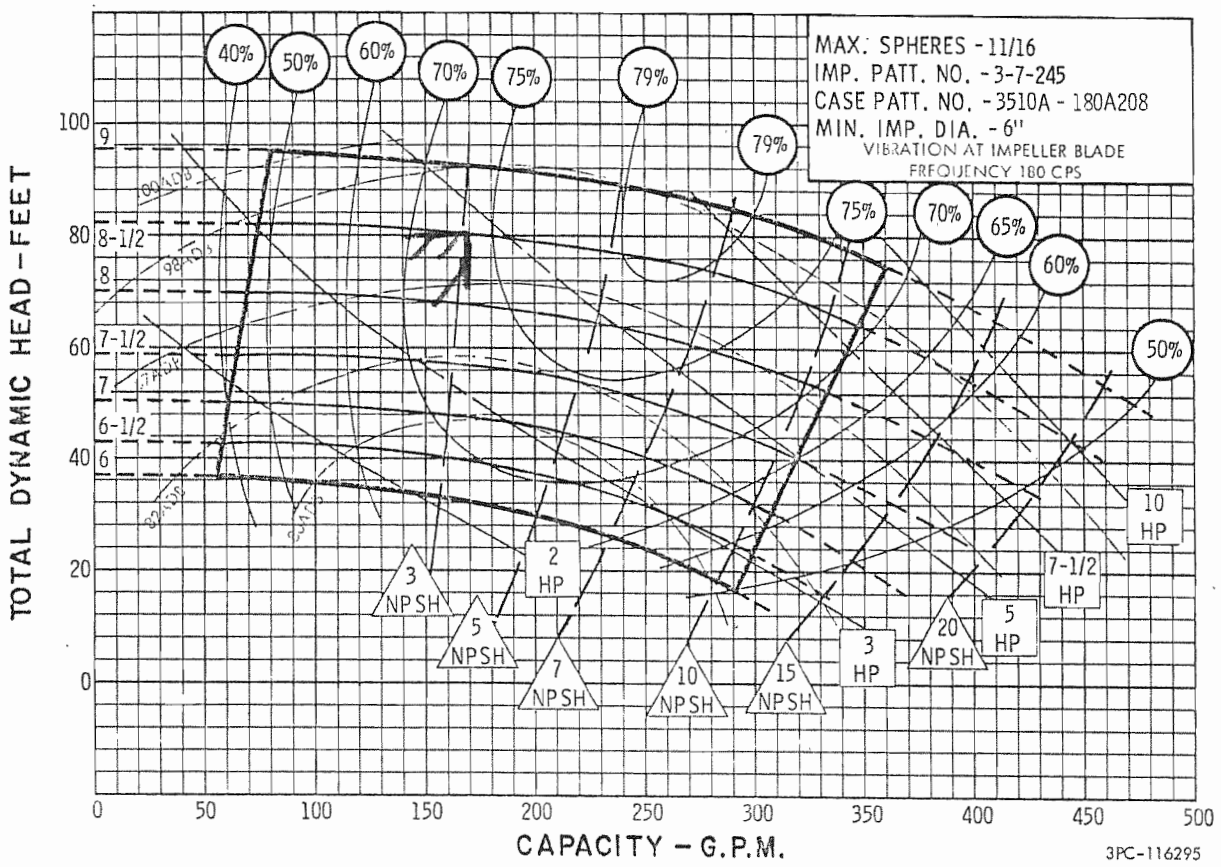
1. All dimensions in inches.
2. Dimensions may vary ± 1/4.
3. Not for construction purposes unless certified.
4. NA - Not applicable.
5. Check discharge position, casing dimensions which exceed dimension "D" may require pads for the pump and/or motor.
6. Conduit box is shown in approximate location. Dimensions are not specified as they may vary with each motor manufacturer.

* Dimension "HT" may vary 1/8" to 1".

† D Dimension of 5 x 6 x 12 and 6 x 6 x 12 pumps with 254T thru 286TS motor is 9".

PUMPS WITH THREADED CONNECTIONS												
PUMP SIZE			X	Y	Z	DC	DD	DH		HL		
DISCH	SUCT	CASE BORE						FRAME 1	FRAME 2 & 3	FRAME 1	FRAME 2	FRAME 3
1-1/4	1-1/2	7	5-1/4	2-7/16	4-3/16	4-15/16	5-3/16	7-3/16	NA	4-3/16	NA	NA
1-1/4	1-1/2	9	6-5/8	2-9/16	5-3/8	6-3/16	6-3/8	7-1/4	NA	4-1/4	NA	NA
1-1/2	2	7	5-3/8	2-1/2	4-5/16	5-1/8	5-3/8	7-5/16	NA	4-5/16	NA	NA
1-1/2	2	9	6-3/4	2-5/8	5-1/2	6-5/16	6-9/16	7-3/8	8-3/8	4-3/8	4-7/8	NA
1-1/2	2	12	7-3/4	2-3/4	7-1/16	8	8-1/4	NA	8-5/8	NA	5-5/8	NA
PUMPS WITH AM. STD. 125 LB. FLANGED CONNECTIONS												
2	2-1/2	7	5-5/8	1-7/8	4-9/16	5-3/8	5-13/16	6-13/16	7-13/16	3-13/16	4-5/16	NA
2	2-1/2	9	7	1-7/8	5-11/16	6-1/2	6-7/8	6-3/4	7-3/4	3-3/4	3-7/8	NA
2	2-1/2	12	8	1-7/8	7-3/16	8-3/16	8-1/2	NA	7-7/8	NA	4-7/8	NA
2-1/2	3	7	5-7/8	2	4-13/16	5-13/16	6-1/4	7-1/16	8-1/16	4-1/16	4-9/16	NA
2-1/2	3	9	7-1/4	2	5-15/16	6-3/4	7-1/4	7	8	4	4-1/2	NA
2-1/2	3	12	8-1/4	2	7-3/8	8-3/8	8-3/4	NA	8-1/8	NA	5-1/8	NA
3	4	9	7-1/2	2-1/8	6-1/8	6-7/8	7-7/16	7-1/4	8-1/4	4-1/4	4-3/4	NA
3	4	12	8-1/2	2-1/8	7-9/16	8-7/16	8-15/16	NA	8-3/8	NA	5-3/8	5-3/8
4	4	7	6-1/2	2-1/2	5-1/2	6-7/16	7-5/16	7-15/16	8-15/16	4-15/16	5-7/16	NA
4	5	9A	7-1/4	3-1/8	5-3/4	6-11/16	7-3/8	NA	9-3/8	NA	5-7/8	5-7/8
4	5	9B	7-3/4	2-5/8	6-5/8	8-1/16	8-11/16	NA	9	NA	5-1/2	NA
4	5	12	8-3/4	2-5/8	7-15/16	8-7/8	9-9/16	NA	9-1/8	NA	6-1/8	6-1/8
5	6	12	9	2-7/8	8-5/16	9-1/4	10-1/8	NA	9-5/8	NA	6-5/8	6-5/8
6		9	8-1/4	2-3/4	7	8	9	NA	9-1/4		5-3/4	NA
6		12	9-1/4	3-1/8	8-11/16	9-11/16	10-13/16	NA	10-1/8		NA	7-1/8

NOTE: WHEN TWO "D" DIMENSIONS ARE INDICATED ALWAYS USE THE LARGER FIGURE.		POWER FRAME	1	2	3
		WG	10-5/16	13-13/16	13-13/16
D	CASE BORE	7	5-1/4	6-1/4	–
		9 & 12	5-1/4	7	7
MOTOR FRAME	C APPROX.	D	BASE NUMBER		
56	12		4	NA	NA
143T	11		4	NA	NA
145T	12		4	7	NA
182T	13		4	7	NA
184T	14		4	7	NA
213T	16	5-1/4	4	7	NA
215T	18	5-1/4	5	7	NA
254T	21	6-1/4	7	8	8
256T	23	6-1/4	NA	8	8
284T	24	7	NA	8	8
284TS	22	7	NA	8	8
286T	25	7	NA	8	8
286TS	24	7	NA	8	8
324T	26	8	NA	11	11
324TS	25	8	NA	11	11
326T	28	8	NA	11	11
326TS	26	8	NA	11	11
364T	29	9	NA	11	11
364TS	27	9	NA	11	11



1750 RPM

P-2

Job No. 501

Submittal No. 1-A

P.O. No. 1222

Date 4-19-85

Spec. Section

☑ NO EXCEPTIONS TAKEN ☐ REJECTED

☐ EXCEPTIONS AS NOTED ☐ REVISE AND RESUBMIT

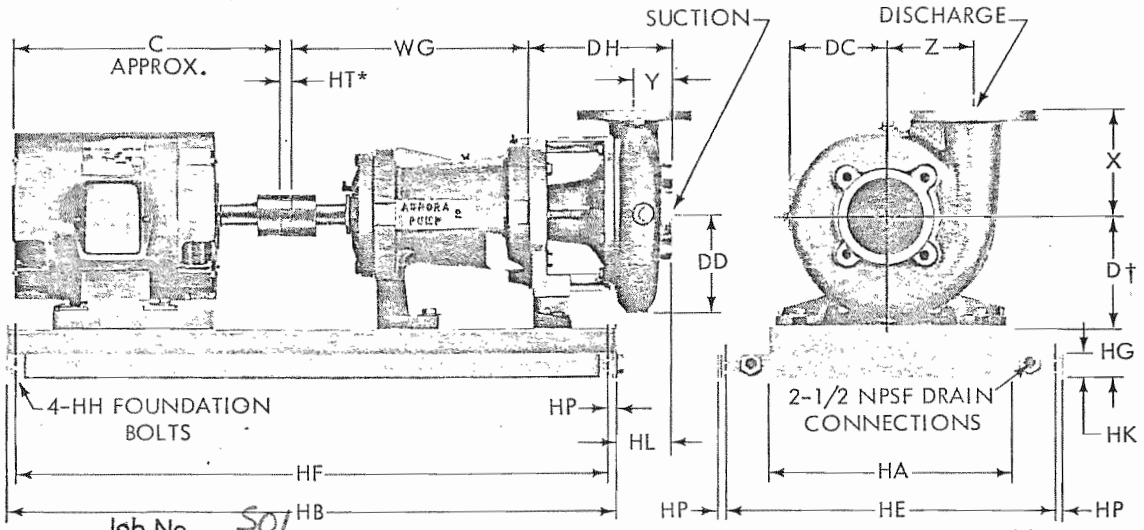
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HEATH ENGINEERING COMPANY

Date APR 2 9 1985 By Samuel D. Stone

AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD · NORTH AURORA, ILLINOIS · 60542

AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD-NORTH AURORA, ILLINOIS-60542



Job No. 501

Submittal No. 1-A

P.O. No. 1222

Date 4/19

P-2

Spec. Section

BASE	SIZE	HA	HB	HE	HG	HH	HP	HK	HF
4	11 x 30	11	30-1/2	15-7/8	3	1/2	11/16	1-1/2	29-1/8
5	11 x 36	11	36-1/2	15-7/8	3	1/2	11/16	1-1/2	35-1/8
7	14 x 36	14	36-1/2	19	3	5/8	3/4	1-1/2	35
8	14 x 42	14	42-1/2	19	3	5/8	3/4	1-1/2	41
11	18 x 46	18	46-1/2	25-1/8	4	3/4	13/16	2	44-7/8

NOTES:

1. All dimensions in inches.
2. Dimensions may vary ± 1/4.
3. Not for construction purposes unless certified.
4. NA - Not applicable.
5. Check discharge position, casing dimensions which exceed dimension "D" may require pads for the pump and/or motor.
6. Conduit box is shown in approximate location. Dimensions are not specified as they may vary with each motor manufacturer.

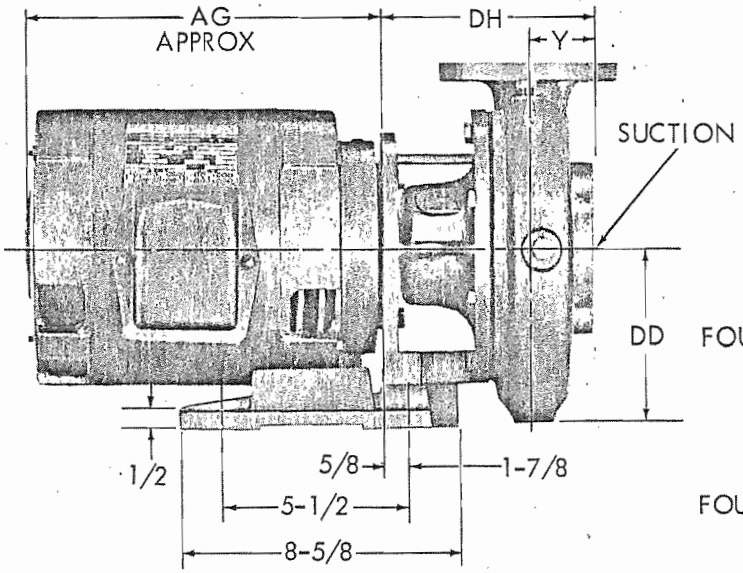
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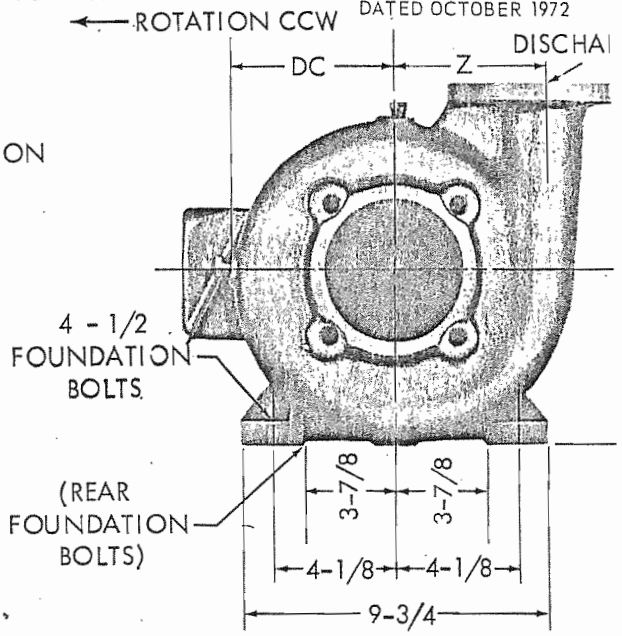
† D Dimension of 5 x 6 x 12 and 6 x 6 x 12 pumps with 254T thru 286TS motor is 9".

PUMP SIZE			X	Y	Z	DC	DD	DH		HL		
DISCH	SUCT	CASE BORE						FRAME 1	FRAME 2 & 3	FRAME 1	FRAME 2	FRAME 3
1-1/4	1-1/2	7	5-1/4	2-7/16	4-3/16	4-15/16	5-3/16	7-3/16	NA	4-3/16	NA	NA
1-1/4	1-1/2	9	6-5/8	2-9/16	5-3/8	6-3/16	6-3/8	7-1/4	NA	4-1/4	NA	NA
1-1/2	2	7	5-3/8	2-1/2	4-5/16	5-1/8	5-3/8	7-5/16	NA	4-5/16	NA	NA
1-1/2	2	9	6-3/4	2-5/8	5-1/2	6-5/16	6-9/16	7-3/8	8-3/8	4-3/8	4-7/8	NA
1-1/2	2	12	7-3/4	2-3/4	7-1/16	8	8-1/4	NA	8-5/8	NA	5-5/8	NA
PUMPS WITH AM. STD. 125 LB. FLANGED CONNECTIONS												
2	2-1/2	7	5-5/8	1-7/8	4-9/16	5-3/8	5-13/16	6-13/16	7-13/16	3-13/16	4-5/16	NA
2	2-1/2	9	7	1-7/8	5-11/16	6-1/2	6-7/8	6-3/4	7-3/4	3-3/4	3-7/8	NA
2	2-1/2	12	8	1-7/8	7-3/16	8-3/16	8-1/2	NA	7-7/8	NA	4-7/8	NA
2-1/2	3	7	5-7/8	2	4-13/16	5-13/16	6-1/4	7-1/16	8-1/16	4-1/16	4-9/16	NA
2-1/2	3	9	7-1/4	2	5-15/16	6-3/4	7-1/4	7	8	4	4-1/2	NA
2-1/2	3	12	8-1/4	2	7-3/8	8-3/8	8-3/4	NA	8-1/8	NA	5-1/8	NA
3	4	9	7-1/2	2-1/8	6-1/8	6-7/8	7-7/16	7-1/4	8-1/4	4-1/4	4-3/4	NA
3	4	12	8-1/2	2-1/8	7-9/16	8-7/16	8-15/16	NA	8-3/8	NA	5-3/8	5-3/8
4	4	7	6-1/2	2-1/2	5-1/2	6-7/16	7-5/16	7-15/16	8-15/16	4-15/16	5-7/16	NA
4	5	9A	7-1/4	3-1/8	5-3/4	6-11/16	7-3/8	NA	9-3/8	NA	5-7/8	5-7/8
4	5	9B	7-3/4	2-5/8	6-5/8	8-1/16	8-11/16	NA	9	NA	5-1/2	NA
4	5	12	8-3/4	2-5/8	7-15/16	8-7/8	9-9/16	NA	9-1/8	NA	6-1/8	6-1/8
5	6	12	9	2-7/8	8-5/16	9-1/4	10-1/8	NA	9-5/8	NA	6-5/8	6-5/8
6	6	9	8-1/4	2-3/4	7	8	9	NA	9-1/4	NA	5-3/4	NA
6	6	12	9-1/4	3-1/8	8-11/16	9-11/16	10-13/16	NA	10-1/8	NA	NA	6-1/8

NOTE: WHEN TWO "D" DIMENSIONS ARE INDICATED ALWAYS USE THE LARGER FIGURE.		POWER FRAME	1	2	3
		WG	10-5/16	13-13/16	13-13/16
D	CASE BORE	7	5-1/4	6-1/4	–
		9 & 12	5-1/4	7	7
MOTOR FRAME	C APPROX.	D	BASE NUMBER		
56	12		4	NA	NA
143T	11		4	NA	NA
145T	12		4	7	NA
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184T	14		4	7	NA
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326TS	26	8	NA	11	11
364T	29	9	NA	11	11

JM MOTOR FRAME
143JM THRU 184JM



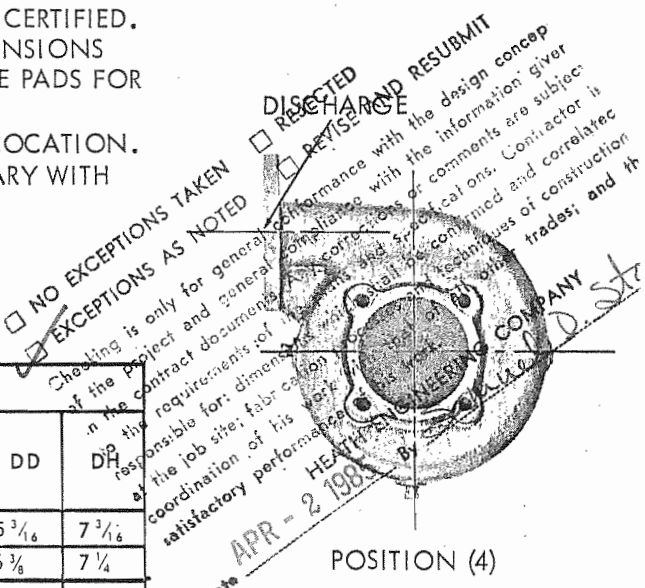


STANDARD POSITION (1)

NOTES

1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. CHECK DISCHARGE POSITION, CASING DIMENSIONS WHICH EXCEED 5-1/4" HEIGHTH MAY REQUIRE PADS FOR THE SUPPORT.
5. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.

* 6-1/4" FOR 9" CASE BORE PUMPS.

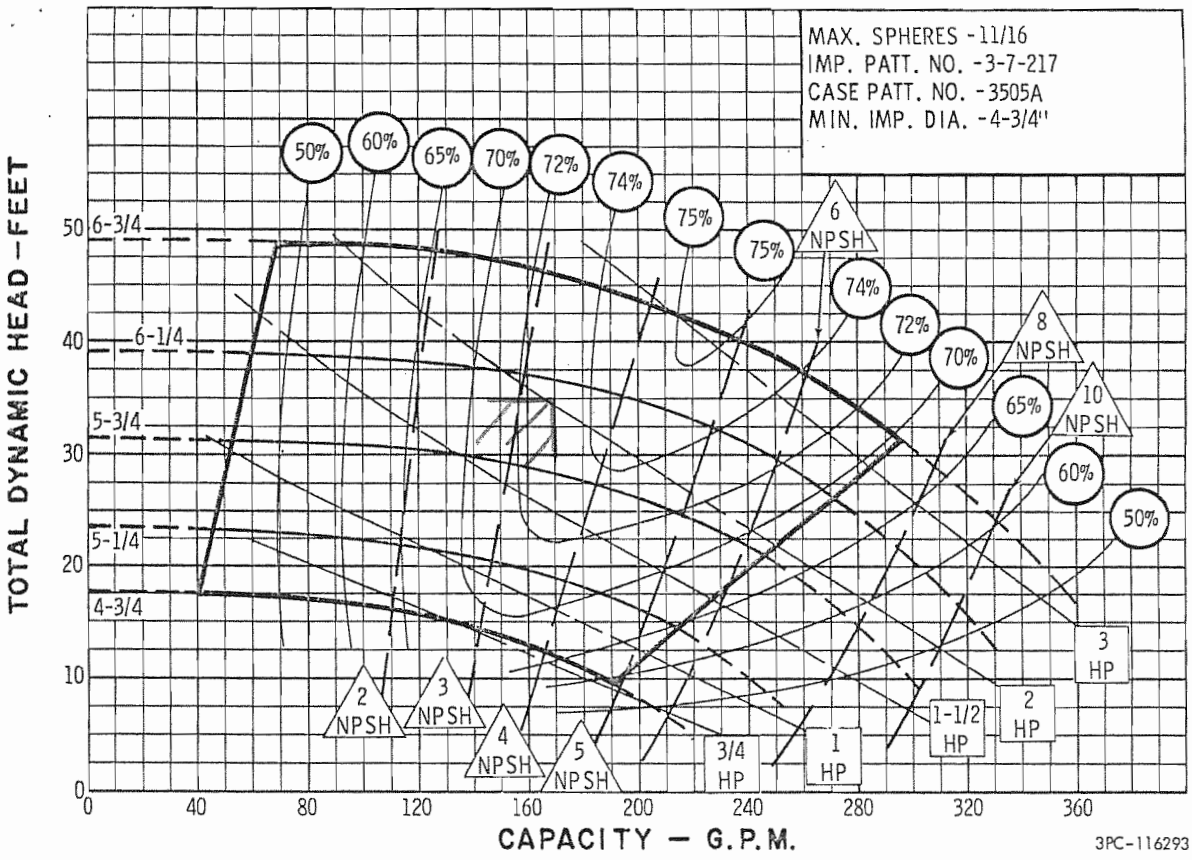


POSITION (4)

PUMPS WITH THREADED CONNECTIONS								
DISCHARGE	SUCTION	CASE BORE	X	Y	Z	DC	DD	DH
1 1/4	1 1/2	7	5 1/4	2 7/16	4 3/16	4 15/16	5 3/16	7 3/16
1 1/4	1 1/2	9	6 5/8	2 9/16	5 3/8	6 3/16	6 3/8	7 1/4
1 1/2	2	7	5 3/8	2 1/2	4 5/16	5 1/8	5 3/8	7 5/16
1 1/2	2	9	6 3/4	2 5/8	5 1/2	6 5/16	6 9/16	7 3/8
PUMPS WITH AM. STD. 125 LB. FLANGED CONNECTIONS								
2	2 1/2	7	5 5/8	1 7/8	4 9/16	5 3/8	5 13/16	6 13/16
2	2 1/2	9	7	1 7/8	5 11/16	6 1/2	6 7/8	6 3/4
2 1/2	3	7	5 7/8	2	4 13/16	5 13/16	6 1/4	7 1/16
2 1/2	3	9	7 1/4	2	5 15/16	6 3/4	7 1/4	7
3	4	9	7 1/2	2 1/8	6 1/8	6 7/8	7 7/16	7 1/4
4	4	7	6 1/2	2 1/2	5 1/2	6 7/16	7 5/16	7 15/16

FRAME	AG
143JM	10
145JM	11
182JM	11
184JM	12

P-1



3PC-116293

1750 R.P.M.

AURORA PUMPS

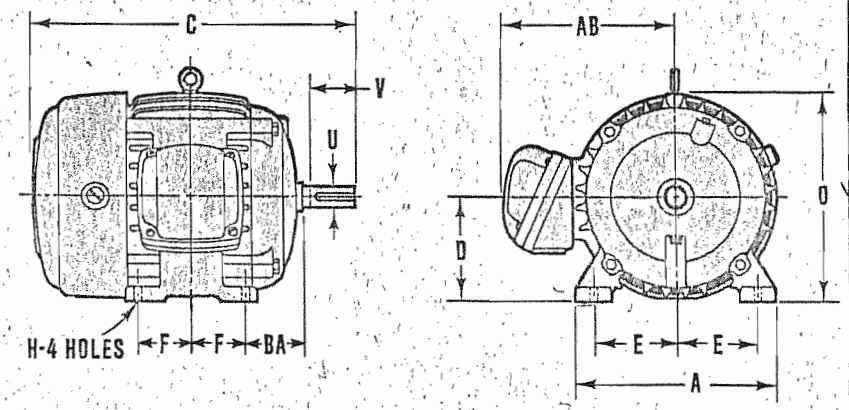
AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD · NORTH AURORA, ILLINOIS · 60542

P-1 3HP 1750 RPM

HORIZONTAL MOTORS

SUPER STANDARD DIMENSIONS

OPEN--TYPES A, D, R -- AIR OVER--TYPE UTN (FRAMES 143T THRU 215T), TN (FRAMES 254T & LARGER)
TOTALLY ENCLOSED FAN COOLED--TYPE UT (FRAMES 143T THRU 215T), T (254T & LARGER)



BASIC FRAME	D	E	H	BA	U	V MIN.	SQ. KEY
140T	3-1/2	2-3/4	11/32	2-1/4	7/8	2	3/16
180T	4-1/2	3-3/4	13/32	2-3/4	1-1/8	2-1/2	1/4
210T	5-1/4	4-1/4	13/32	3-1/2	1-3/8	3-1/8	5/16
250T	6-1/4	5	17/32	4-1/4	1-5/8	3-3/4	3/8
280T	7	5-1/2	17/32	4-3/4	1-7/8	4-3/8	1/2
280TS	7	5-1/2	17/32	4-3/4	1-5/8	3	3/8
320T	8	6-1/4	21/32	5-1/4	2-1/8	5	1/2
320TS	8	6-1/4	21/32	5-1/4	1-7/8	3-1/2	1/2
360T	9	7	21/32	5-7/8	2-3/8	5-5/8	5/8
360TS	9	7	21/32	5-7/8	1-7/8	3-1/2	1/2
400T	10	8	13/16	6-5/8	2-7/8	7	3/4
400TS	10	8	13/16	6-5/8	2-1/8	4	1/2
440T	11	9	13/16	7-1/2	3-3/8	8-1/4	7/8
440TS	11	9	13/16	7-1/2	2-3/8	4-1/2	5/8

ALL DIMENSIONS ARE IN INCHES

	A		C				O		AB	
FRAME	TYPES A, R, D	TYPES UT/UTN T/TN	TYPES A, R, D	TYPES UT/T	TYPES UTN/TN	F	TYPES A, R, D	TYPES UT/T	TYPES UTN/TN	TYPES A, R, D	TYPES UT/T UTN/TN
143T	6-1/2	6-1/2	12-13/16	11-1/2	10-3/16	2	6-23/32	7-9/64	6-3/4	—■	6
145T, B145T	6-1/2	6-1/2	12-13/16	11-1/2▲	10-3/16	2-1/2	6-23/32	7-9/64	6-3/4	—■	6
182T	8-1/2	8-3/8	13-5/8	16-1/8	13-3/4	2-1/4	8-15/16	9-9/32	9	6-5/16	6-29/32
184T	8-1/2	8-3/8	13-5/8	16-1/8	13-3/4	2-3/4	8-15/16	9-9/32	9	6-5/16	6-29/32
213T	9-5/8	9-1/2	15-1/2	18-5/8	15-7/8	2-3/4	10-7/16	10-7/8	10-9/16	7-9/16	8-1/8
215T	9-5/8	9-1/2	17	20-1/8	17-3/8	3-1/2	10-7/16	10-7/8	10-9/16	7-9/16	8-1/8
254T	11-3/8	11-3/8	20-5/16	23-3/4	20-5/16	4-1/8	12-7/16	12-15/16	12-11/16	8-15/16	8-15/16
256T	11-3/8	11-3/8	22-1/16	25-1/2	22-1/16	5	12-7/16	12-15/16	12-11/16	8-15/16	8-15/16
284T (AL)	12-3/8	12-3/8	22-11/16	27-11/16	—	4-3/4	13-13/32	13-13/32	—	9-1/8	9-1/8
284TS (AL)	12-3/8	12-3/8	—	26-5/16	—	4-3/4	13-13/32	13-13/32	—	9-1/8	9-1/8
286T (AL)	12-3/8	12-3/8	23-3/16	29-3/16	—	5-1/2	13-13/32	13-13/32	—	9-1/8	9-1/8
286TS (AL)	12-3/8	12-3/8	—	27-13/16	—	5-1/2	13-13/32	13-13/32	—	9-1/8	9-1/8
284T (CI)	14	13-3/4	23-3/8	26-1/8	—	4-3/4	13-7/8	14-3/16	—	11-9/16	11-7/8
284TS (CI)	14	13-3/4	22	24-3/4	—	4-3/4	13-7/8	14-3/16	—	11-9/16	11-7/8
286T (CI)	14	13-3/4	24-7/8	27-5/8	—	5-1/2	13-7/8	14-3/16	—	11-9/16	11-7/8
286TS (CI)	14	13-3/4	23-1/2	26-1/4	—	5-1/2	13-7/8	14-3/16	—	11-9/16	11-7/8
324T	16	15-3/4	25-15/16	29-11/16	—	5-1/4	15-15/16	16-3/16	—	13-5/8	14-1/16
324TS	16	15-3/4	24-7/16	28-3/16	—	5-1/4	15-15/16	16-3/16	—	13-5/8	14-1/16
326T	16	15-3/4	27-7/16	31-3/16	—	6	15-15/16	16-3/16	—	13-5/8	14-1/16
326TS	16	15-3/4	25-15/16	29-11/16	—	6	15-15/16	16-3/16	—	13-5/8	14-1/16
364T	18	17-3/4	28-11/16	32-1/8	—	5-5/8	17-3/4	18-1/8	—	15-5/8	15-11/16
364TS	18	17-3/4	26-9/16	30	—	5-5/8	17-3/4	18-1/8	—	15-5/8	15-11/16
365T	18	17-3/4	29-11/16	33-1/8	—	6-1/8	17-3/4	18-1/8	—	15-5/8	15-11/16
365TS	18	17-3/4	27-9/16	31	—	6-1/8	17-3/4	18-1/8	—	15-5/8	15-11/16
404T	20	19-3/4	32-9/16	36-1/2	—	6-1/8	18-3/4	20-1/2	—	15-5/8	17-1/8
404TS	20	19-3/4	29-9/16	—	—	6-1/8	18-3/4	—	—	15-5/8	—
405T	20	19-3/4	34-1/16	38	—	6-7/8	18-3/4	20-1/2	—	15-5/8	17-1/8
405TS	20	19-3/4	31-1/16	35	—	6-7/8	18-3/4	20-1/2	—	15-5/8	17-1/8
444T	22	22	37-3/4	44-1/16	—	7-1/4	22	22-3/4	—	22-3/16	18-1/2
444TS	22	22	34	40-5/16	—	7-1/4	22	22-3/4	—	22-3/16	18-1/2
445T	22	22	39-3/4	46-1/16	—	8-1/4	22	22-3/4	—	22-3/16	18-1/2
445TS	22	22	36	42-5/16	—	8-1/4	22	22-3/4	—	22-3/16	18-1/2
447T	22	22	43-1/4	49-9/16	—	10	22	22-3/4	—	22-3/16	18-1/2
447TS	22	22	39-1/2	45-13/16	—	10	22	22-3/4	—	22-3/16	18-1/2
449T	22	22	48-1/4	54-5/8	—	12-1/2	22	23-3/8	—	22-3/16	19-3/16
449TS	—	22	—	50-7/8	—	12-1/2	—	23-3/8	—	—	19-3/16

AL: Aluminum frame; CI: cast iron frame.

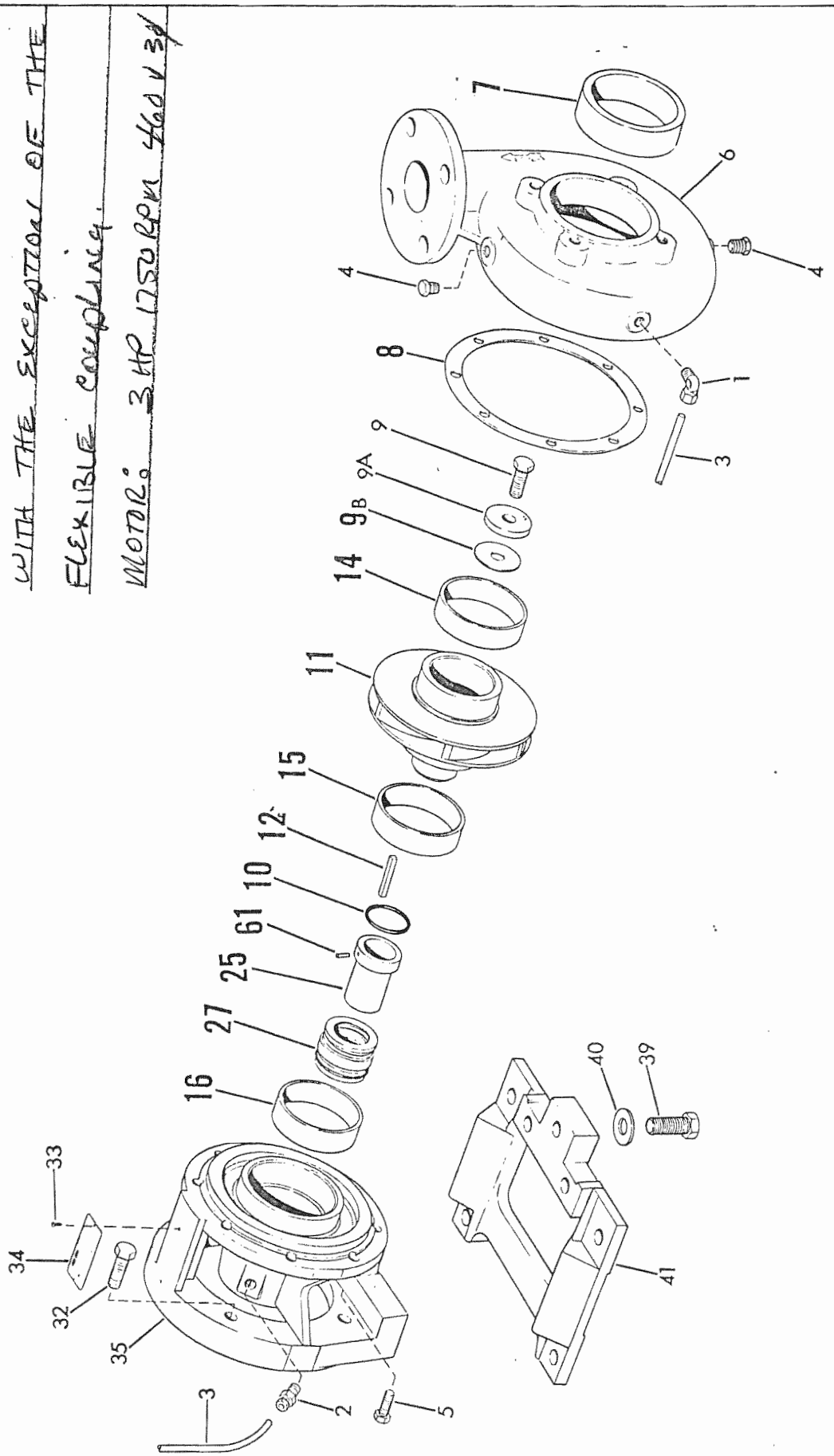
▲Frame B145T :12-3/4

■ Not applicable, since 143T and 145T type "D" motors do not have an external conduit box.

AURORA # 341 2 1/2 x 3 x 7B

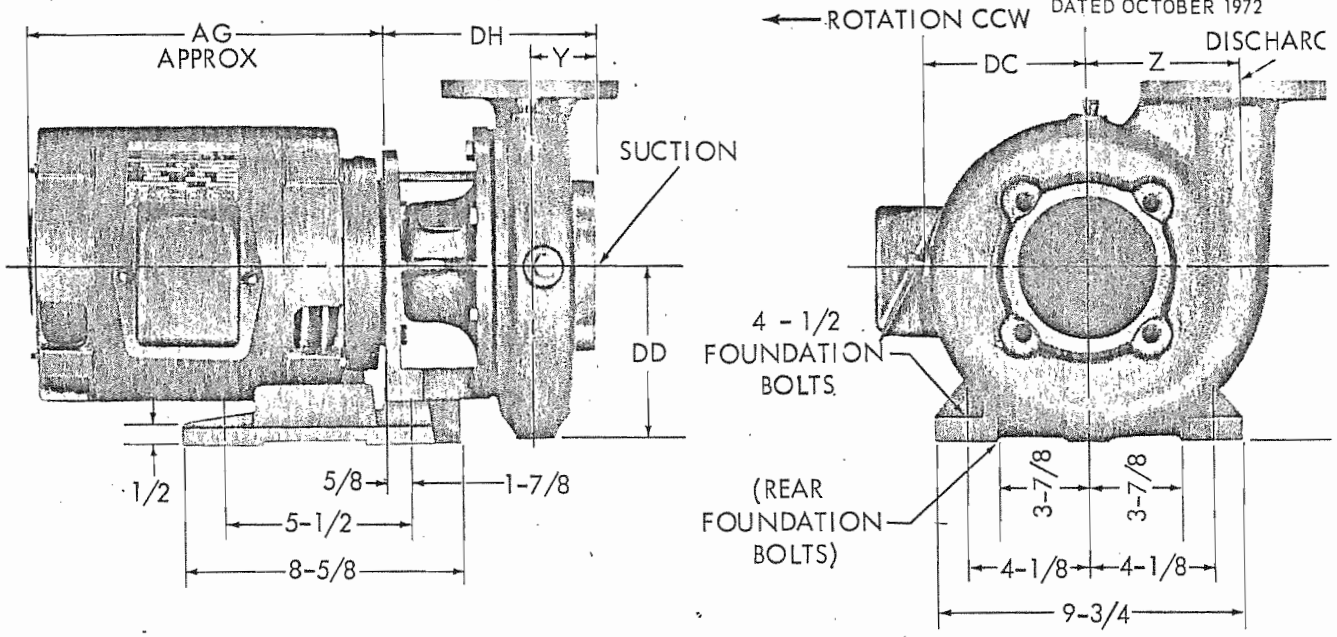
DISCRIPTION: P-1 BOOSTER MEETS SYSTEM SPECIFICATION WITH THE EXCEPTION OF THE FLEXIBLE COUPLING.

MOTOR: 3 HP 1750 RPM 460 V 3Ø



JM MOTOR FRAME
143JM THRU 184JM

DATED MARCH 1975
SUPERSEDES PAGE 201
DATED OCTOBER 1972

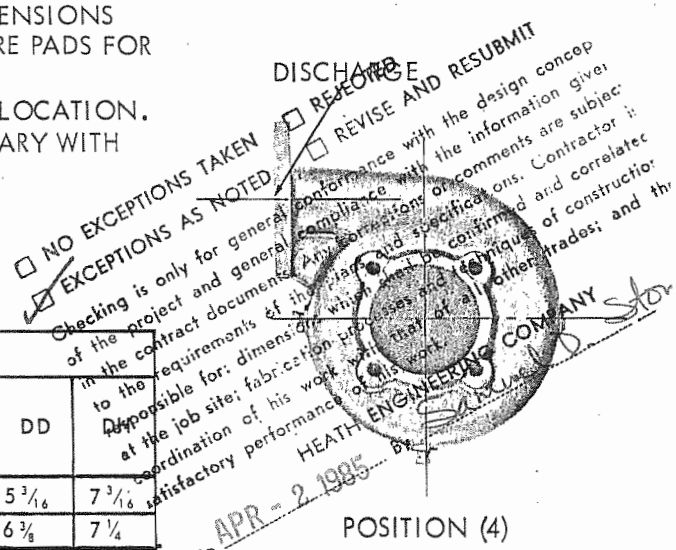


STANDARD POSITION (1)

NOTES

1. ALL DIMENSIONS IN INCHES.
2. DIMENSIONS MAY VARY ± 1/4.
3. NOT FOR CONSTRUCTION PURPOSES UNLESS CERTIFIED.
4. CHECK DISCHARGE POSITION, CASING DIMENSIONS WHICH EXCEED 5-1/4" HEIGHTH MAY REQUIRE PADS FOR THE SUPPORT.
5. CONDUIT BOX IS SHOWN IN APPROXIMATE LOCATION. DIMENSIONS ARE NOT SPECIFIED AS THEY VARY WITH EACH MOTOR MANUFACTURER.

* 6-1/4" FOR 9" CASE BORE PUMPS.



POSITION (4)

PUMPS WITH THREADED CONNECTIONS								
DISCHARGE	SUCTION	CASE BORE	X	Y	Z	DC	DD	
1 1/4	1 1/2	7	5 1/4	2 7/16	4 3/16	4 15/16	5 3/16	7 3/16
1 1/4	1 1/2	9	6 3/8	2 9/16	5 3/8	6 3/16	6 3/8	7 1/4
1 1/2	2	7	5 3/8	2 1/2	4 5/16	5 1/8	5 3/8	7 5/16
1 1/2	2	9	6 3/4	2 5/8	5 1/2	6 5/16	6 9/16	7 3/8
PUMPS WITH AM. STD. 125 LB. FLANGED CONNECTIONS								
2	2 1/2	7	5 5/8	1 7/8	4 9/16	5 3/8	5 13/16	6 13/16
2	2 1/2	9	7	1 7/8	5 11/16	6 1/2	6 7/8	6 3/4
2 1/2	3	7	5 7/8	2	4 13/16	5 13/16	6 1/4	7 1/16
2 1/2	3	9	7 1/4	2	5 15/16	6 3/4	7 1/4	7
3	4	9	7 1/2	2 1/8	6 1/8	6 7/8	7 7/16	7 1/4
4	4	7	6 1/2	2 1/2	5 1/2	6 7/16	7 5/16	7 15/16

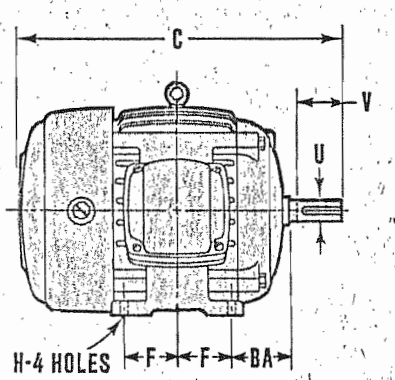
FRAME	AG
143JM	10
145JM	11
182JM	11
184JM	12

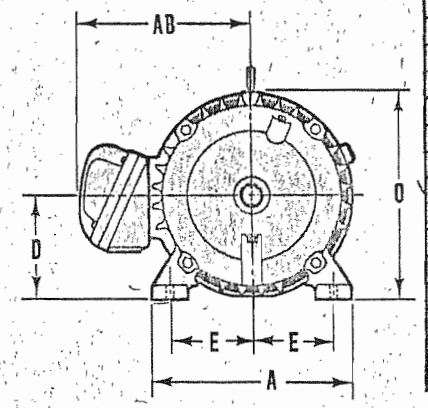
P-2

HORIZONTAL MOTORS

SUPER STANDARD DIMENSIONS

OPEN--TYPES A, D, R -- AIR OVER--TYPE UTN (FRAMES 143T THRU 215T), TN (FRAMES 254T & LARGER)
TOTALLY ENCLOSED FAN COOLED--TYPE UT (FRAMES 143T THRU 215T), T (254T & LARGER)





BASIC FRAME	D	E	H	BA	U	V MIN.	SQ. KEY
140T	3-1/2	2-3/4	11/32	2-1/4	7/8	2	3/16
180T	4-1/2	3-3/4	13/32	2-3/4	1-1/8	2-1/2	1/4
210T	5-1/4	4-1/4	13/32	3-1/2	1-3/8	3-1/8	5/16
250T	6-1/4	5	17/32	4-1/4	1-5/8	3-3/4	3/8
280T	7	5-1/2	17/32	4-3/4	1-7/8	4-3/8	1/2
280TS	7	5-1/2	17/32	4-3/4	1-5/8	3	3/8
320T	8	6-1/4	21/32	5-1/4	2-1/8	5	1/2
320TS	8	6-1/4	21/32	5-1/4	1-7/8	3-1/2	1/2
360T	9	7	21/32	5-7/8	2-3/8	5-5/8	5/8
360TS	9	7	21/32	5-7/8	1-7/8	3-1/2	1/2
400T	10	8	13/16	6-5/8	2-7/8	7	3/4
400TS	10	8	13/16	6-5/8	2-1/8	4	1/2
440T	11	9	13/16	7-1/2	3-3/8	8-1/4	7/8
440TS	11	9	13/16	7-1/2	2-3/8	4-1/2	5/8

ALL DIMENSIONS ARE IN INCHES

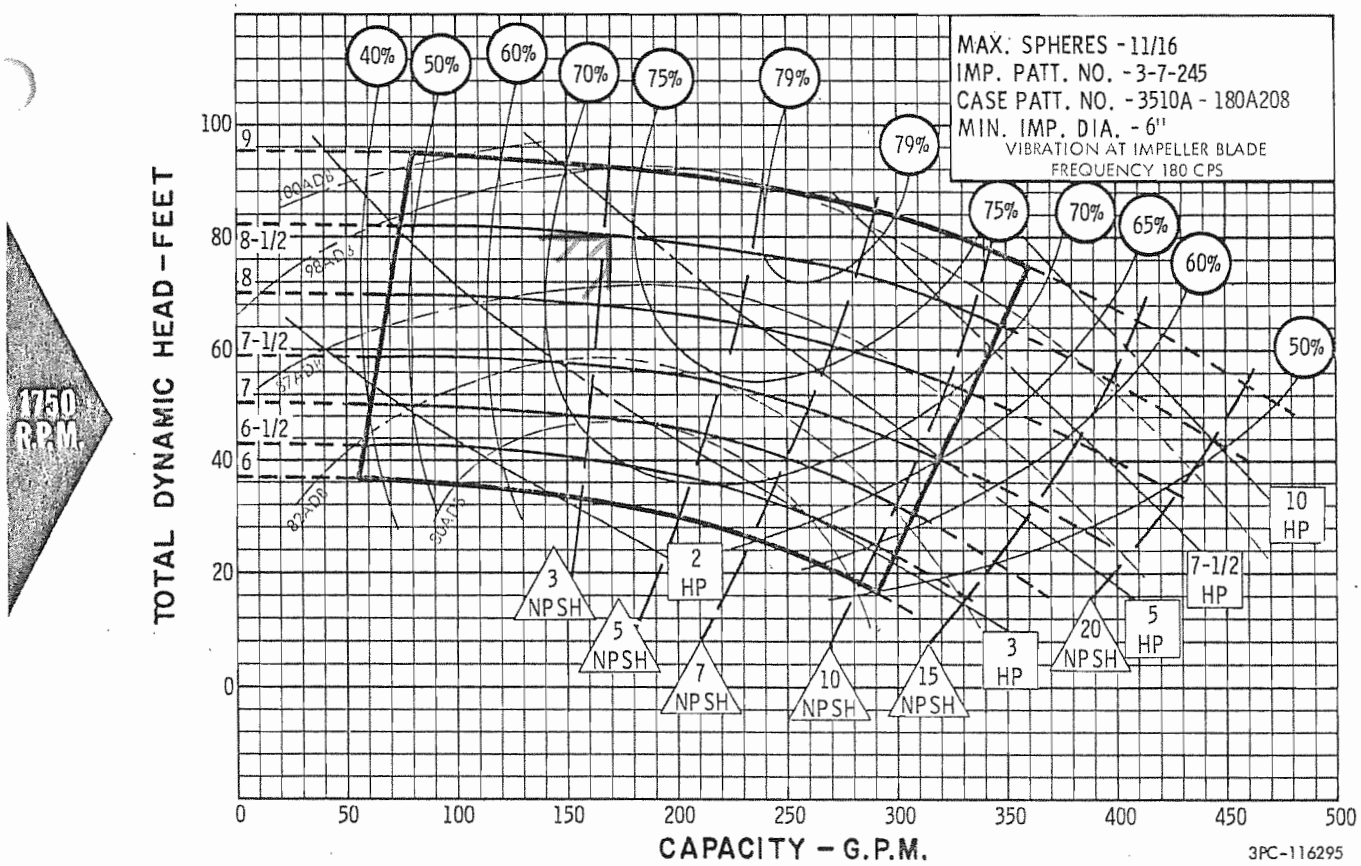
	A		C				O		AB	
FRAME	TYPES A, R, D	TYPES UT/UTN T/TN	TYPES A, R, D	TYPES UT/T	TYPES UTN/TN	F	TYPES A, R, D	TYPES UT/T	TYPES UTN/TN	TYPES A, R, D	TYPES UT/T UTN/TN
143T	6-1/2	6-1/2	12-13/16	11-1/2	10-3/16	2	6-23/32	7-9/64	6-3/4	— ■	6
145T, B145T	6-1/2	6-1/2	12-13/16	11-1/2▲	10-3/16	2-1/2	6-23/32	7-9/64	6-3/4	— ■	6
182T	8-1/2	8-3/8	13-5/8	16-1/8	13-3/4	2-1/4	8-15/16	9-9/32	9	6-5/16	6-29/32
184T	8-1/2	8-3/8	13-5/8	16-1/8	13-3/4	2-3/4	8-15/16	9-9/32	9	6-5/16	6-29/32
213T	9-5/8	9-1/2	15-1/2	18-5/8	15-7/8	2-3/4	10-7/16	10-7/8	10-9/16	7-9/16	8-1/8
215T	9-5/8	9-1/2	17	20-1/8	17-3/8	3-1/2	10-7/16	10-7/8	10-9/16	7-9/16	8-1/8
254T	11-3/8	11-3/8	20-5/16	23-3/4	20-5/16	4-1/8	12-7/16	12-15/16	12-11/16	8-15/16	8-15/16
256T	11-3/8	11-3/8	22-1/16	25-1/2	22-1/16	5	12-7/16	12-15/16	12-11/16	8-15/16	8-15/16
284T (AL)	12-3/8	12-3/8	22-11/16	27-11/16	—	4-3/4	13-13/32	13-13/32	—	9-1/8	9-1/8
284TS (AL)	12-3/8	12-3/8	—	26-5/16	—	4-3/4	13-13/32	13-13/32	—	9-1/8	9-1/8
286T (AL)	12-3/8	12-3/8	23-3/16	29-3/16	—	5-1/2	13-13/32	13-13/32	—	9-1/8	9-1/8
286TS (AL)	12-3/8	12-3/8	—	27-13/16	—	5-1/2	13-13/32	13-13/32	—	9-1/8	9-1/8
284T (CI)	14	13-3/4	23-3/8	26-1/8	—	4-3/4	13-7/8	14-3/16	—	11-9/16	11-7/8
284TS (CI)	14	13-3/4	22	24-3/4	—	4-3/4	13-7/8	14-3/16	—	11-9/16	11-7/8
286T (CI)	14	13-3/4	24-7/8	27-5/8	—	5-1/2	13-7/8	14-3/16	—	11-9/16	11-7/8
286TS (CI)	14	13-3/4	23-1/2	26-1/4	—	5-1/2	13-7/8	14-3/16	—	11-9/16	11-7/8
324T	16	15-3/4	25-15/16	29-11/16	—	5-1/4	15-15/16	16-3/16	—	13-5/8	14-1/16
324TS	16	15-3/4	24-7/16	28-3/16	—	5-1/4	15-15/16	16-3/16	—	13-5/8	14-1/16
326T	16	15-3/4	27-7/16	31-3/16	—	6	15-15/16	16-3/16	—	13-5/8	14-1/16
326TS	16	15-3/4	25-15/16	29-11/16	—	6	15-15/16	16-3/16	—	13-5/8	14-1/16
364T	18	17-3/4	28-11/16	32-1/8	—	5-5/8	17-3/4	18-1/8	—	15-5/8	15-11/16
364TS	18	17-3/4	26-9/16	30	—	5-5/8	17-3/4	18-1/8	—	15-5/8	15-11/16
365T	18	17-3/4	29-11/16	33-1/8	—	6-1/8	17-3/4	18-1/8	—	15-5/8	15-11/16
365TS	18	17-3/4	27-9/16	31	—	6-1/8	17-3/4	18-1/8	—	15-5/8	15-11/16
404T	20	19-3/4	32-9/16	36-1/2	—	6-1/8	18-3/4	20-1/2	—	15-5/8	17-1/8
404TS	20	19-3/4	29-9/16	—	—	6-1/8	18-3/4	—	—	15-5/8	—
405T	20	19-3/4	34-1/16	38	—	6-7/8	18-3/4	20-1/2	—	15-5/8	17-1/8
405TS	20	19-3/4	31-1/16	35	—	6-7/8	18-3/4	20-1/2	—	15-5/8	17-1/8
444T	22	22	37-3/4	44-1/16	—	7-1/4	22	22-3/4	—	22-3/16	18-1/2
444TS	22	22	34	40-5/16	—	7-1/4	22	22-3/4	—	22-3/16	18-1/2
445T	22	22	39-3/4	46-1/16	—	8-1/4	22	22-3/4	—	22-3/16	18-1/2
445TS	22	22	36	42-5/16	—	8-1/4	22	22-3/4	—	22-3/16	18-1/2
447T	22	22	43-1/4	49-9/16	—	10	22	22-3/4	—	22-3/16	18-1/2
447TS	22	22	39-1/2	45-13/16	—	10	22	22-3/4	—	22-3/16	18-1/2
449T	22	22	48-1/4	54-5/8	—	12-1/2	22	23-3/8	—	22-3/16	19-3/16
449TS	—	22	—	50-7/8	—	12-1/2	—	23-3/8	—	—	19-3/16

AL: Aluminum frame; CI: cast iron frame.

▲Frame B145T :12-3/4

■ Not applicable, since 143T and 145T type "D" motors do not have an external conduit box.

2-1/2 x 3 x 9 SERIES 340 OR 360
ENCLOSED IMPELLER

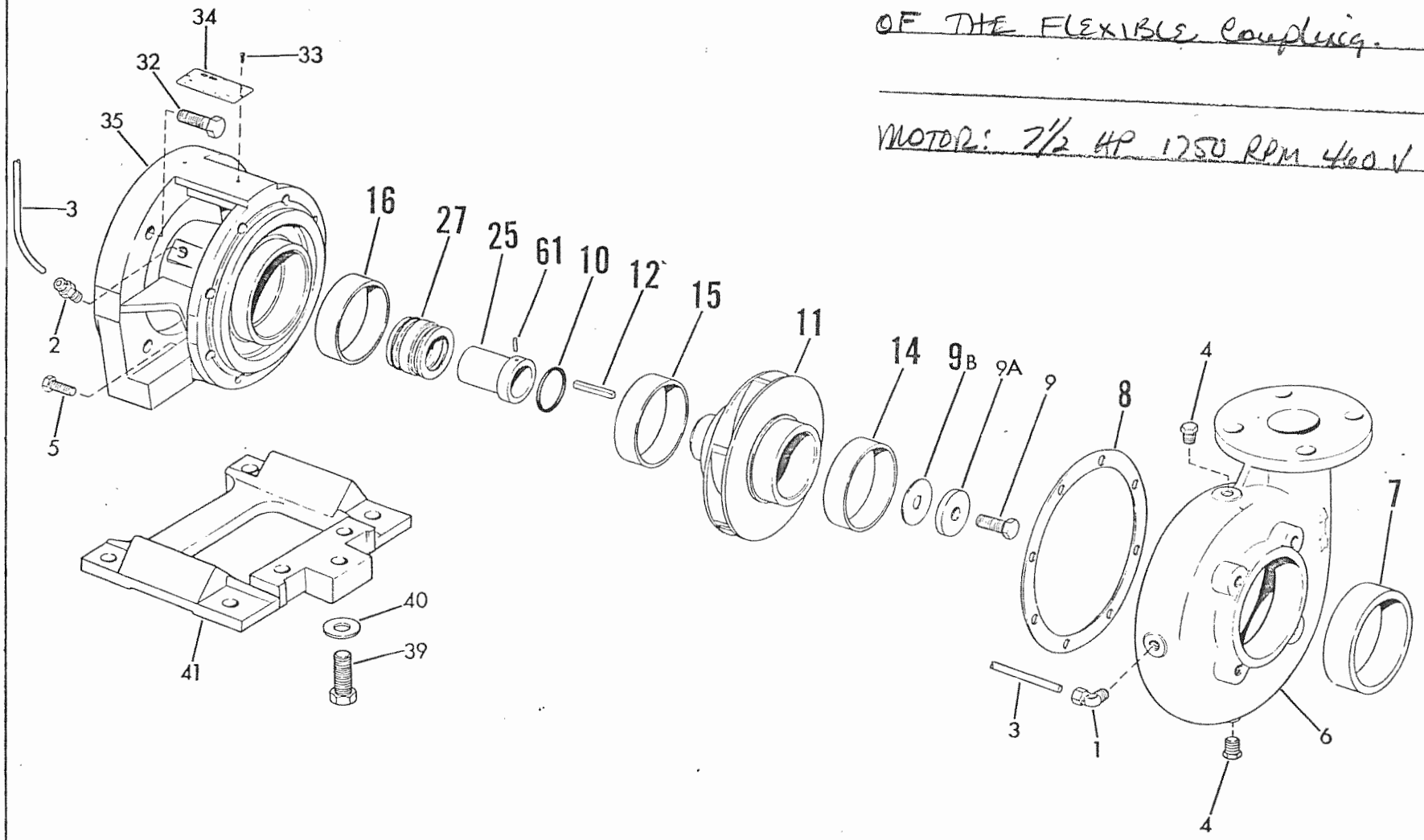


AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD · NORTH AURORA, ILLINOIS · 60542

AURORA # ~~341~~ 547 2½ x 3 x 9

DISCRIPTION: P-2 BOOSTERS MEETS SYSTEM SPECIFICATIONS WITH EXCEPTION OF THE FLEXIBLE COUPLING.

MOTOR: 7½ HP 1750 RPM 460 V 3φ



MODEL 341

P-1,2

SECTION 6 ITEM 344
DATED FEBRUARY 1969

AURORA® PUMPS

INSTRUCTION MANUAL
REPAIR
MODEL 344

6

SERVICE

Your Aurora pump requires no maintenance other than periodic inspection, occasional cleaning and lubrication of bearings. The intent of inspection is to prevent breakdown, thus obtaining optimum service life. The liquid end of the pump is lubricated by the fluid being pumped and therefore does not require periodic lubrication. The motor, however may require lubrication, in which case, the motor manufacturer's recommendation should be followed.

LUBRICATION OF IMPELLER SHAFT BEARINGS

The MODEL 344 pump is available with two options for lubricating the shaft bearings. They are:

1. Regreasable (standard)
2. Oil Lubrication

Regreasable bearings will require periodic lubrication and can be accomplished by using the zerk or lubrication fittings in the cartridge cap and power frame. Lubricate the bearings at regular intervals using a grease of high quality. Lime, lithium, lithium soda or calcium base grease is recommended as lubricants for pumps operating in both wet and dry locations. Mixing of different brands of grease should be avoided due to possible chemical reactions between the brands which could damage the bearings. Accordingly, avoid grease of vegetable or animal base which can develop acids, as well as grease containing rosin, graphite, talc and other impurities. Under no circumstances should used grease be reused.

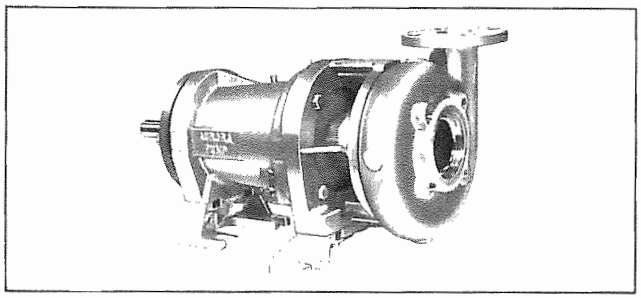
Over lubrication should be avoided as it may result in overheating and possible bearing failure. Under normal application, adequate lubrication is assured if the amount of grease is maintained at 1/3 to 1/2 the capacity of the bearing and adjacent space surrounding it.

In dry locations, each bearing will need lubrication at least every 600 hours of running time or every 6 to 12 months, whichever is more frequent. In wet locations the bearings should be lubricated at least after every 300 hours of running time or every 4 to 6 months, whichever is more frequent. A unit is considered to be installed in a wet location if the pump and motor are exposed to dripping water, to the weather, or to heavy condensation such as is found in unheated and poorly ventilated underground locations.

Oil lubricated bearings are optional on MODEL 344 pumps. A fixed oil level is maintained with the power frame by an oiler which allows visual indications of reserve oil.

At initial installation and before starting a unit that has been shut down for repairs or for any extended length of time, run enough 10/20 weight motor oil through the oiler to maintain a constant oil level to insure that the bearing will never be without an oil supply. Oil will have to be added at intervals to maintain a constant level in the oiler. This interval can only be determined by experience.

Under working conditions, oil will breakdown and need to be replaced at regular intervals. The length of these intervals will depend on many factors. Under normal operation, in clean and dry locations, the oil should be changed about once a year. However, when the pump is exposed to dirt contamination, high temperatures (200° F. or above) or a wet location, the oil may have to be changed every 2 or 3 months.



A. Assembled Unit

At times it may be necessary to clean the bearings due to accumulated dirt or deteriorated lubricants. This can be accomplished by flushing the bearing with a light oil heated to 180 to 200° F. while rotating it on a spindle. Wipe the bearing housing with a clean rag soaked in a cleaning solvent, and flush all surfaces.

Dry bearing thoroughly before relubricating. Compressed air can be used to speed drying, but care should be taken not to let bearings rotate while being dried.

CAUTION

Use normal fire caution procedures when using any petroleum cleaner.

The motor which drives your Aurora pump may or may not require lubrication. Consult the manufacturer's recommendations for proper maintenance instructions.

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NO. AURORA, ILLINOIS

REPAIRS

The pump may be disassembled using the illustrations and text provided. Although complete disassembly is covered, it will seldom be necessary to completely disassemble your Aurora pump.

The illustrations accompanying the disassembly instructions show the pump at various stages of disassembly. The illustrations are intended to aid in the correct identification of the parts mentioned in the text.

Inspect removed parts at disassembly to determine their reusability. Cracked castings should never be reused. Gaskets should be replaced at reassembly simply as a matter of economy; they are much less expensive to replace routinely than to replace as the need occurs. In general it is economical to return to the manufacturer for repair only the motor and motor controller.

DISASSEMBLY

Disassemble only what is needed to make repairs or accomplish inspection. (See Figure 2.)

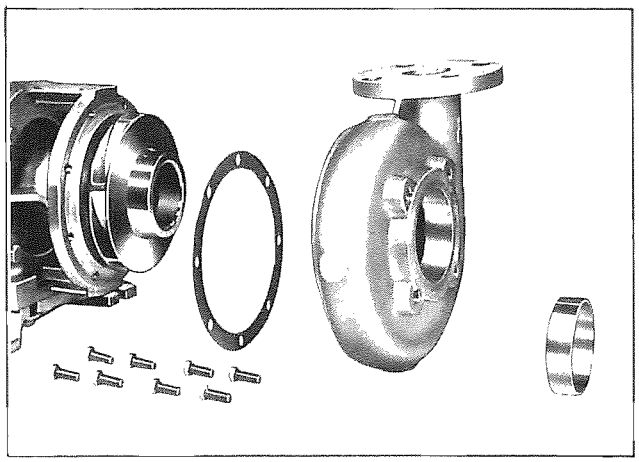
1. Break electrical connections to prevent drive unit from being energized during disassembly.

2. Unscrew the two drain plugs (4) from the casing (6).

3. Remove all relief, cooling, flushing or drain lines from the pump, including compression connections (1 and 2) and tubing (3). Break suction and discharge piping.

4. Remove the flexible coupling from between the pump and motor. Next unscrew the bolts that hold support(s) (41 & 64) to the base and slide the pump out to be worked on.

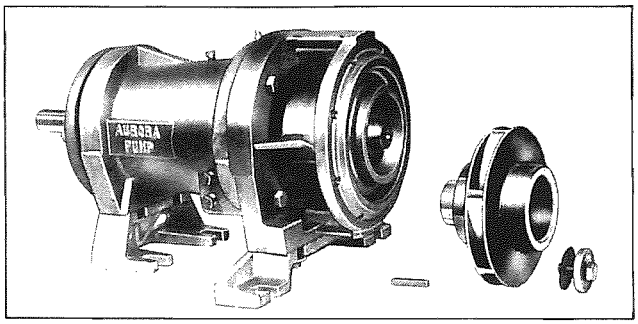
5. Remove capscrews (5) and pull casing (6) from bracket (35). Remove gasket (8).



B. Casing, Gasket, and Wearing Ring Removed

6. Unscrew impeller screw (9) and remove washer (9A), taking care not to damage gasket (9B).

7. Slide impeller (11) and impeller key (12) from the shaft, again taking care not to damage gasket (10) located behind impeller. Remove gasket (10).

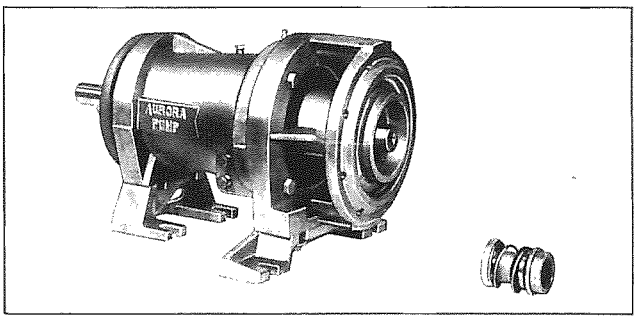


C. Impeller and Key Removed

8. Wearing ring(s) (7 & 16) are pressed into their housings with an interference fit and must be removed with a puller. New ring(s) should be used for reassembly since it is likely that during removal this fit will be lost.

9. Impeller wearing rings (optional - 14 and 15) are pressed on and must be cut off if replacement is necessary. If they are turned off in a lathe, take care not to cut into the impeller.

10. Slide sleeve (25) with rotating parts of mechanical seal (27) from the shaft. The sleeve should be carefully cleaned to remove any residue that may be remaining in the seal area. The rubber in seal (27) may have become partially adhered to the sleeve. The sleeve must also be checked for abrasion or corrosion that can occur when fluid residue penetrates between the seal (27) and sleeve (25). The sleeve under the seal may be polished lightly to a 32 RMS finish before reassembly. Do not reuse a pitted sleeve.

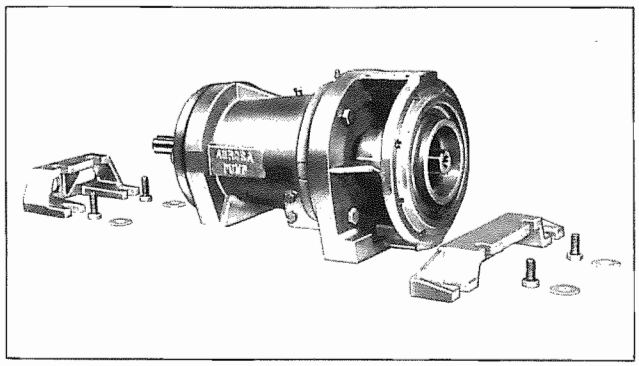


D. Mechanical Seal Removed

CAUTION

The mechanical seal is a precision product and must be treated as such. During removal great care must be taken to avoid dropping any part of the seal. Take particular care not to scratch the lapped faces on the washer or the sealing seat. Do not put a seal back into service until the sealing faces of the washer and seat have been lapped or replaced. (SEE FIGURE 1.)

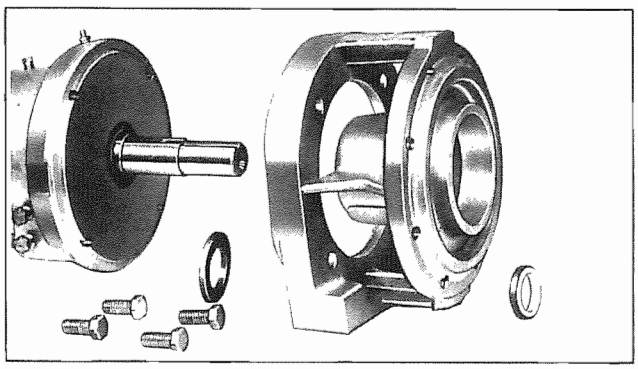
11. Remove capscrews (39 and 62) and washers (40 and 63) to take off support feet (41 and 64).



E. Support Feet Removed

12. Unscrew capscrews (32) to remove bracket (35) from frame (57).

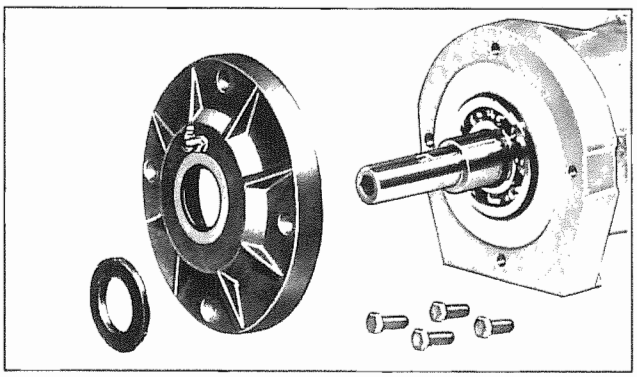
13. The seal flexible cup and stationary seat should be pressed out of the bracket (35) and the cavity cleaned of all residue. Make sure that the 1/32 inch radius in the seal seat cavity is not damaged during disassembly since a sharp edge can easily cut the flexible cup during reassembly.



F. Bracket and Slinger Seal Flexible Cup and Stationary Seat Removed

14. Remove key (42) from the shaft and remove slingers (47).

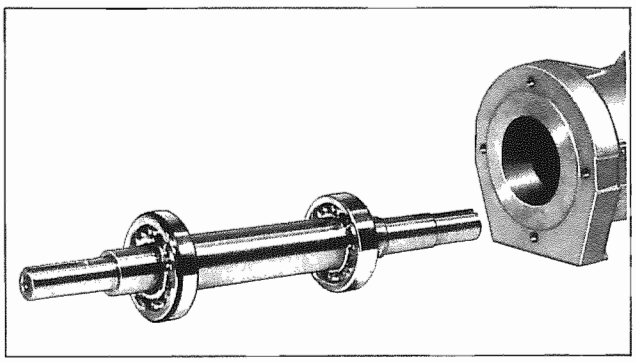
15. Unscrew capscrews (48) and remove bearing cap (49). Remove gasket (50) and retainer ring (52).



G. Bearing Cap and Slinger Removed

16. Slide out shaft (55) and bearings (53 and 54). Since bearings (53 and 54) are press fitted on the shaft, they will have to be pulled or pressed off the shaft. Remove grease seals (51) from frame (57), and bearing cap (49).

17. Remove nameplate (34) and screws (33) only if replacement is needed.



H. Shaft Assembly Removed

REASSEMBLY

Reassembly will generally be in reverse order of disassembly.

1. Press grease seals (51) into frame (57).

2. Press bearings (53 and 54) onto shaft (55). Snap retainer ring (52) into place.

3. Slide shaft (55) and bearings (53 and 54) into frame (57) and place gasket (50) in place.

4. Fasten bearing cap (49) in position with capscrews (48). Insert grease seals (51) and position slingers (47) on the shaft.

5. The mechanical seal (27) (see Figure 1) cannot be installed as an assembly. It is necessary to have the seal seat properly in place before the balance of parts can be added.

Thoroughly inspect the seal cavity in the bracket for burrs or nicks which could damage the seat of the seal. Apply a film of soap paste or flax soap (do not use oil or grease) to the seal seat and install, taking care to seat it evenly and squarely.

NOTE

If it is not possible to insert seat with fingers, place the cardboard protecting ring furnished with seal over lapped face of seat and press into place with a piece of tubing having end cut square. Tubing should be slightly larger than the diameter of the shaft. Remove cardboard after seat is firmly seated.

6. Mount bracket (35) by screwing capscrews (32) evenly into frame (57) to assure proper alignment. Turn all capscrews in an even amount. Fasten the bracket and frame to supports (41 and 64) by placing washers (40 and 63) over capscrews (39 and 62) and screwing them into position.

7. If nameplate (34) was removed, install and attach with screws (33).

8. Wipe the sealing faces of the seat and seal washer clean. Oil these surfaces with a clean light oil. Lightly oil the shaft sleeve (25). Slide the entire rotating assembly onto the sleeve. The shaft sleeve with the seal rotating assembly on it may now be replaced onto the motor shaft. Spring tension will probably prevent the sleeve from remaining in position axially until the impeller is locked against it.

9. Press wearing ring(s) (7 & 16) in casing (6) and bracket (35). Rings should not be hammered into place. Use a press, or clamp the parts in a bench vise, using wooden blocks to protect the rings. It may be necessary to pin or dowel the rings after assembly if the insert or casing has had rings replaced before, since each reassembly can stretch or tear metal and thereby loosen the fits. If the facilities are available, it is good practice to take a very light finish cut or to ream the inside diameter of the casing rings after pressing to restore roundness. When rings are pressed, they may get squeezed out of shape.

10. Replace wear ring(s) (optional - 14 and 15) on impeller, using the same care as for the case wear ring(s). If the rings are to be trued on a lathe, do not clamp the impeller so tightly that it is permanently distorted.

11. Carefully place gasket (10) on motor end of impeller. Assemble key (12) and impeller (11) to motor shaft. Secure impeller with gasket (9B), washer (9A), and impeller screw (9).

12. Install the two pipe plugs (4) in the pump casing. Position the gasket (8) and casing (6) against the motor bracket and secure with screws (5).

13. Replace all relief, cooling, flushings, or drain lines from the pump including compression connections (1 and 2) and tubing (3). Connect discharge piping and suction piping, if required. Make sure to install gaskets on the flanged connections.

14. Read carefully the section of the manual titled INSTALLATION, especially those paragraphs referring to pump and coupling alignment.

15. Connect electricity to the motor.

STARTING PUMP AFTER REASSEMBLY

Do not start pump until all air and vapor has been bled and until making sure that there is liquid in the pump to provide the necessary lubrication. Without the fluid around it, the seal may be ruined in a few seconds of operation. It is possible that the mechanical seal may drip during the first few minutes to one hour of operation.

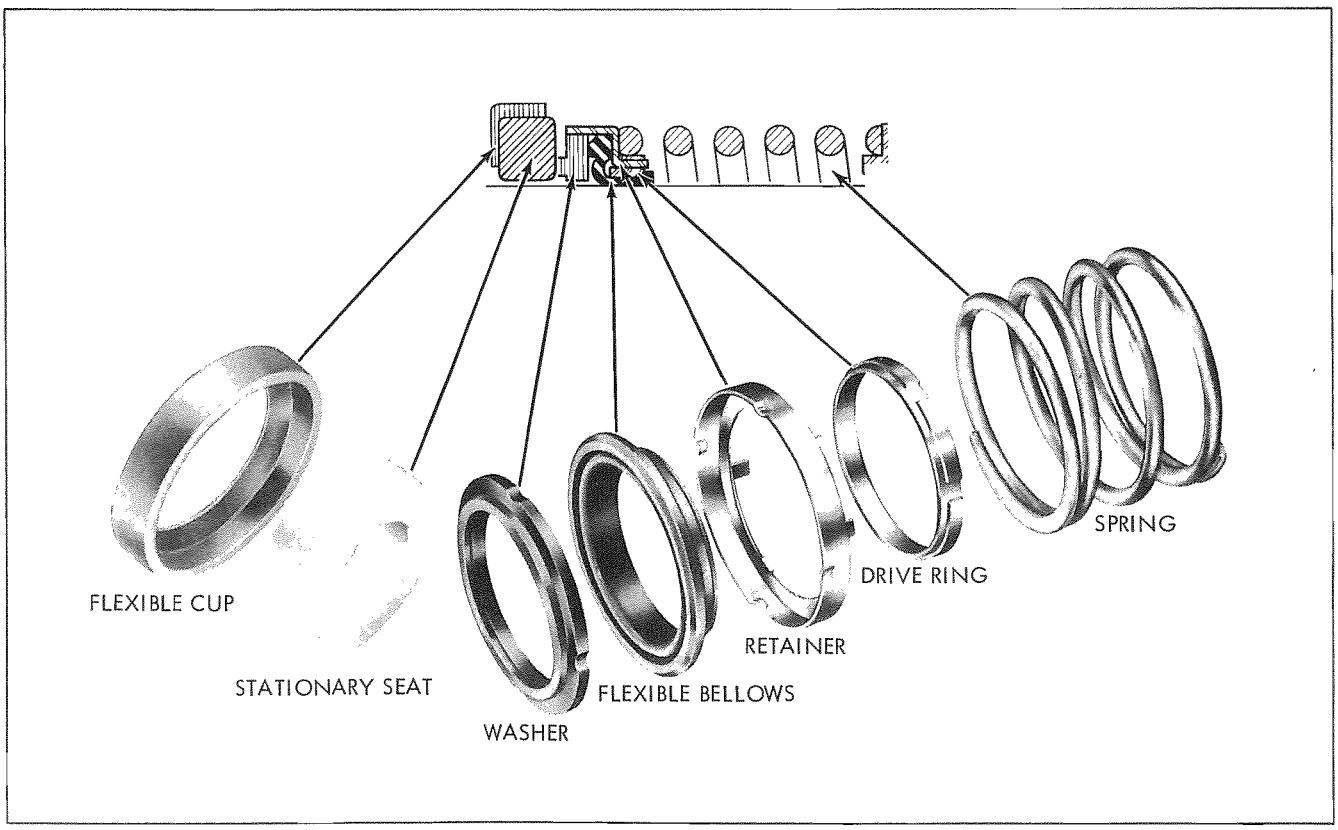
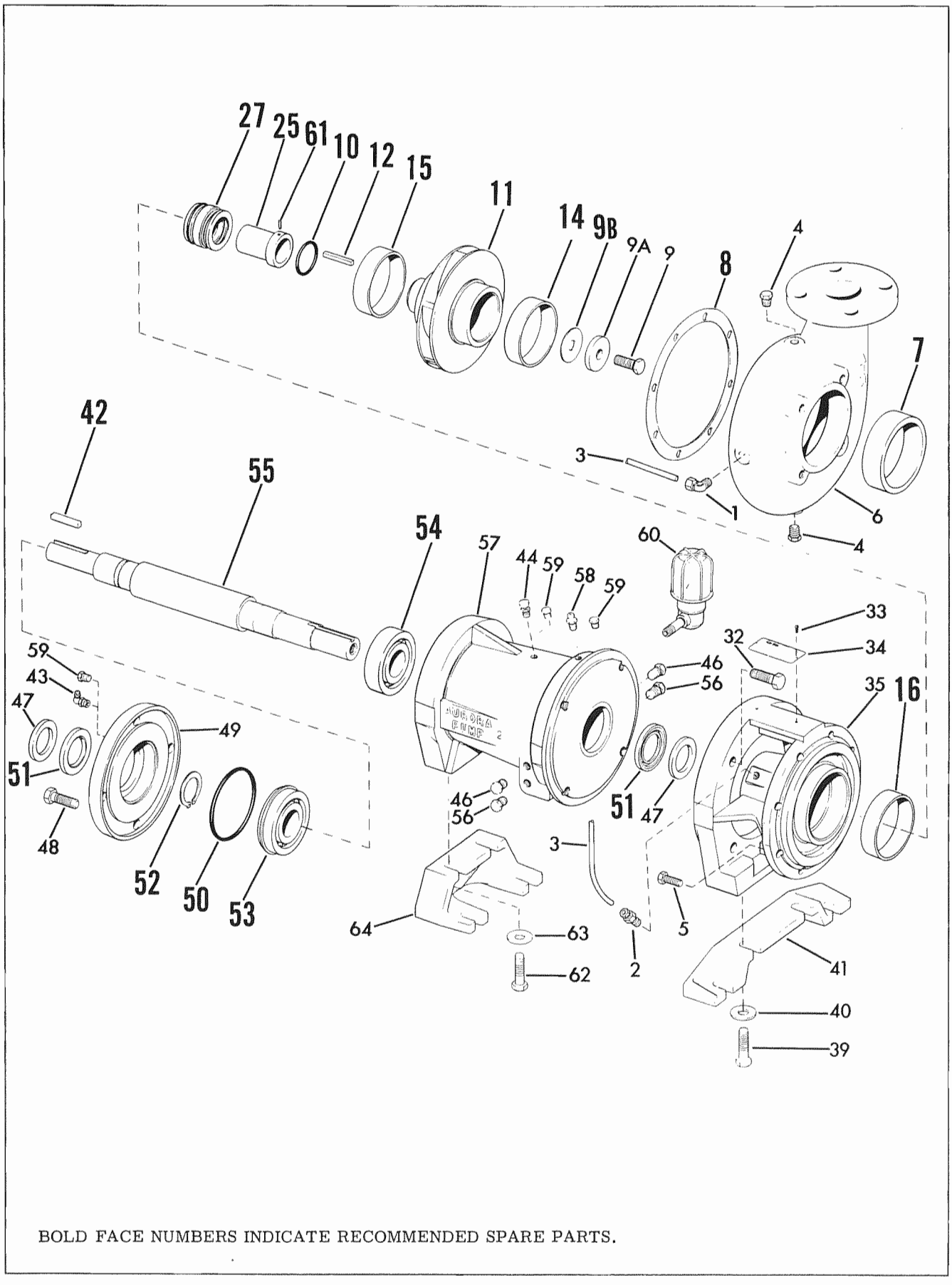


Figure 1. Mechanical Seal



BOLD FACE NUMBERS INDICATE RECOMMENDED SPARE PARTS.

Figure 2. Pump and Power Frame, Exploded View

MODEL 344 LIST OF PARTS

1.	Elbow	16.	Wear Ring	49.	Bearing Cap
2.	Connector	25.	Sleeve	50.	Gasket
3.	Tubing	27.	Seal	51.	Seal
4.	Plug, Pipe	32.	Capscrew	52.	Retaining Ring
5.	Capscrew	33.	Screw	53.	Bearing
6.	Casing	34.	Nameplate	54.	Bearing
7.	Wear Ring	35.	Bracket	55.	Shaft
8.	Gasket	39.	Capscrew	56.	Plug, Pipe
9.	Impeller Screw	40.	Washer	57.	Frame
9A.	Washer	41.	Support	58.	Grease Fitting
9B.	Gasket	42.	Key	59.	Plug, Pipe
10.	Gasket	43.	Grease Fitting	60.	Oiler Assembly
11.	Impeller	44.	Tube, Vent	61.	Pin
12.	Impeller Key	46.	Plug, Pipe	62.	Capscrew
14.	Wear Ring	47.	Slinger	63.	Washer
15.	Wear Ring	48.	Capscrew	64.	Support

NOTES:
1. BRONZE FITTED CONSTRUCTION WILL BE FURNISHED AS STANDARD UNLESS SPECIFIED.
2. REFER TO FACTORY FOR SPECIAL ALLOYS.
3. AURORA PUMP RESERVES THE RIGHT TO SUBSTITUTE MATERIALS WITHOUT NOTICE.
4. PIECE NUMBERS 14 AND 15 ARE NOT FURNISHED AS STANDARD, WHEN FURNISHED IMPELLER MUST BE MODIFIED.

NOTE

WHEN ORDERING SPARE PARTS ALWAYS INCLUDE THE PUMP TYPE, SIZE, SERIAL NUMBER, AND THE PIECE NUMBER FROM THE EXPLODED VIEW IN THIS MANUAL.

ORDER ALL PARTS FROM YOUR LOCAL AUTHORIZED DISTRIBUTOR, FACTORY BRANCH SALES OFFICE OR THE FACTORY AT NORTH AURORA, ILLINOIS.

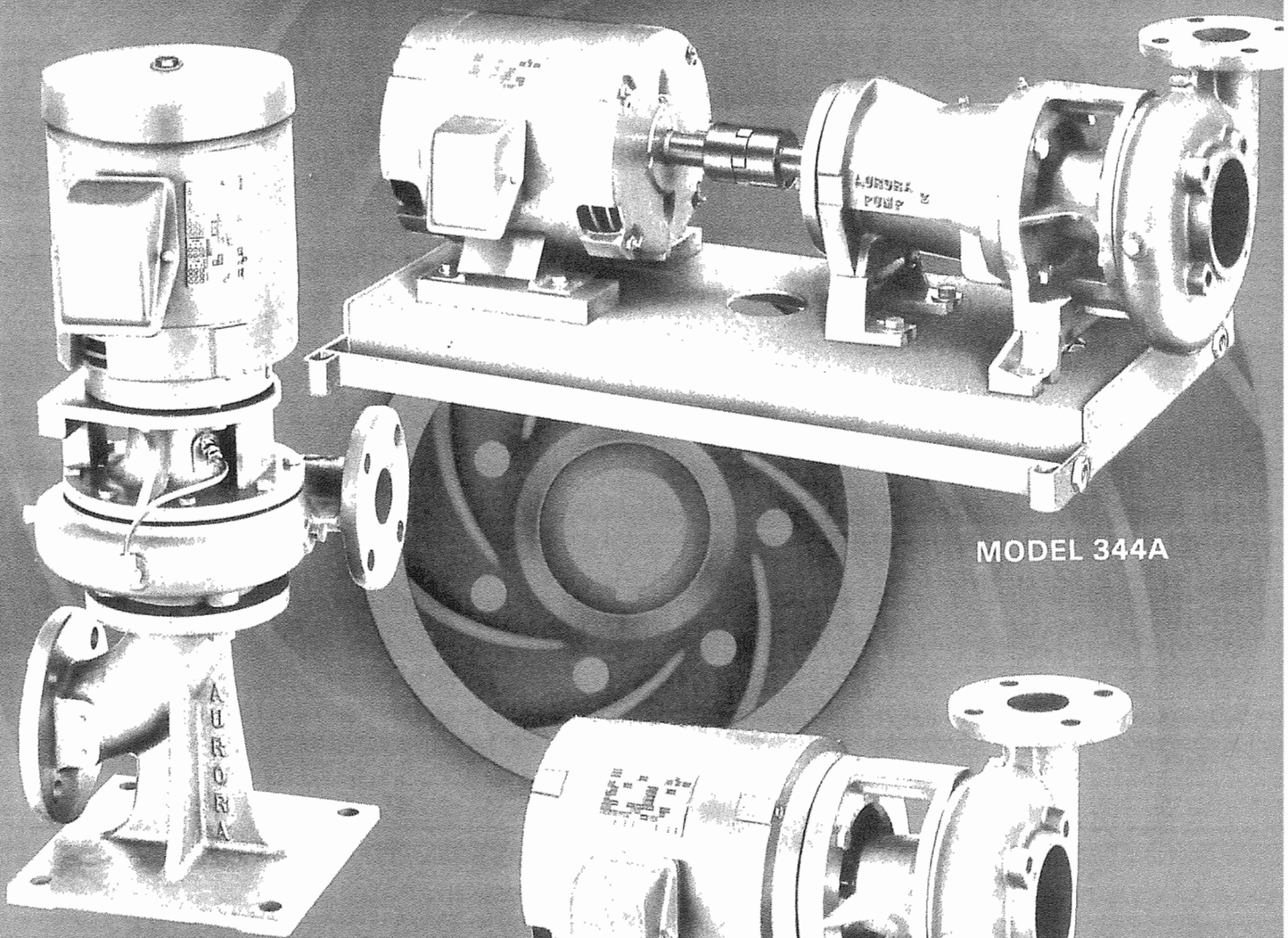
A UNIT OF GENERAL SIGNAL GS

AURORA PUMP

BULLETIN 340C

340 SERIES SINGLE STAGE END SUCTION PUMPS

CAPACITIES TO 1900 G.P.M.
HEADS TO 360 FEET
TEMPERATURES TO 225°F.



MODEL 344A

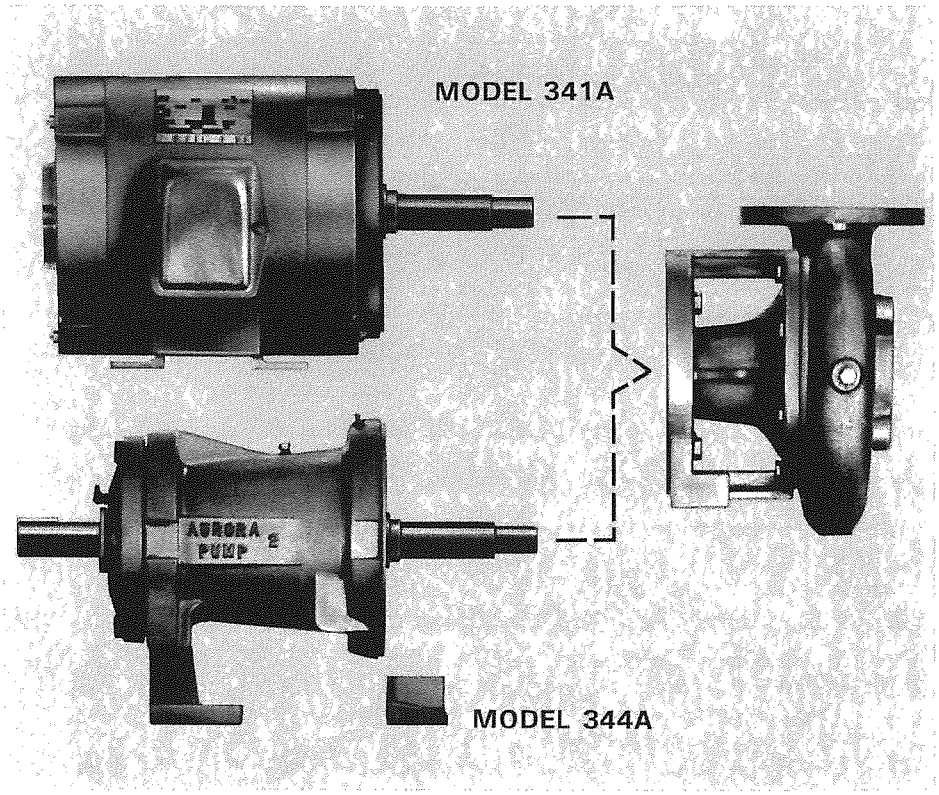
MODEL 342A

MODEL 341A

A.I.A. FILE NO. 30-C-5

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INTRODUCTION
AURORA 340 SERIES PUMPS



Today's problem of liquid handling is much more involved than it was five years ago. The variety of liquids being handled has increased along with temperatures and pressures. The costs of engineering and construction have risen considerably. The need for economy and interchangeability in design has become more important. The variety of today's installations demands quiet, smooth-running pumps with long life. Sound data is now required to assure quiet pump operation.

The reliability of pump performance has become an essential. The 340 series is a modern design based on Aurora Pump's 65 years experience with the design, sales and manufacture of centrifugal pumps. Significantly, pump Models 341A and 342A offer as standard HI-NEMA type JM stock motors. Aurora Pump also offers the power frame mounted Model 344A as a solution to your pumping problems. With this new design Aurora Pump offers several important features:

INTERCHANGEABILITY

The 340 series offer the greatest degree of interchangeability. An important interchangeability feature is shown. The complete liquid end (casing, impeller, and bracket) of any size pump is fully interchangeable between standard close coupled JM motors and the Aurora power frame of comparable size. The shaft extension and mounting face dimensions are identical. This means less spare parts inventory & speedy delivery on replacement parts or components. A 2-1/2 x 3 x 7 pump is shown illustrating typical interchangeability between motor frame 215 JM & the number 2 power frame, 341A and 344A respectively.

QUIET, SMOOTH-RUNNING DESIGN FOR LONGER LIFE.
MAXIMUM INTERCHANGEABILITY FOR GREATER ECONOMY.
COMPACT DESIGN FOR EASY INSTALLATION AND MAINTENANCE.
RELIABLE PUMP OPERATION.

Look through this bulletin and see what real accomplishments can be made when an imaginative approach is taken to the customer's problem of moving liquids within complex piping installation systems of today.

QUICK REFERENCE 340 SERIES FEATURE SELECTOR

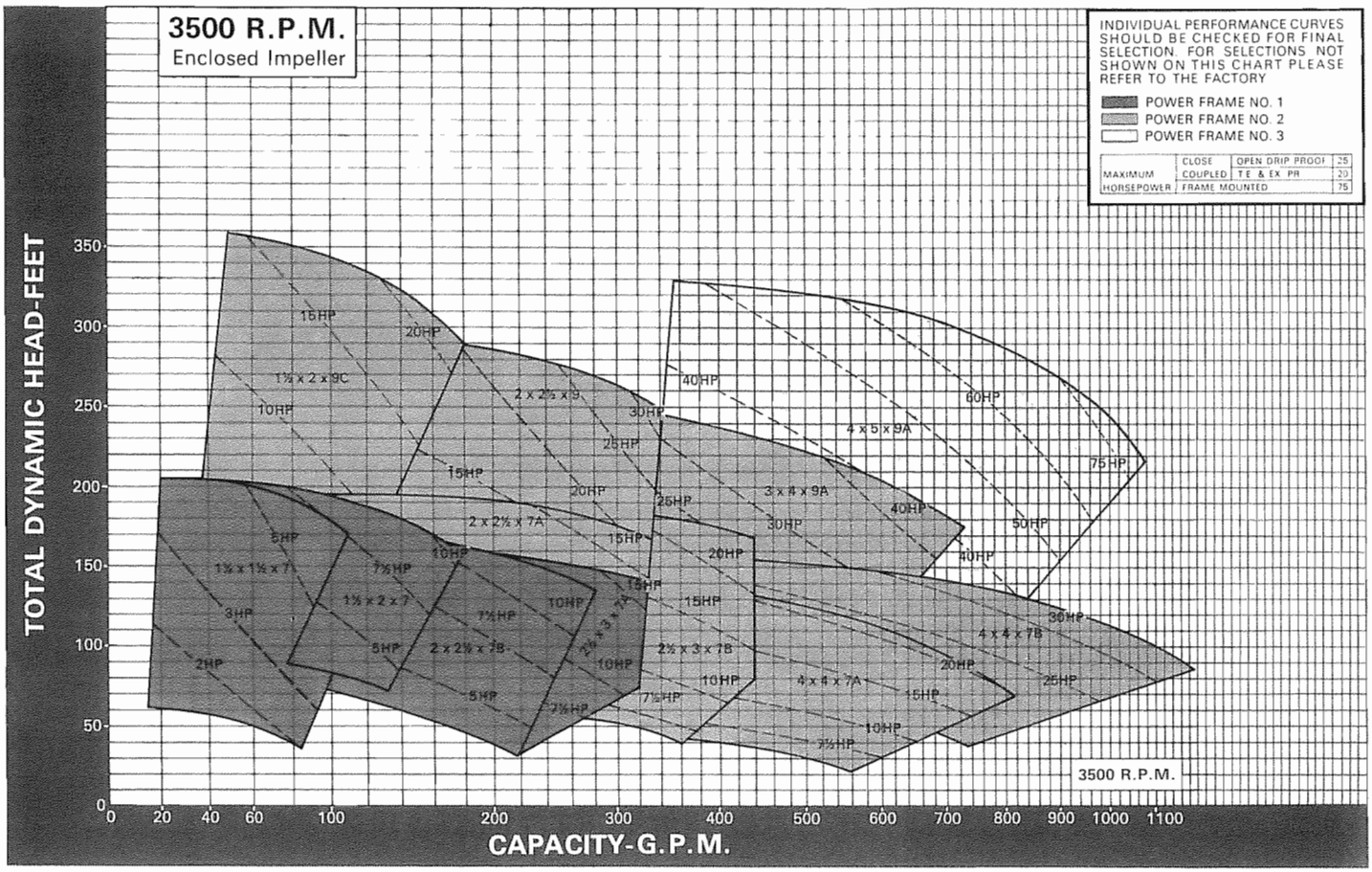
STANDARD

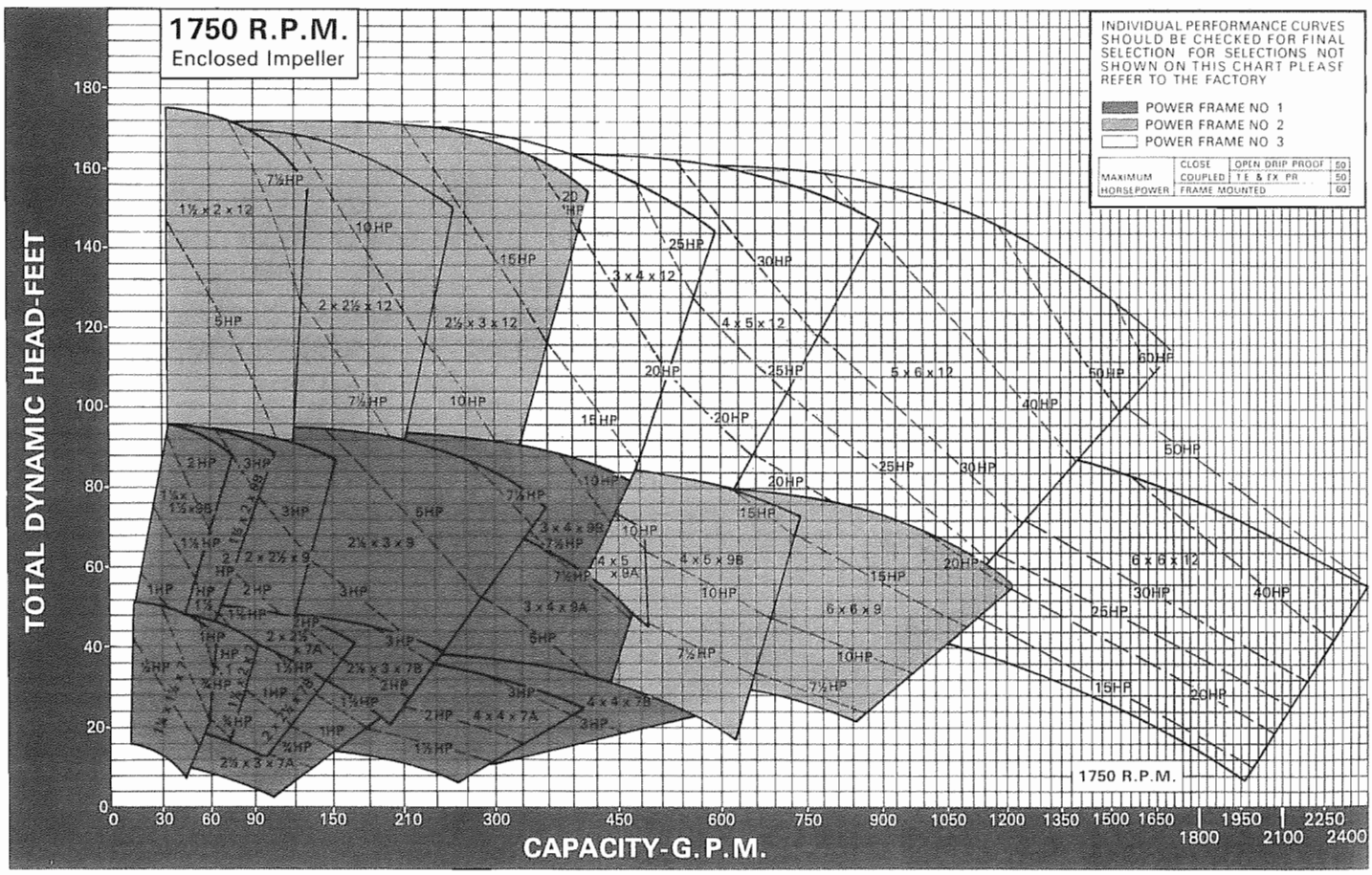
Bronze shaft sleeve
Dynamically balanced vacuum cast impeller
Casing wearing ring
303 Stainless mechanical seal with Buna-N, Ni-Resist and carbon parts
Regreaseable bearings (Model 344A)
Discharge position No. 1
Std. JM motor (Model 341A, 342A)
V.I.P. performance test
Coupling guards (Model 344A)

OPTIONAL

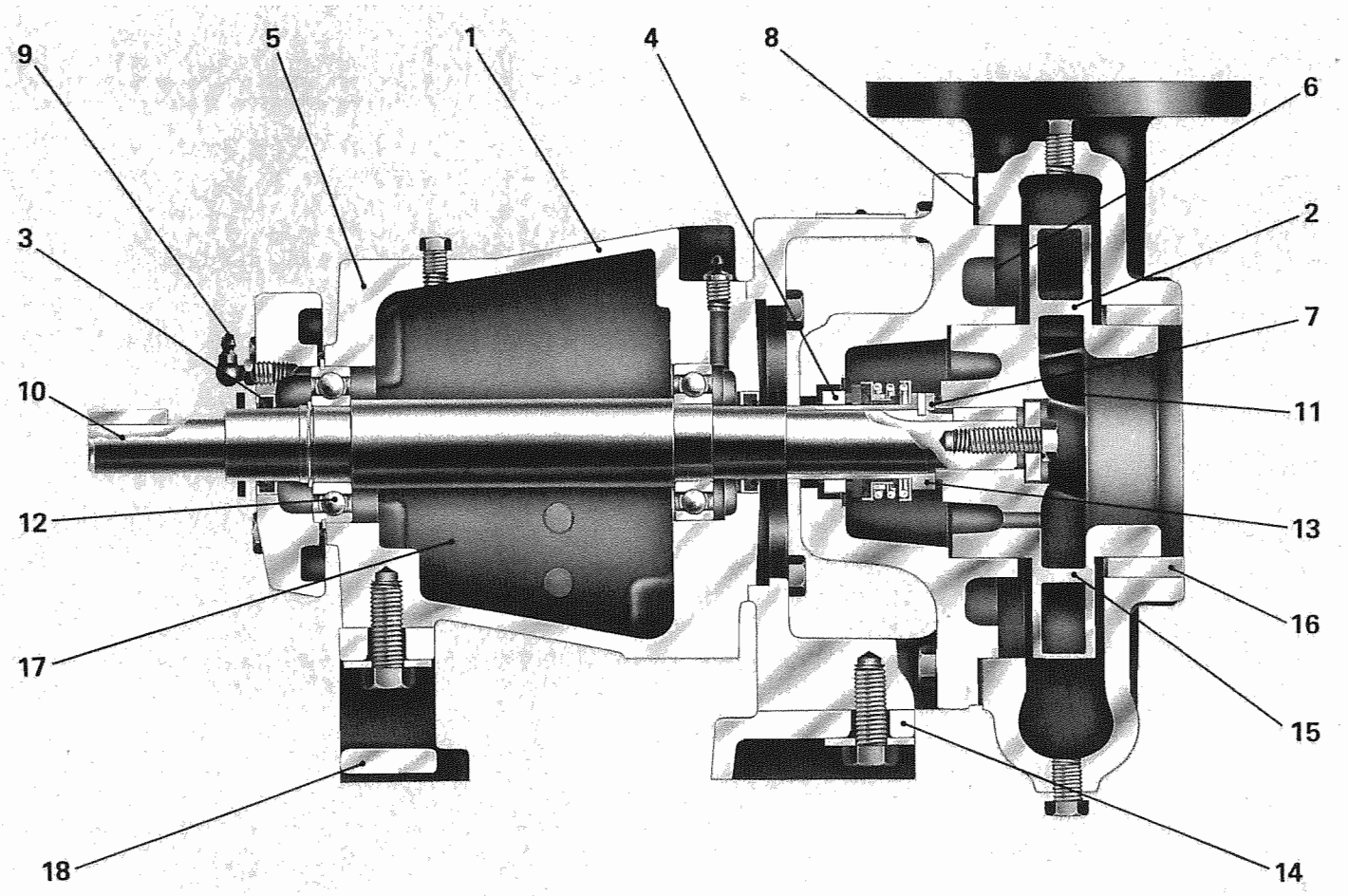
316 Stainless steel shaft sleeve (standard on all iron pumps)
Stainless steel shaft
Impeller wearing rings
Oil lubricated ball bearings (Model 344A)
Discharge position No. 2, 3 & 4 (see dimensions)
Fabricated steel drip-rim bases (Models 341A & 344A)
Formed steel bases (Model 344A)
High temp. mech. seal
Variety of alternative constructions

RANGE CHARTS





PUMP FEATURES



1 COMPUTER-MACHINED major components with 360 degree registered fits to assure concentricity of all pump parts.

2 VACUUM CAST IMPELLER Quality controlled manufacturing process assures consistently high pumping performance.

3 OIL SEALS and non-sparking Neoprene rotating slingers protect both bearings during pump operation and pump washdown.

4 MECHANICAL SEAL has carbon against Ni-Resist face for optimum hot water performance. Long life is also assured with 303 stainless steel metal parts and "Buna-N" elastomers.

5 POWER FRAME provides maximum interchangeability for flexible coupled applications.

6 V.I.P. FACTORY TEST guarantees performance at your specified operating conditions.

7 BRONZE SHAFT SLEEVE prevents shaft wear, is slip fit over the shaft, keylocked, and extends the full length of seal box. Sleeve is "O" ring sealed.

8 BACK PULL-OUT design simplifies disassembly. The suction and discharge piping is not disturbed at disassembly.

9 LUBRICATION FITTINGS are conveniently located for quick accessibility and provides positive bearing lubrication. Oil lubrication optionally available.

10 CARBON STEEL SHAFT designed for minimum deflection, not to exceed .002" at the sealing faces at maximum load.

11 DYNAMICALLY BALANCED IMPELLER is keyed to the shaft extension and secured by a capscrew and washer.

12 BEARINGS selected for 3 year minimum life at maximum load. Average bearing life 5 x minimum. Grease lube standard.

13 SHAFT SLEEVE and hex head impeller screw are "O" ring sealed to eliminate corrosion of the shaft by the pumped liquid. This eliminates the requirement for high cost, special stainless steel or alloy shafts.

14 CLOSE COUPLED MOTORS in smaller frame sizes are supported off of the motor bracket for maximum rigidity.

15 ENCLOSED IMPELLER design provides highest efficiency.

16 CASE WEARING RING prevents wear on casing and is easily and inexpensively replaced. Impeller rings are available.

17 LARGE CAPACITY OIL RESERVOIR is provided on power frame Model 344A pumps for optional oil lube.

18 REAR SUPPORT FOOT provides support and simplifies coupling alignment. All supports are slotted to simplify back pull-out of power frame.

OPTIONAL EQUIPMENT

Standard 340 series pumps are designed to meet the requirements of most applications. However, to meet special services, a number of optional features have been made available. For services not handled by the features listed, refer to the factory.

IMPELLER WEARING RINGS—Replaceable wearing rings protect the impeller from wear.

ALTERNATE DISCHARGE POSITIONS—Refer to dimension tables page 6 for details.

SHAFTS—Stainless steel shafts are available for special applications.

FAB. STEEL DRIP RIM BASES—Are available for Models 341A & 344A. Drip pocket extends under pump casing drain openings. Close coupled bases allow back pull out of pump.

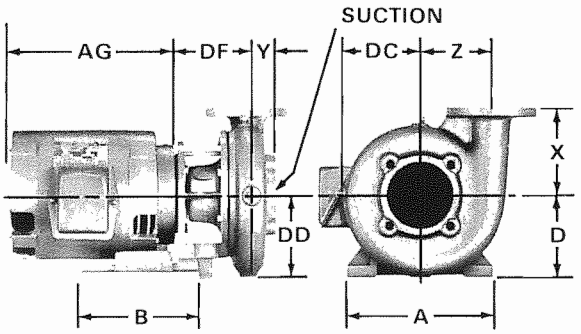
ENGINEERING SPECIFICATIONS AND DIMENSIONS

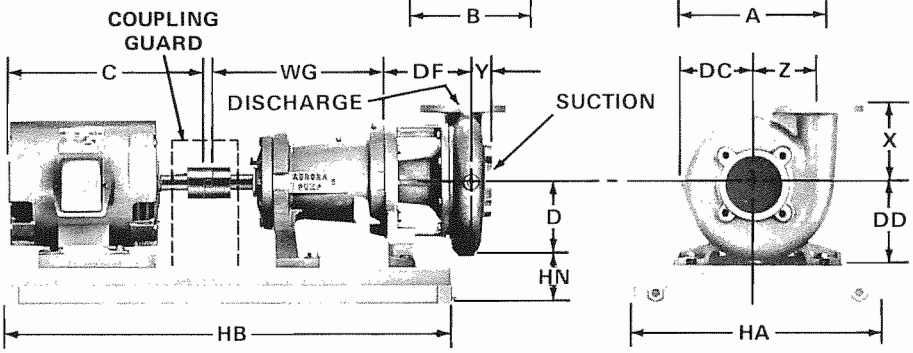
FLEXIBLE-CLOSE COUPLED PUMPS The contractor shall furnish (and install as shown on the plans) Aurora Model (341A horizontal close coupled) (342A vertical close coupled) (344A horizontal flexible coupled) back pull out centrifugal pumps size . . . x . . . x . . . of (standard fitted) (bronze fitted) (all iron) construction. Each pump shall have a capacity of . . . GPM at . . . ft. total head, with a temperature of . . . °F., . . . specific gravity and structureborne sound level not to exceed . . . ADB. Each pump is to be furnished with a mechanical seal with all metal parts to be 303 stainless steel with "Buna-N" elastomers, Ni-Resist seat, and carbon washer. The unit must be equipped with (bronze) (stainless steel) keylocked shaft sleeve that extends the length of the seal box. The pump shaft extension shall be "O" ring sealed from the pumped liquid. Pump shall have a case wearing ring (impeller wearing rings). Impellers to be vacuum cast, dynamically balanced, and keylocked to the shaft.

FLEXIBLE COUPLED PUMPS (344A) Pump and motor are to be mounted on a common (fab. steel drip rim) (steel) baseplate. The shaft is to be steel, installed in a cast iron power frame. Pumps shall have a shaft design for .002" deflection at the seal face with the pump running under max. load condition. (Grease) (oil) lubricated ball bearings, having a 3 year min. life (AFBMA B_{10}) under the max. condition of load protected by separate oil seals and slingers, shall be used. The pump shall be flexible coupled to a standard horizontal NEMA . . . HP . . . phase . . . Hertz . . . volts . . . RPM (drip-proof) (totally enclosed) (explosion-proof) motor. Alignment shall be checked in accordance with the Standards of the Hydraulic Institute after installation and there shall be no strain transmitted to the pumps. CLOSE COUPLED PUMPS (341A) CLOSE COUPLED PUMPS (342A) Each pump is to be close coupled to a standard HI-NEMA-JM . . . HP . . . phase . . . Hertz . . . volt . . . RPM (drip-proof) (totally enclosed) (explosion-proof) motor. Model 341A in motor frame sizes up to 184JM shall be supported by a separate support foot on the pump bracket.

NOTES:
1 Dimensions and weights are approximate
2 All dimensions are in inches and may vary ± 1/4"
3 Frame sizes, "C" & "AG" dimension and motor weight are for open drip proof motors only
4 Conduit box is shown in approximate position. Dimensions are not specified as they vary with each motor manufacturer
5 Add pump, base and motor weight for unit weight
6 Not for construction purposes unless certified
7 Discharge position No. 2 and 3 is not available on Model 341A and 344A. Position No. 1 is furnished as standard unless otherwise specified. See page 4
8 Aurora Pump reserves the right to make revisions to its products and their specifications, and to this bulletin and related information, without notice
9 When two "D" dimensions are indicated, always use the larger figure
10 Note: Power frame selection can be made from the range charts

†Model 341A & 342A have "JM" motor frames
Model 344A have "T" frame motors.





PUMPS WITH THREADED CONNECTIONS													
PUMP SIZE			PUMP WEIGHT IN LBS.	X	Y	Z	DC	DD	DF		SEE PAGE 4		
DISCH.	SUCTION	CASE BORE							FRAME 1 143 JM-213 JM	FRAME 2 or 3 254 JM-256 JM	VD	VE	VY
1-1/4	1-1/2	7	52	5-1/4	2-7/16	4-3/16	4-15/16	5-3/16	4-3/4	—	9-3/8	3-3/4	4
1-1/4	1-1/2	9	71	6-5/8	2-9/16	5-3/8	6-3/16	6-3/8	4-11/16	—	9-3/8	3-3/4	4
1-1/2	2	7	56	5-3/8	2-1/2	4-5/16	5-1/8	5-3/8	4-13/16	—	10-5/16	4-1/8	4-1/2
1-1/2	2	9	76	6-3/4	2-5/8	5-1/2	6-5/16	6-9/16	4-3/4	5-3/4	10-5/16	4-1/8	4-1/2
1-1/2	2	12	112	7-3/4	2-3/4	7-1/16	8	8-1/4	4-7/8	5-7/8	10-7/16	4-1/8	4-1/2
PUMPS WITH ANSI STD. 125 LBS. FLANGED CONNECTIONS													
2	2-1/2	7	68	5-5/8	1-7/8	4-9/16	5-3/8	5-13/16	4-15/16	5-15/16	11-7/16	4-1/2	5
2	2-1/2	9	94	7	1-7/8	5-11/16	6-1/2	6-7/8	4-7/8	5-7/8	11-7/16	4-1/2	5
2	2-1/2	12	142	8	1-7/8	7-3/16	8-3/16	8-1/2	5	6	11-7/16	4-1/2	5
2-1/2	3	7	73	5-7/8	2	4-13/16	5-13/16	6-1/4	5-1/16	6-1/16	12-9/16	5	5-1/2
2-1/2	3	9	101	7-1/4	2	5-15/16	6-3/4	7-1/4	5	6	12-9/16	5	5-1/2
2-1/2	3	12	142	8-1/4	2	7-3/8	8-3/8	8-3/4	5-1/8	6-1/8	12-9/16	5	5-1/2
3	4	9	104	7-1/2	2-1/8	6-1/8	6-7/8	7-7/16	5-1/8	6-1/8	14-11/16	6	6-1/2
3	4	12	158	8-1/2	2-1/8	7-9/16	8-7/16	8-15/16	5-1/4	6-1/4	14-11/16	6	6-1/2
4	4	7	103	6-1/2	2-1/2	5-1/2	6-7/16	7-5/16	5-7/16	6-7/16	14-15/16	6	6-1/2
4	5	9A	133	7-1/4	3-1/8	5-3/4	6-11/16	7-3/8	5-1/4	6-1/4	17-3/16	6-1/2	7-1/2
4	5	9B	133	7-3/4	2-5/8	6-5/8	8-1/16	8-11/16	5-3/8	6-3/8	16-11/16	6-1/2	7-1/2
4	5	12	176	8-3/4	2-5/8	7-15/16	8-7/8	9-9/16	—	6-1/2	16-11/16	6-1/2	7-1/2
5	6	12	195	9	2-7/8	8-5/16	9-1/4	10-1/8	—	6-3/4	—	—	—
6	6	9	164	8-1/4	2-3/4	7	8	9	5-1/2	6-1/2	17-13/16	7	8
6	6	12	221	9-1/4	3-1/8	8-11/16	9-11/16	10-13/16	—	7	—	—	—

PUMP MODEL	BASE NUMBER	WEIGHT IN POUNDS	HA	HB	HN	POWER FRAME			1	2	3
						WEIGHT IN POUNDS			36	82	87
344A	1	100	14-1/2	42-3/4	3-1/2	D	CASE BORE	7 9 & 12	5-1/4 6-1/4	6-1/4 7	— 7
	2	110	17	43	3-1/2						
	3	175	19	51	4-1/2	WG			10-5/16	13-13/16	13-13/16

PUMP MODEL	MOTOR FRAME	HORSEPOWER 3500 RPM	HORSEPOWER 1750 RPM	MOTOR WEIGHT IN LBS.	D	PUMP MODEL 341A & 342A A	B	AG	C	BASE NUMBER		
344A	56	—	1/3-1/2-3/4	50	5-1/4	—	—	—	12	1	—	—
341A, 342A† & 344A	143T	1-1/2	1	30	5-1/4	9-3/4	8-5/8	10	11	1	—	—
	145T	2-3	1-1/2-2	35	5-1/4	9-3/4	8-5/8	11	12	1	2	—
	182T	5	3	45	5-1/4	9-3/4	8-5/8	11	13	1	2	—
	184T	7-1/2	5	50	5-1/4	9-3/4	8-5/8	12	14	1	2	—
	213T	10	7-1/2	120	5-1/4	10-1/2	7-1/2	14	16	1	2	—
	215T	15	10	144	5-1/4	10-1/2	9	15	18	1	2	—
	254T	20	15	217	6-1/4	12-1/2	10-3/4	17	21	1	3	3
	256T	25	20	246	6-1/4	12-1/2	12-1/2	19	23	—	3	3
344A	284T	—	25†	320	7	13-3/4	11-1/2	19	24	—	3	3
	284TS	30	—	320	7	—	—	—	22	—	3	3
	286T	—	30†	351	7	13-3/4	13	21	25	—	3	3
	286TS	40	—	351	7	—	—	—	24	—	3	3
	324T	—	40†	442	8	14-1/2	12-1/4	22	25	—	3	3
	324TS	50	—	442	8	—	—	—	25	—	3	3
	326TS	60	50†	522	8	14-1/2	13-3/4	23	26	—	3	3
	364TS	75	60	625	9	—	—	—	27	—	3	3

† Also available in Models 341A and 342A 12" bore pumps.

A UNIT OF GENERAL SIGNAL GS

AURORA PUMP

800 AIRPORT ROAD • NORTH AURORA, IL 60542

SALES OFFICES IN ALL MAJOR CITIES AND COUNTRIES
Refer to "Pumps" in the yellow pages of your phone directory

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Export Dept.: No. Aurora, Illinois, Cable Address "NYABINT"

The Trade-mark AURORA is registered in U.S. Patent Office

HYDRAULIC INSTITUTE 1917

Heath Engineering Company

377 West 800 North Salt Lake City, Utah 84103 Telephone (801) 322-0487

April 8, 1985

White Plumbing & Heating
P. O. Box 1741
Twin Falls, Idaho 83301

Attention: Jack White

Re: Twin Falls High School/Sawtooth Geothermal Retrofit
Submittals Number 2 and Number 3

Gentlemen:

We have reviewed the subject submittals and have marked them as follows:

1. Bondstrand Pipe, Series 1600, with filament-wound flange.

   NO EXCEPTIONS TAKEN

2. ADS Corrugated Polyethylene Tubing for the irrigation drain line.

   REJECTED

We have retained one copy of the submittals for our files.

Sincerely,

HEATH ENGINEERING COMPANY

Samuel D. Stone

SDS/pj

Enclosures

ENGINEERING CONSULTANTS
Blair O. Fumer C. Lewis Wilson George V. Lemmon Larry D. Veinel H. Lynn Wray Victor S. Willes James A. Maughan Steven L. Sorenson Samuel D. Stone Randall T. Veinel Jeffrey C. Anderson

WHITE PLUMBING & HEATING, Inc.

P.O. BOX 1741 — TWIN FALLS, ID 83303-1741 — PHONE 208-733-4556

SHOP DRAWING FOR APPROVAL

TO: Heath Engineering Company DATE 3/28/85

377 West 800 North

Salt Lake City, Utah 84103 Sam Stone

CONTRACT NO. J-501 TRANSMITTAL NO. 2 NEW SUBMITTAL XX

RESUBMITTAL ..... TRANSMITTAL NO. ..... P. O. NO. 1224

PROJECT Geothermal Project TFHS LOCATION Twin Falls, Idaho

SPECIFICATIONS SECTION ..... FOR BUILDING .....

PAR NO.	DESCRIPTION OF EQUIPMENT	MANUFACTURER	PUB. NO.	COPIES SUB'M.	ACTION TAKEN	COPIES RET'D.
	Bondstrand Pipe & Fittings	Ameron		7		

Please return 4 approved copies to this office.

CONTRACTOR **WHITE PLUMBING & HEATING, Inc.**

MAILING ADDRESS **P.O. Box 1741, Twin Falls, ID 83303-174**

cc: File w/copy

Field

By J J White

STANDARD TWIN FALLS

Supplier: Industrial Sales

2719 Lemel Circle
Salt Lake City, Utah 84115

Bill Lund (801) 487-9831

☑ NO EXCEPTIONS TAKEN ☐ REJECTED

☐ EXCEPTIONS AS NOTED ☐ REVISE AND RESUBMI

Checking is only for general conformance with the design concep of the project and general compliance with the information given in the contract documents. Any corrections or comments are subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

HEATH ENGINEERING COMPANY

By Samuel D. Stone

APR - 8 1985

Bondstrand®

Chemical Resistance Chart Series 1200 and Series 1600 Pipe and Fittings

Series 1200 and Series 1600 are unlined epoxy products produced by the filament-winding process. Series 1200 piping offers the user a locked O-ring joint for quick, reliable joining of either suspended or buried pipe systems, even under adverse weather conditions. For those users who prefer the rugged strength and performance of the Quick-Lock® adhesive bonded joint, Ameron offers Series 1600 piping with its heavier pipe walls, longer spans and greater ring stiffness.

This chemical resistance chart is provided to aid the user in making his own determination of suitability for his specific applications.

The information and recommendations for usage it contains are based on (1) laboratory tests, (2) information supplied by resin and gasket manufacturers, and (3) publications of recognized professional associations such as the National Association of Corrosion Engineers, and are believed to be reliable. However, conditions vary from plant to plant and the user must be aware that mixtures of chemicals, trace impurities and operating variables can affect product performance.

Where the standard ethylene-propylene gasket upon which the table is based appears incompatible with the fluid, suitable alternative polymers may be available on special order.

These two piping series are designed for use only in those applications where the glass-reinforced structure does not require protection from attack. For those applications where information is not available, or where Series 1200 or 1600 piping appears unsuitable, please refer to the "Bondstrand Chemical Resistance Chart," BC-1, which covers the lined Bondstrand piping products. In many cases you will find that other piping products offered by Ameron will meet your demanding service requirements. For more information, please contact your local Bondstrand distributor or your Ameron sales representative.

Ameron®

Series 1200 and Series 1600 Pipe and Fittings

Chemical Solution	Concentration[1]	Temperature Limit °F	Temperature Limit °C	Gasket Suitability[3]
Acetic Acid	0-10%	150	66	✓
	10-100%	NR	NR	
Acetone		75	24	✓
Acrylic Acid		NR	NR	
Air		210	99	✓
Aluminum Potassium Sulfate		210	99	✓
Aluminum Chloride	0-1%	210	99	✓
Aluminum Nitrate		200	93	✓
Aluminum Sulfate		210	99	✓
Ammonia Gas Dry		150	66	✓
Ammonium Chloride		120	49	✓
Ammonium Hydroxide	0-28%	100	38	✓
Ammonium Phosphate		150	66	✓
Ammonium Sulfate		210	99	✓
Ammonium Nitrate	0-25%	210	99	✓
Aniline		75	24	✓
Barium Chloride		200	93	✓
Benzene		120	49	NR
Black Liquor (paper mfg.)		150	66	✓
Boric Acid	0-20%	200	93	✓
Bromine Water	0-4%	150	66	NR
Calcium Chloride		210	99	✓
Calcium Hypochlorite[2]		150	66	✓
Calcium Nitrate		200	93	✓
Calcium Sulfate		200	93	—
Carbon Disulfide		75	24	NR
Carbon Tetrachloride		150	66	NR
Chloroacetic Acetic	0-10%	75	24	✓
Chloroacetic Acid—Glacial		NR	NR	
Chlorobenzene		75	24	NR

Series 1200 and Series 1600 Pipe and Fittings

Chemical Solution	Concentration[1]	Temperature Limit °F	Temperature Limit °C	Gasket Suitability[3]
Chloroform		NR	NR	
Chlorine Gas, wet		NR	NR	
Chlorinated Brine		NR	NR	
Chlorinated Water[2]	0-50 ppm	150	66	—
Chlorinated Water	>50 ppm	NR	NR	
Chromic Acid	0-10%	NR	NR	
Citric Acid		210	99	✓
Copper Chloride		200	93	✓
Copper Nitrate		200	93	—
Copper Sulfate		210	99	✓
Crude Oil (sweet & sour)		210	99	NR
Cyclohexanol		100	38	NR
Detergents		120	49	✓
Diallylphthalate		120	49	—
O-Dichlorobenzene		150	66	NR
Diesel Fuel		200	93	NR
Diethylene Triamine		NR	NR	
Dipropylene Glycol		150	66	✓
Ethyl Acetate		120	49	✓
Ethyl Acrylate		120	49	✓
Ethyl Alcohol		100	38	✓
Ethyl Benzene		100	38	NR
Ethyl Chloride		NR	NR	
Ethyl Ether		100	38	NR
Ethylene Dichloride		NR	NR	
Ethylene Glycol		210	99	✓
Fatty Acids		100	38	NR
Ferric Chloride		170	77	✓
Ferric Nitrate		150	66	✓
Ferric Sulfate		210	99	—

[1] Where no concentration is shown, recommendations apply to any concentration up to 100% or to saturation.

Series 5000 pipe can be expected to provide a longer service life in this environment.

[3] General fluid compatibility of standard polymer used in O-ring gasket for Bondstrand Series 1200 piping.

✓ Standard Gasket OK
NR Not Recommended
— Not Tested

Series 1200 and Series 1600 Pipe and Fittings

Chemical Solution	Concentration[1]	Temperature Limit °F	Temperature Limit °C	Gasket Suitability[3]
Formaldehyde		75	24	✓
Formic Acid		NR	NR	
Fuel Oil		210	99	NR
Gasoline		150	66	NR
Glycerin		210	99	✓
Green Liquor (paper)		100	38	✓
Heptane		150	66	NR
Hexane		100	38	NR
Hydraulic Oils		200	93	NR
Hydrobromic Acid		NR	NR	
Hydrochloric Acid	1% or less	75	24	✓
	>1%	NR	NR	
Hydrofluoric Acid		NR	NR	
Hydrofluosilic Acid	0-25%	NR	NR	
Hydrogen Chloride Gas Dry		150	66	NR
Hydrogen Peroxide	0-30%	NR	NR	
Hydrogen Sulfide		150	66	✓
Iodine (Sat @ R T)		120	49	✓
Isopropyl Alcohol		120	49	✓
Jet Fuel		200	93	NR
Kerosene		210	99	NR
Lactic Acid		170	77	NR
Latex Solutions		210	99	—
Lead Nitrate		170	77	✓
Linseed Oil		200	93	NR
Lithium Chloride		210	99	—
Lithium Hydroxide		150	66	—
Magnesium Carbonate		170	77	—
Magnesium Chloride		210	99	✓
Magnesium Hydroxide		210	99	✓

Series 1200 and Series 1600 Pipe and Fittings

Chemical Solution	Concentration[1]	Temperature Limit °F	Temperature Limit °C	Gasket Suitability[3]
Magnesium Nitrate		200	93	—
Magnesium Sulfate		210	99	✓
Maleic Acid		170	77	NR
Maleic Anhydride		150	66	NR
Methyl Alcohol		100	38	✓
Methyl Chloride		NR	NR	
Methyl Ethyl Ketone		100	38	✓
Methyl Isobutyl Ketone		100	38	NR
Methylene Chloride		NR	NR	
Mineral Oil		210	99	NR
Monochlorobenzene		100	38	NR
Naphtha		210	99	NR
Natural Gas		210	99	NR
Nickel Chloride		210	99	✓
Nickel Nitrate		180	82	✓
Nickel Sulfate		210	99	✓
Nitric Acid[2]	1-10%	75	24	✓
Nitric Acid	10-70%	NR	NR	
Oil (crude)		210	99	NR
Oleic Acid		200	93	NR
Perchloric Acid[2]	0-70%	75	24	NR
Perchloroethylene		100	38	NR
Phenol	<1%	75	24	NR
	>1%	NR	NR	
Phosphoric Acid	0-2%	100	38	✓
	2-25%	75	24	✓
	25-50%	75	24	✓
	50-85%	NR	NR	
Polyvinyl Alcohol Emulsion		100	38	—
Potassium Chloride		210	99	✓

[1] Where no concentration is shown, recommendations apply to any concentration up to 100% or to saturation.

[2] Series 5000 pipe can be expected to provide a longer service life in this environment.

[3] General fluid compatibility of standard polymer used in O-ring gasket for Bondstrand Series 1200 piping.

✓ Standard Gasket OK
NR Not Recommended
— Not Tested

Chemical Solution	Concentration[1]	Temperature Limit °F	Temperature Limit °C	Gasket Suitability[3]
Potassium Cyanide		210	99	✓
Potassium Fluoride	0-30%	150	66	—
Potassium Hydroxide	0-50%	100	38	✓
Potassium Nitrate		210	99	✓
Potassium Sulfate		210	99	✓
Propylene Glycol		210	99	✓
Sodium Bromide		210	99	—
Sodium Bisulfate		200	93	✓
Sodium Carbonate	0-10%	210	99	✓
	0-50%	150	66	✓
Sodium Chlorate[2]		210	99	—
Sodium Chloride		210	99	✓
Sodium Cyanide	0-6%	210	99	✓
Sodium Hydroxide	0-10%	100	38	✓
	10-50%	NR	NR	
Sodium Hypochlorite	0-5¼%	NR	NR	
Sodium Nitrate		210	99	✓
Sodium Sulfate		210	99	✓
Sodium Sulfide		210	99	✓
Styrene		75	24	NR
Sulfamic Acid	0-25%	100	38	—
Sulfuric Acid	1-2%	75	24	✓
Sulfuric Acid	2-95%	NR	NR	
Sulfur Dioxide Gas Dry		150	66	✓
Tannic Acid	0-15%	210	99	✓
Tartaric Acid	0-10%	210	99	✓
Tetrachloroethylene		150	66	NR
Toluene		100	38	NR
Trichloroethylene		NR	NR	
Triethanolamine		150	66	✓

Series 1200 and Series 1600 Pipe and Fittings

Chemical Solution	Concentration[1]	Temperature Limit °F	Temperature Limit °C	Gasket Suitability[3]
Vinegar		150	66	✓
Water (distilled or deionized)		210	99	✓
Water (salt)[4]		210	99	✓
Water (fresh)[4]		210	99	✓
Xylene		150	66	NR
Zinc Chloride		200	93	✓
Zinc Sulfate		200	93	✓

[1] Where no concentration is shown, recommendations apply to any concentration up to 100% or to saturation.

[2] Series 5000 pipe can be expected to provide a longer service life in this environment.

[3] General fluid compatibility of standard polymer used in O-ring gasket for Bondstrand Series 1200 piping.

[4] For water contaminated with oil or fuel, standard polymer provides suitable performance at temperatures up to 180°F (82°C).

✓ Standard Gasket OK
NR Not Recommended
— Not Tested

Important Notice

This product literature and the recommendations for usage it contains are based on test data reasonably believed to be reliable. It is intended that this literature be used by personnel having specialized training in accordance with currently accepted industry practice and normal operating conditions. Variation in environment, changes in operating procedures, or extrapolation of data may cause unsatisfactory results. We recommend that your engineers verify the suitability of this product for your intended adaptation. Since we have no control over the conditions of service, we expressly disclaim responsibility for the results obtained or for any consequential or incidental damages of any kind incurred.

Written comments regarding this document are invited. Please write Director of Engineering, Ameron Corrosion Resistant Piping Division, 595 West Lambert Road, Brea, California 92621.

595 West Lambert Road
Brea, California 92621

Ameron®
Corrosion Resistant
Piping Division

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R8/81 supersedes 4/79
Printed in U.S.A.
BC-2

Bondstrand® Assembly Instructions

Adhesive-Bonded Quick-Lock® Joints

To make the bell and spigot assembly of Bondstrand pipe and fittings using Ameron's thermosetting adhesives, you need only follow these step-by-step instructions. They show you how to cut the pipe, prepare the ends, use the adhesive, insert the spigot, and cure the adhesive to produce a strong and reliable Quick-Lock joint.

When assembling and installing coated Bondstrand Series 5000 piping, special procedures may be required. These are described at the end of this brochure.



Ameron®

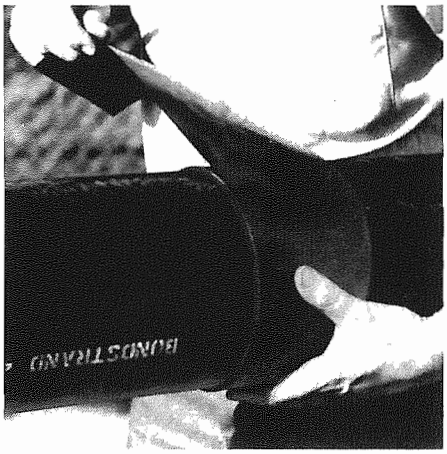
1 To cut a pipe to length, measure the desired length and scribe the pipe using a pipefitter's wrap-around. Place the pipe in a vise but avoid pipe damage caused by clamping too tightly. Use a 1/4-inch (6 mm) thick rubber pad between the clamps and the pipe to protect pipe. Cut pipe with hacksaw, saber saw, or abrasive wheel. Check the squareness of cut by inserting a pipe shaver arbor flush into the cut pipe. Pipe up to 4 inches (100 mm) should be square to within 1/16 inch (1.6 mm). Larger pipe should be square to within 1/8 inch (3.2 mm). Use a disc grinder or file to correct squareness.

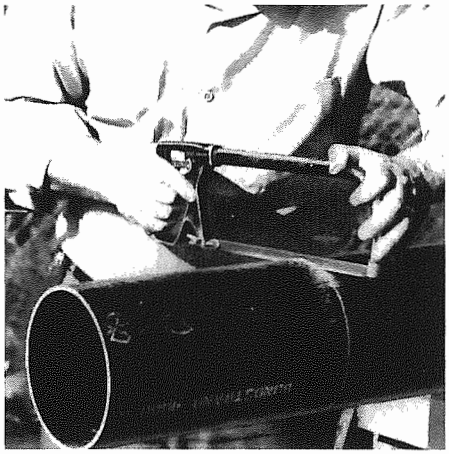
Danger: Avoid inhaling dust produced by cutting and grinding operations. Provide adequate ventilation; wear OSHA-approved dust respirator.

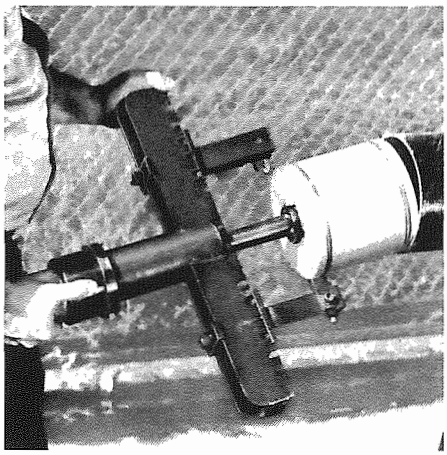
Table 1
Shaved Dimensions
(inches and millimeters)

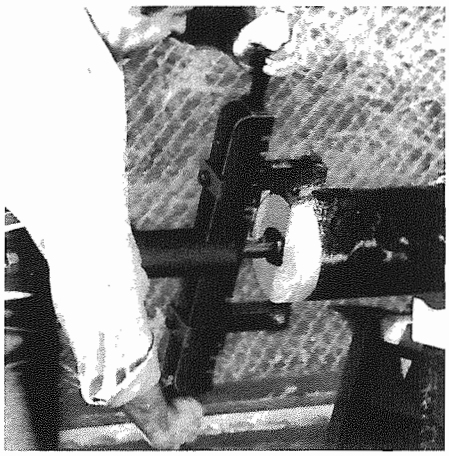
Pipe Size	Dia. – Max.	Dia. – Min.
2" (50 mm)	2.346" (59.59 mm)	2.330" (59.18 mm)
3" (80 mm)	3.466" (88.04 mm)	3.450" (87.63 mm)
4" (100 mm)	4.446" (112.93 mm)	4.430" (112.52 mm)
6" (150 mm)	6.560" (166.62 mm)	6.544" (166.22 mm)
8" (200 mm)	8.560" (217.42 mm)	8.544" (217.02 mm)
10 " (250 mm)	10.696" (271.68 mm)	10.680" (271.27 mm)
12" (300 mm)	12.700" (322.58 mm)	12.684" (322.17 mm)
14" (350 mm)	13.945" (354.20 mm)	13.929" (353.80 mm)
16" (400 mm)	15.925" (404.50 mm)	15.909" (404.10 mm)

Note: A large diameter shaver and power drive are required for 14- and 16-inch pipe.



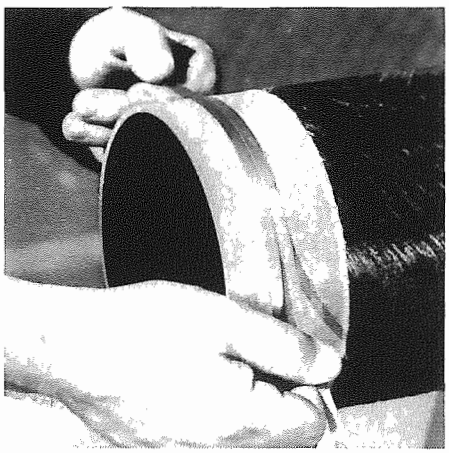






2 Shave the cut end of the pipe using the Bondstrand pipe shaver. Shaving can be done manually, but a portable power drive is advisable if shaving several sections. Measure the shaved pipe using a Pi Tape® to ensure the dimensions in Table 1 are obtained.

Note: Instructions for adjusting and operating the pipe shaver to prepare the correct spigot diameter and length are provided with the shaver or may be obtained from your local Ameron representative.

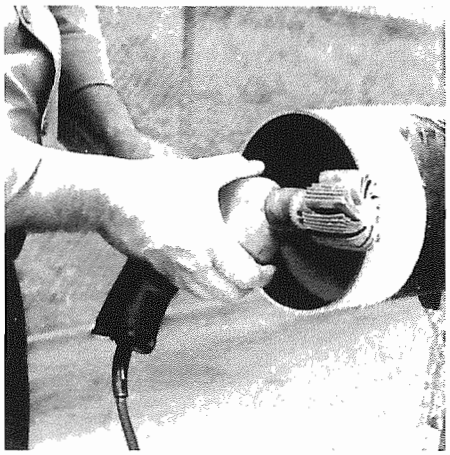


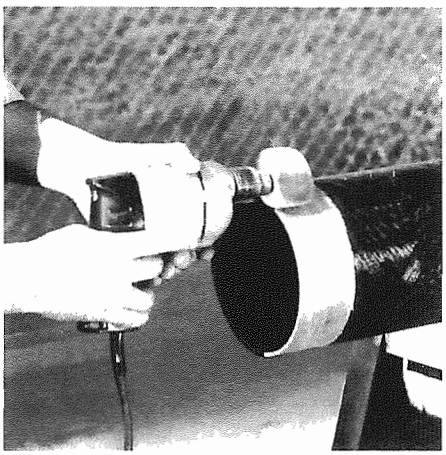
3 All fittings, sockets, pipe ends (spigots), and pipe sockets must be clean and dry and must be sanded within two hours of assembly. Sanding should be accomplished using a 1/4-inch (6 mm) drill motor, 1700 - 2000 rpm, and flapper type sander with a 40 - 60 grit aluminum oxide abrasive, available from Ameron. After sanding, surfaces to be bonded should show a dull fresh finish, not a polished look. Don't forget to sand the end surfaces of the spigot.

Caution: Clean and dry sanded surfaces are necessary for proper bonding.

Danger: Avoid inhaling dust produced by cutting and grinding operations. Provide adequate ventilation; wear OSHA-approved dust respirator.

Thoroughly wipe the sanded socket and spigot with a clean, dry cloth, or use a duster brush to removed dust particles. If surfaces are wet, warm with Bondstrand heating blanket until dry, then resand. Protect the bonding surfaces from moisture during bad weather with tenting over the working area. Do not touch the prepared surfaces with bare hands or any articles that would leave an oily film.







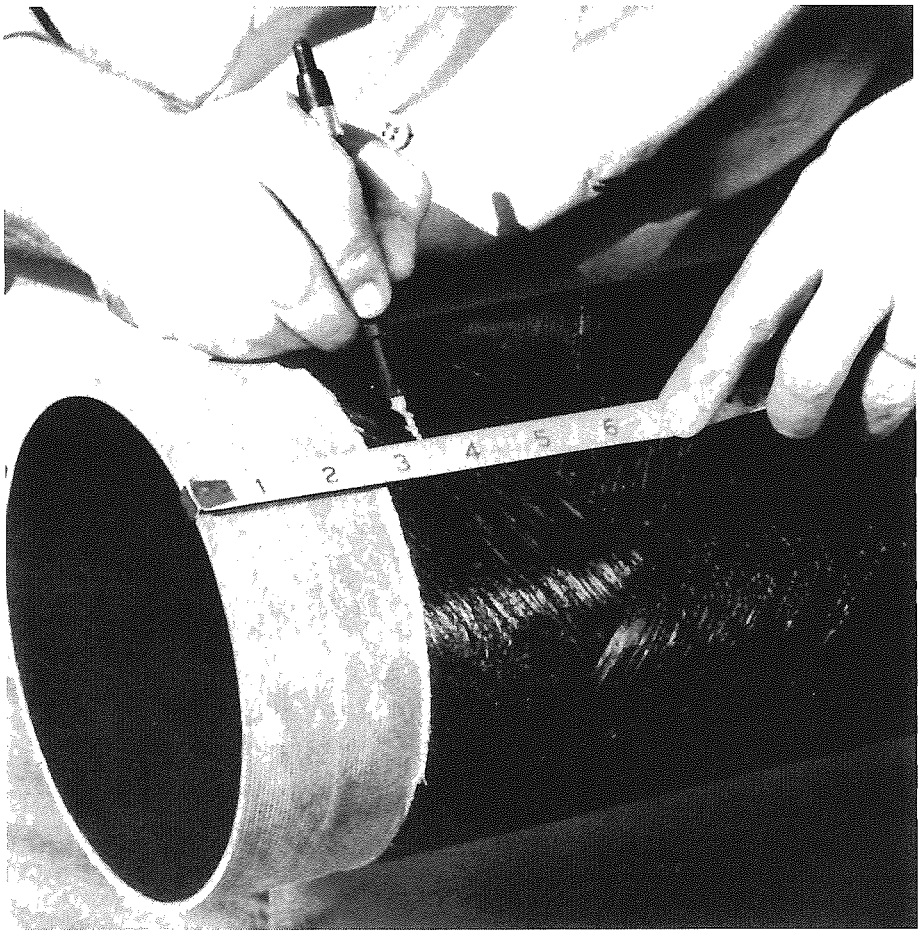


4a Measure back from the spigot end of each pipe to be joined the distance shown in Table 2, and scribe a line using a white grease pencil or soapstone.

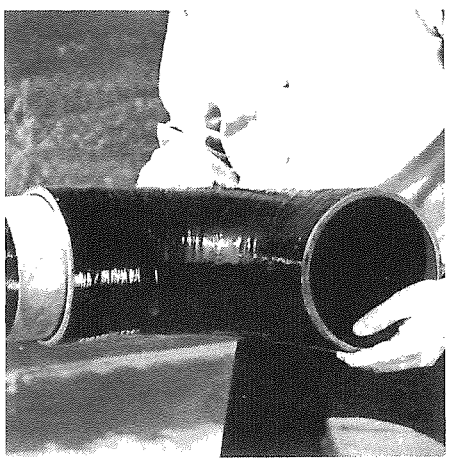
When the spigot is bottomed to the pipe stop in the socket, the scribed line will be 1-inch (25 mm) from the end of the socket.

Table 2
Mark Location for Checking Spigot Insertion (Step 7d)

Nominal Diameter	Mark in from Spigot End
2" (50 mm)	2-13/16" (71 mm)
3" (80 mm)	2-13/16" (71 mm)
4" (100 mm)	2-13/16" (71 mm)
6" (150 mm)	3-1/4" (83 mm)
8" (200 mm)	3-1/2" (89 mm)
10" (250 mm)	3-3/4" (95 mm)
12" (300 mm)	4" (102 mm)
14" (350 mm)	4-1/2" (114 mm)
16" (400 mm)	5" (127 mm)



b For proper fittings alignment, matchmark the two mating pieces. Taking care to avoid contaminating mating surfaces, fit together loosely the two pieces to be joined using a white grease pencil or soapstone, mark each piece in a common longitudinal line for subsequent realignment.





5 Ameron offers several chemically resistant thermosetting adhesives for use in pipelines transporting fluids. The Bondstrand Chemical Resistance Chart available from your Bondstrand supplier gives recommendations for most fluids as well as maximum service temperatures. Because the acceptability for pipelines transporting food or potable water depends on local laws and regulations, contact your Bondstrand supplier for advice or assistance before using adhesives in these services.

a Store adhesives at temperatures below 100°F (38°C) and use before the expiration date stamped on the top flap of the package. Do not use kit if either container shows evidence of leakage.

b Select the size of adhesive kit in accordance with Table 3.

Table 3
Guide for Determining Adhesive Quantities

Kit Size	Pipe Diameter	Approx. Number of Joints/Kit
3 fluid oz. (89 cc)	2" (50 mm)	4
	3" (80 mm)	3
	4" (100 mm)	2
	6" (150 mm)	1
	8" (200 mm)	1
6 fluid oz. (177 cc)	10" (250 mm)	1
	12" (300 mm)	1
	14" (350 mm)	1/2*
	16" (400 mm)	1/2*

*2 kits required per joint

Be aware of the working time available to you after the adhesive is mixed. Table 4 shows the approximate working time at various temperatures.

Table 4
Working Time in Minutes after Mixing Adhesive

Adhesive Temperature	RP-6A 3 oz.	RP-6A 6 oz.	RP-34 & RP-48 3 oz.	RP-34 & RP-48 6 oz.	RP-60 3 oz.	RP-60 6 oz.	RP-105 3 oz.	RP-105 6 oz.
70°F 21°C	50	45	25	18	60	45	75	40
80°F 27°C	30	25	15	11	53	40	40	25
90°F 32°C	20	15	11	7	45	33	20	15
100°F 38°C	9	7	8	6	35	25	12	10

If the adhesive is not within this 70°F to 100°F (21°C to 38°C) range, you will need to warm or cool it before mixing. The adhesive won't mix and spread well below 70°F (21°C) and will set up too fast above 100°F (38°C).

Caution: Epoxy adhesive resins and hardeners, separately or combined, will cause skin and eye irritation. Avoid contact with skin and eyes. Do not take internally.

RP-105 polyester adhesive only.

Warning! Flammable!
Vapor harmful.
Eye irritant.

RP-105 resin in the glass container and adhesive after mixing contain styrene. Avoid contact with eyes and skin. Avoid prolonged breathing of vapors or dust. Keep away from sparks, heat and open flames. Use only with adequate ventilation.

First aid: In case of skin contact, wash thoroughly with soap and water; for eyes, flush with plenty of water for 15 minutes and get medical attention. If affected by inhalation of vapor or dust, remove to fresh air.

Keep out of the reach of children.

For industrial use only.

c Observe the following good "housekeeping" rules:

(1) Use soap and water to wash skin area with which adhesive components have come in contact. Do not use solvents on the skin.

(2) Use water-removable protective creams to avoid allergic reactions. Solvent-removable creams are not recommended. Disposable polyethylene gloves can be used to avoid contact of Bondstrand adhesive with the hands.

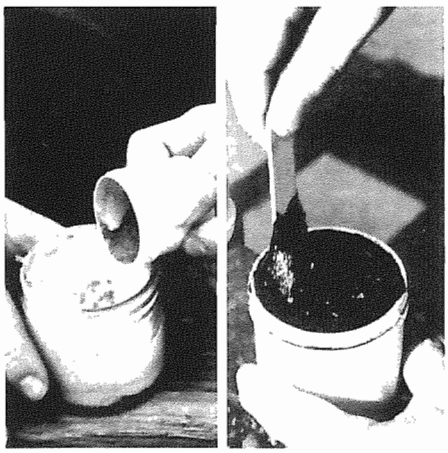
d After the joint has been properly prepared (see Steps 1 through 4) and it is ready to be bonded, add the contents of the small container (hardener) to the large container (resin). For powdered hardeners, pour in a sheltered area to avoid loss.

Caution: Avoid inhalation of powder and contact with skin and eyes.

Stir thoroughly for at least one minute and until no streaks are visible in the mixture. Immediately after mixing, apply the adhesive to the surfaces to be bonded as described below.

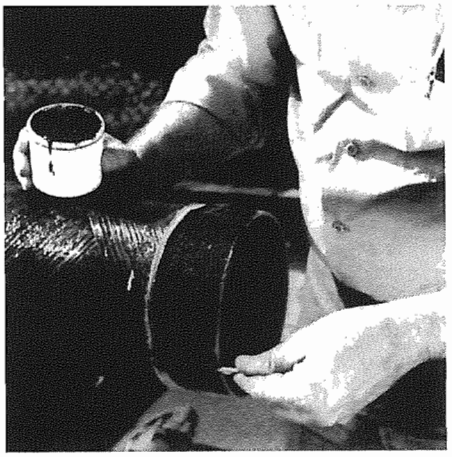
If your epoxy adhesive mixture has started to heat in the container, discard and start a new one. Heating indicates that the mixture has started to cure.

If your polyester adhesive mixture has started to gel in the container, discard and start a new one. Appearance of gelled (lumpy) material indicates that the mixture has started to cure.

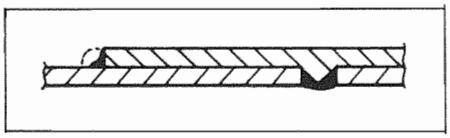


6 With the wooden stick supplied in the adhesive kit or with a reusable steel spatula, apply a layer of adhesive approximately 1/32-inch (0.8 mm) thick to the surface of the socket, including the pipe stop. (Too much adhesive on the socket will result in a flow restriction inside the joint.) Apply adhesive liberally to the entire spigot surface and a thin layer to the cut end of the pipe. Excess adhesive on the spigot surface will be forced out when the socket and spigot are joined.





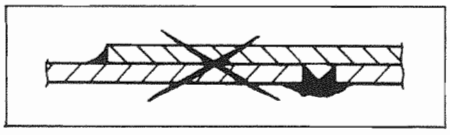
Proper adhesive application



Correct

In a properly made joint the adhesive applied to the socket is pushed to the inside of the joint where it forms a "bead" of adhesive that protects the cut edge of the pipe.

Excess adhesive applied to pipe spigot will be pushed to the outside of the joint and can be easily removed.

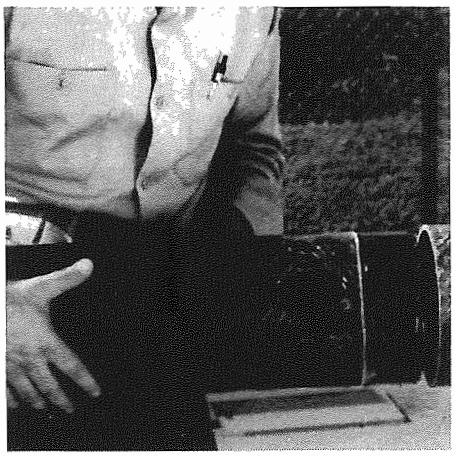


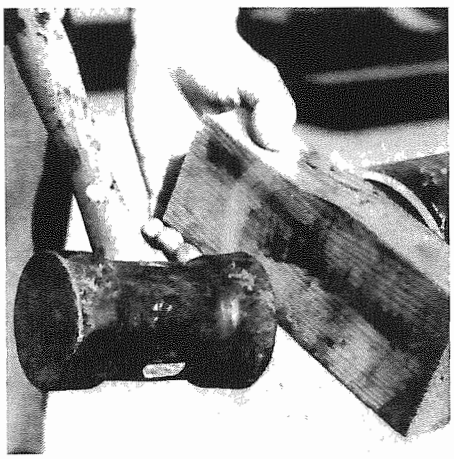
Incorrect

Too much adhesive can form a barrier and restrict flow through pipe.



7a Without delay, insert the pipe slowly and without rotation into the socket until the spigot end rests firmly against the pipe stop. For 6-inch (150 mm) pipe and larger, use a ratchet winch to seat and clamp the joint. Support the winch on a wooden bridge across the joint so the winch can be left snug while the heating blanket cures the adhesive, Step 8. Smaller pipe (2-, 3-, and 4-inch) (50, 80 and 100 mm) is joined by tapping on a two-by-four (approximately 50 x 100 mm) wooden block placed over the pipe end to seat the spigot into the socket.

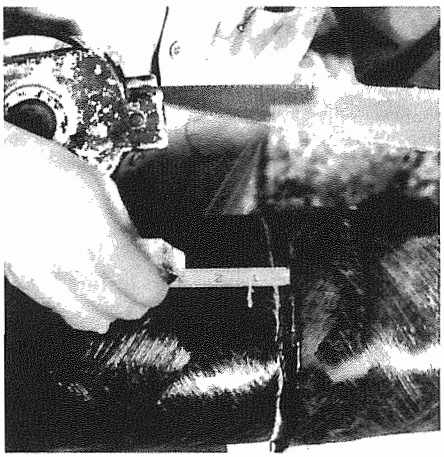




Caution: Never use a metal hammer directly on Bondstrand pipe or fittings.

b Fittings may be joined to pipe spigots by using one of the two methods of Step 7a or 2-pound (1kg) rubber hammer (Shore A Durometer 70-80) 2-1/2 to 3 inches (60 to 75 mm) in diameter may be used to tap directly on Bondstrand fittings for proper seating. It may be helpful or even necessary to back up the outside radius of an elbow, tee, lateral, etc., with a sandbag or similar shock absorber while tapping pipe spigots into fittings.

c Align flanges, tees, and other fittings to the matchmarks as you assemble the spigot and socket. Avoid having to rotate the part while assembling. Then, for flanges, check rotational alignment of bolt holes and squareness of flange faces. Flanges with bolt holes more than 1/16 inch (1.6 mm) out of rotational alignment, flanges more than 1/16 inch (1.6 mm) out of square across the flange face, or any angular errors of more than 1/2 degree in the axial or rotational alignment of spigot and socket joints are likely to introduce subsequent assembly problems. If misaligned, pull joint apart, remove adhesive from the pipe stop area, reapply adhesive as in Step 6 and rejoin before adhesive starts to set up.



d Check for proper seating. The scribed mark on the spigot (see Step 4a) should now be 1 inch (25 mm) from the end of the socket.

e Clean up and remove excess adhesive from outside of joint and from front, back, and inside of flange. Flange face must be clean and free of adhesive.

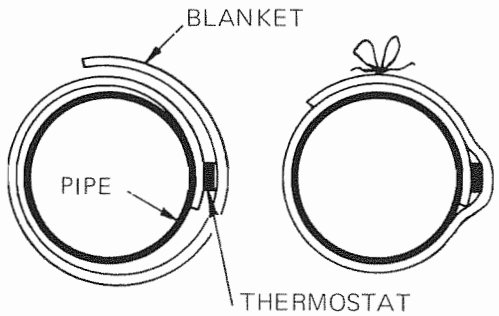
8a Cure adhesive joints as follows:

Place the thermostat end of your Bondstrand heating blanket against the assembled joint with the thermostat side facing out from the joint. Wrap the remainder of the blanket around the joint so that overlap, if any, will cover the thermostat. Tie the blanket in place with any nonconducting tie.

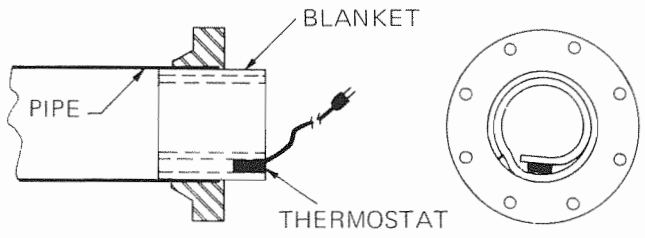
b It is always a good idea to insulate around the heating blanket and to close the pipe ends. This is essential when it is windy or when the air temperature is below 40°F (4°C). Fiberglass insulation backed with alumi-foil generally works well. Insulation should overlap the blanket sides about 4 inches (100 mm) each way and be tied down near the edges to trap the heat.

Caution: Joint must not be moved, vibrated, or otherwise disturbed during cure of adhesive.

c Flange mounting requires a special wrap. Lay the blanket flat with the thermostat down and, starting at the thermostat end, roll up the blanket. Insert the rolled blanket into the pipe end the depth of the fresh joint, leaving the cord and part of the blanket exposed as shown. Fill the space inside the rolled blanket with fiberglass insulation or some other heat resistant materal to ensure that the blanket remains snugly against the inside joint surface.



Standard Wrap for Pipe and Fitting Joints



Special Wrap for Flange Mounting

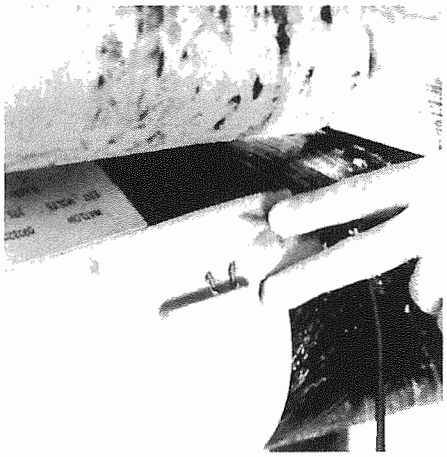
d Apply alternating current (ac) at the voltage marked on the heating blanket, and mark the starting time on the pipe. Make sure the blanket is operating and, in fact, heats up.

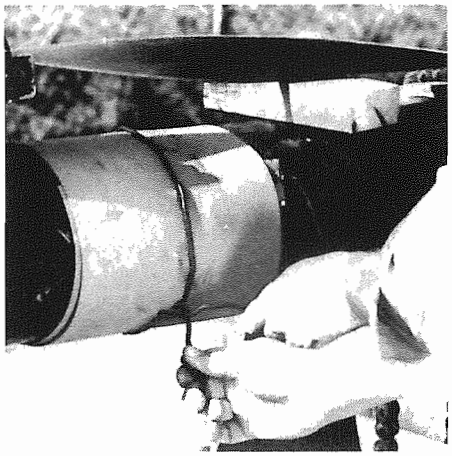
9 All adhesives are cured with an Ameron-approved heating blanket. However, the proper cure time depends on the choice of adhesive and the conditions of service. Table 5 summarizes the cure times required. Operating pressure and temperature conditions must, of course, not exceed the rating of the parts being joined (see Bondstrand Fittings Engineering Guide).

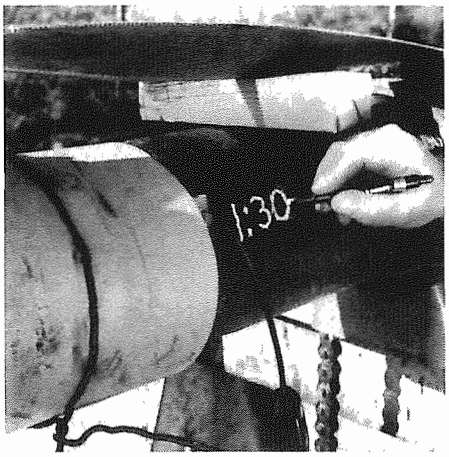
Table 5
Cure Times

Bondstrand Adhesive	30 minutes or 45 minutes(1)	60 minutes or 75 minutes(2)
RP-6A(3)	Yes	No
RP-34(4)	Yes	Yes
RP-48(4)	Yes	Yes
RP-60	No	Yes
RP-105(3)	Yes	No

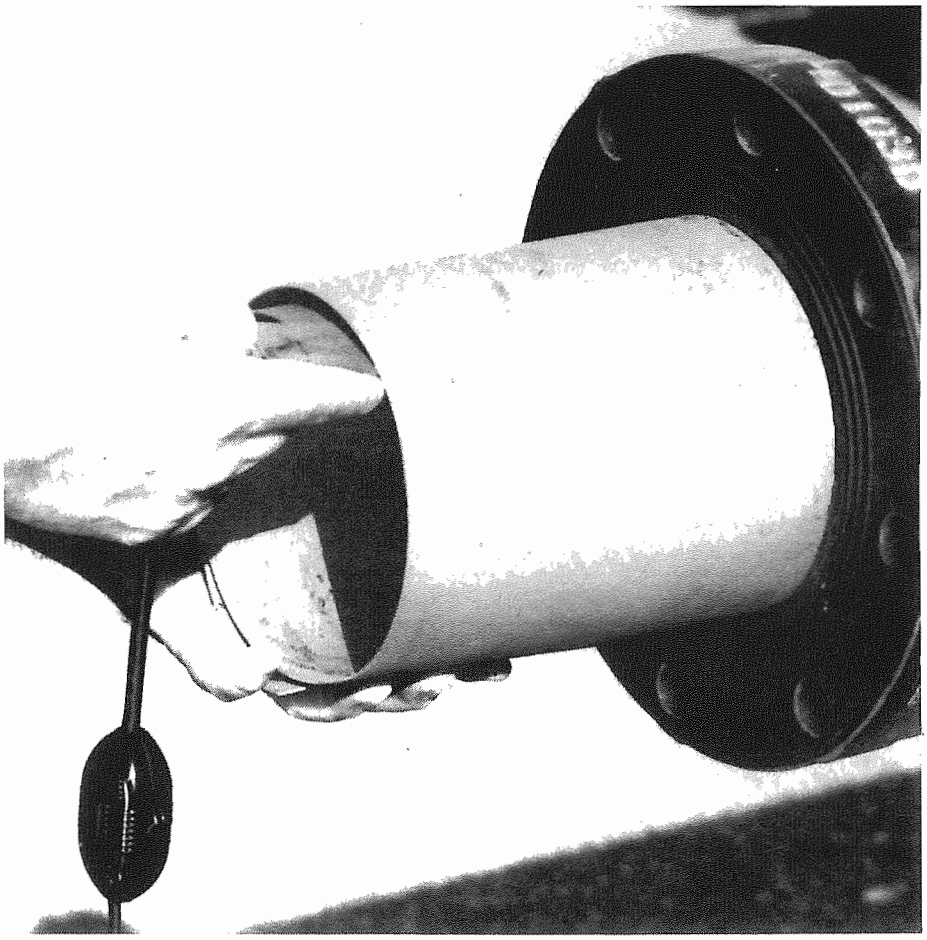
(1) Use a 30-minute cure for pipe joints and flange mountings, and a 45-minute cure for fittings.
(2) Use a 60-minute cure for pipe joints and flange mountings, and a 75-minute cure for fittings.
(3) For blocked or buried installations with operating temperatures above 150°F (66°C) contact your Ameron representative for recommendations.
(4) To select proper cure time for RP-34 and RP-48 epoxy adhesives, see discussion in text.






1:30





For RP-34 and RP-48 only

Selection of the proper cure time for RP-34 and RP-48 epoxy adhesives depends on (1) whether the piping system is restrained against length changes, and (2) the maximum operating temperature and pressure expected in the system. The following rules apply.

a Rules for pipe systems not restrained.

Here the concern is pressure and the loads across the joint due to pressure. This occurs when the pipe is free to move at turns and not blocked or buried. The joint must carry the full end loads caused by pressure. In this case, temperature affects only the strength of the joint; it does not add appreciable load to the joint.

Rule 1. If the pressure in the system at the operating temperature is equal to or less than shown in Table 6, use a 30-minute cure for pipe joints and flange mountings, and use a 45-minute cure for fittings.

Rule 2. If the pressure in the system at the operating temperature is greater than shown in Table 6, use a 60-minute cure for pipe joints and flange mountings, and use a 75-minute cure for fittings.

b Rules for pipe systems restrained.

In restrained systems the concern is temperature-induced loads such as in the joints of a block or buried system, and Table 6 does not apply. Here the blocks substantially absorb the pressure loads so the stress in the joint due to pressure is greatly reduced. However, substantial loads are introduced into the pipe and joints by temperature change in a pipe restrained against change in length.

Rule 1. If the operating temperature in the system is less than 100°F (38°C), use a 30-minute cure for pipe joints and flange mountings, and use a 45-minute cure for fittings.

Rule 2. If the operating temperature in the system is greater than 100°F (38°C), and does not increase more than 200°F (110°C) from its coldest condition to its hottest condition, use a 60-minute cure for pipe joints and flange mountings, and use a 75-minute cure for fittings.

Exception: If the temperature of the system can change more than 200°F (110°C), contact your Ameron representative for more explicit instructions.

Read this if assembling and installing coated Bondstrand Series 5000 pipe.

For Assembly

(Steps refer to Assembly Instructions.)

1 Cutting pipe. When cutting pipe to length, measure the desired length and scribe the coating using a pipefitter's wraparound. Without removing the coating, cut the pipe as in Step 1.

2 Shaving. To prepare spigot ends on cut pipe, it is not necessary to first remove the coating. Simply mount

Table 6
Maximum Allowable Pressures for a 30- or 45-Minute Cure* for Pipe Systems not Restrained (see Step 9a above).

Nominal Diameter	70°F 21°C	150°F 66°C	200°F 93°C	250°F 120°C	300°F 150°C
2" (50 mm)	450 psig 31 bars	260 psig 18 bars	190 psig 13 bars	160 psig 11 bars	130 psig 9.0 bars
3" (80 mm)	280 19	160 11	120 8.3	100 6.9	80 5.5
4" (100 mm)	215 15	125 8.6	90 6.2	75 5.2	60 4.1
6" (150 mm)	175 12	100 6.9	75 5.2	60 4.1	50 3.4
8" (200 mm)	150 10	85 5.9	60 4.1	50 3.4	40 2.8
10" (250 mm)	125 8.6	75 5.2	55 3.8	45 3.1	35 2.4
12" (300 mm)	115 7.9	65 4.5	50 3.4	40 2.8	30 2.1
14" (350 mm)	115 7.9	65 4.5	50 3.4	40 2.8	30 2.1
16" (400 mm)	115 7.9	65 4.5	50 3.4	40 2.8	30 2.1

*Tabulated maximum allowable pressures apply when heating blanket is operated 30 minutes for pipe joints and flange mountings, and 45 minutes for fitting joints. Pipe joints and flange mountings cured for 60 minutes and fitting joints cured for 75 minutes with a heating blanket develop the full rated pressure of the parts being joined.

shaver on coated pipe end and proceed as described in Step 2. Cutting head will remove coating as it advances and shaves the new spigot.

3 Factory-prepared pipe ends. Remove protective foamed coating from both spigot and socket ends of as-received pipe when ready to begin adhesive joint assembly. Paper layer at ends allows easy removal of coating to the necessary lengths. Then prepare spigots and sockets as required by Step 3.

4 Heat blanket curing. Coating removal from socket end will provide sufficient width for cure using a Bondstrand heating blanket. Direct contact between heating blanket and coating may cause a charred discoloration of the coating surface and possible bubbles or delamination. Although Ameron suggests this direct contact with the heating blanket be avoided, it has no detrimental effect on the pipe.

Note: *Protective coating removed at joints and supports need not be replaced.*

For Installation Aboveground

1 Saddles. Removal of the foamed protective coating is required at locations where saddles are to be bonded at hangers and supports. Use a rotary wire brush mounted on a drill motor for best results. Danger! Avoid inhaling dust produced by wire brushing. Provide adequate ventilation or wear OSHA-approved dust respirator.

2 Abrasion protection. Wherever movement of the pipe with respect to the supports is anticipated, a thermoplastic or metal wrapper should be strapped on over the coating to protect agaisnt wear and abrasion.

3 Heat tracing. For heat tracing of coated pipe contact your Ameron representative.

4 Paint coatings. Quality and integrity of the foamed protective coating may be extended by occasional application of an Ameron-recommended paint coating.

For Buried Installation

Buried installation of Series 5000 piping with foamed protective coating can proceed in accordance with normal Bondstrand installation procedures. No special instructions are required.

Recommended equipment for installing Bondstrand pipe.

(a) Pipe shaver and arbors (Ameron)*
(b) Hacksaw, saber saw, or abrasive wheel
(c) Ratchet winch, for 6" (150 mm) and larger, Dayton No. 2Z614
(d) Pi Tape® measuring tape
(e) White grease pencil or soapstone
(f) Rubber mallet, 2 lb. (1 kg), Shore A Durometer 70 - 80, 2-1/2" to 3" (60 to 75 mm) diameter
(g) Pipefitter's wraparound
(h) Disc grinder or file (optional)
(i) Heat blanket (Ameron)
(j) Electric 1/4" (6 mm) drive drill motor, 1700 - 2000 rpm
(k) Level
(l) Flapper wheel sander (Ameron)
(m) Folding rule, 10' (3 m)
(n) Tape, 50' (15 m)
(o) Duster brush or clean rags
(p) Portable power drive,* Ridgid® No. 700 or Amaz-O-Thred® 181D
(q) Pipe vise (Pilot No. 20) and 1/4" (6 mm) thick elastomer pad

* A large diameter shaver and power drive are required for 14- and 16- inch pipe.

Warranty

Ameron warrants its products to be free from defects in material and workmanship. Ameron's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Ameron's option, to either replacement of products not conforming to this Warranty or credit to Buyer's account in the invoiced amount of the non-conforming products. Any claim under this Warranty must be made by Buyer to Ameron in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the delivery date, whichever is earlier. Buyer's failure to notify Ameron of such non-conformance as required herein shall bar Buyer from recovery under this Warranty.

Ameron makes no other warranties concerning the products. No other warranties, whether express, implied or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply. In no event shall Ameron be liable for consequential or incidental damages.

Any recommendation or suggestion relating to the use of the products made by Ameron, whether in its technical literature, or in response to specific inquiry, or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and know-how in the industry, and therefore it is for Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedures of use, or extrapolation of data may cause unsatisfactory results.

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Ameron's liability on any claim of any kind, including claims based upon Ameron's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or part thereof which give rise to the claim. **In no event shall Ameron be liable for consequential or incidental damages.**

595 West Lambert Road
Brea, California 92621

Ameron®
Corrosion Resistant
Piping Division

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WHITE PLUMBING & HEATING, Inc.

P.O. BOX 1741 — TWIN FALLS, ID 83303-1741 — PHONE 208-733-4556

SHOP DRAWING FOR APPROVAL

TO: Heath Engineering Company DATE 4/9/85

377 West 800 North

Salt Lake City, Utah 84103

CONTRACT NO. J-501 TRANSMITTAL NO. 4 NEW SUBMITTAL XX

RESUBMITTAL ..... TRANSMITTAL NO. ..... P. O. NO. 1225

PROJECT Geothermal Project T.F.H.S. LOCATION Twin Falls, Idaho

SPECIFICATIONS SECTION ..... FOR BUILDING .....

PAR NO.	DESCRIPTION OF EQUIPMENT	MANUFACTURER	PUB. NO.	COPIES SUB'M.	ACTION TAKEN	COPIES RET'D.
	Ravanco Pipe	Rovanco		8		

Please return ..... approved copies to this office.

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Field

CONTRACTOR **WHITE PLUMBING & HEATING, Inc.**

MAILING ADDRESS **P.O. Box 1741, Twin Falls, ID 83303-1741**

By J.J. White

STANDARD TWIN FALLS

Supplier: Industrial Sales

2719 Lemel Circle
Salt Lake City, Utah 84115
Bill Lund 1-801-487-9831

☑ NO EXCEPTIONS TAKEN ☐ REJECTED

☐ EXCEPTIONS AS NOTED ☐ REVISE AND RESUBMIT

Checking is only for general conformance with the design concep of the project and general compliance with the information given in the contract documents. Any corrections or comments are subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.

HEATH ENGINEERING COMPANY

Date APR 16 1985 By Samuel D. Stow

ROVANCO® Corp.

Insul-8®

Manufacturers of Pre-Insulated Piping Systems

I-5 FRONTAGE ROAD
JOLIET, ILLINOIS 60436

PHONE: 815-741-6700
TELEX NO 72-3459

SUBMITTAL DATA

DATE: April 2, 1985

JOB NAME: Twin Falls High School

LOCATION: Twin Falls, Idaho

CONTRACTOR: Whites Plumbing & Heating

SYSTEM: Geothermal Supply - Below Ground

CARRIER PIPE: Series 1600 Bondstrand Fiber Reinforced Plastic, bell and spigot, designed to withstand 210° at 150 psi. 3" and 4" in 30-foot lengths.

INSULATION: Polyurethane foam with the following minimum characteristics: K Factor - .13, Density - 2 pcf, Closed Cell Content - 90-95% in conformance with MIL-I-24172 completely filling the annular space between the carrier pipe and jacketing.

JACKETING MATERIAL: High impact, seamless Polyvinylchloride (PVC) Class 12454-B compound conforming to ASTM 1784, Type 1, Grade 1.

Pipe Size	Jacket Size	Insulation Thick.	Jacket Thick.
4"	8"	1.75"	80 mils
3"	6"	1.25"	70 mils

INSULATION OF COUPLING JOINTS: As per the Metal Fittings Covers Instruction sheet which is attached. Refer to section "Poured In Place Insulation".

FITTINGS: All fittings will be filament wound Bondstrand 1600 bell by bell type.

ANCHORS: FRP pipe should be joined to steel systems with flanges. All steel systems should be anchored within 5 feet of connection point to eliminate any thrust, stress or torque from the steel pipe being transferred to the FRP. FRP transition anchor is recommended at all horizontal wall penetrations if the nearest anchor point is farther than 20' per Drawing #12-A, by others.

THRUST BLOCKS: All changes of direction will be poured in concrete thrust blocks to provide anchor points and direct expansion and contraction.

MFGR'S ASSISTANCE: Upon request, Rovanco can provide to the contractor a field service man on site to properly instruct the contractor's personnel in all phases of the installation.

February, 1982

FIELD INSTRUCTIONS FOR METAL JACKET AND METAL FITTING COVERS

Receipt and Handling of Insul-8 Piping

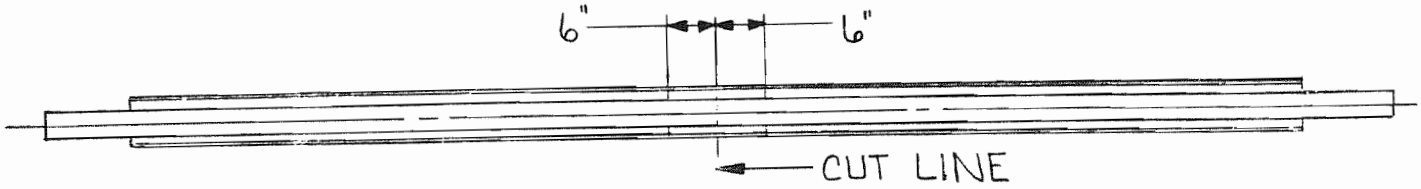
INSPECTION: All shipments should be inspected on receipt. Examine all pipe and accessories as they are unloaded. Make a thorough check to insure every item on the packing list is received. Check the contents of cartons to insure the materials have arrived safely. Do not throw the cartons from the vehicle. Handle all materials carefully at all times. Have the carrier make out a damage or short receipt if any discrepancies are found. Keep a signed copy of this receipt and notify Rovanco Corp. immediately. We will not be responsible for damage or shortages reported later than 3 days after receipt.

UNLOADING: Rovanco Insul-8 Systems are manufactured to withstand normal field handling but, like any piping, it can be damaged by careless handling. If using mechanical means for unloading, use nylon slings, not chains or chokers to unload the pipe. If the pipe is to be unloaded by hand, it can be slid one length on another, however, the bottom layer should be lifted to avoid damage to the casing from sliding on a rough surface. Do not whip, throw or drop the pipe. Lay the pipe on a flat surface.

STORAGE: Use dunnage material under the pipe and between successive layers to protect the casing from damage by foreign objects. Do not stack more than four layers high to avoid excess weight on the bottom casings. Prior to installation it is recommended that the pipe ends be covered with a canvas tarp or similar material. Plastic coverings are not recommended. Cartons of material (ie, tape, glue, foam kits, fiberglass adhesive, etc.) should be stored in a dry area at 60° to 70°F. Freezing or high temperature may effect the ability to preform their functions.

Field Fabricating Pipe

1. Select the point at which pipe is to be cut and mark this point on the casing.
2. Measure 6 inches on either side of this point and using a saber saw, hand saw, or similar device make two circumferential cuts through the casing.
3. Make two longitudinal cuts on either side of the pipe between the two circumferential cuts. Peel away the casing and knock off the exposed foam.
4. Using a wire brush or emery paper remove all foam residue from the exposed pipe. Cut the carrier pipe to measurement and dress ends appropriately.



INSULATING INSTRUCTIONS FOR USE WITH METALLIC CASING

Coupling Joints

Each length of Insul-8 piping comes with approximately 6 inches of pipe exposed at each end to allow for joining.

IMPORTANT: Read all instructions completely before proceeding with actual installation. It is recommended that a successful hydrostatic test per job specifications is completed before starting to insulate joint areas.

Material List

Insul-8 pipe joints and fittings are easily field insulated. You will receive the following materials from Rovanco Corp. with your order:

1. Containers of A & B Agent.



2. Mixer Head Attachment.



3. Mixing Cups.



4. Mixing Chart and Paper Towel.
5. Band-It Tool.
6. Banding Material.
7. 3/4" Plug for Sleeves.



8. Cleaning Solvent.



9. Measuring Cups.



10. Banding Clips.
11. RTV Caulk.
12. Metal Fitting Covers.

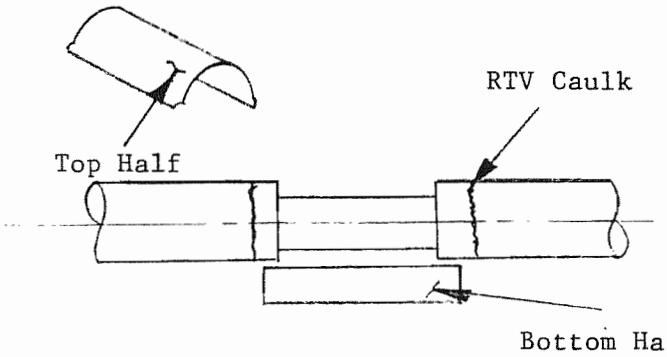
You will need to provide a 1500 R.P.M. (Min.) 1/4" drill, 3/4" drill, caulking gun, and a metal can for your cleaning solvent. Safety glasses or a face shield should be used during the insulating process.

Poured In Place Insulation

SLEEVE JOINT:

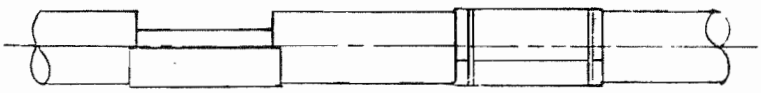
STEP #1

Apply bead of RTV sealant 1/2 inch from end of metal jacket.



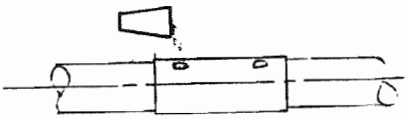
STEP #2

Put bottom half in place first - apply top half and use bands to hold in place.
A. Use temporary bands if you intend to remove the top half of the cover to inspect the foaming job.
B. Use permanent bands if you don't intend to remove the cover.



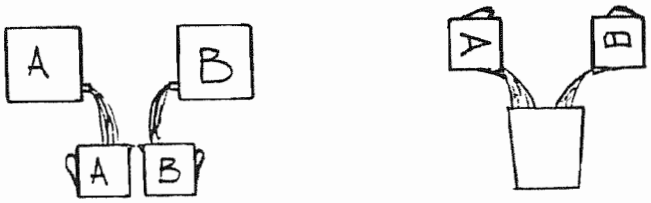
STEP #3

Drill a 3/4 inch hole in each end of the sleeve joint 3 inches from end of jacketing at 11 o'clock.
Mix foam as follows.



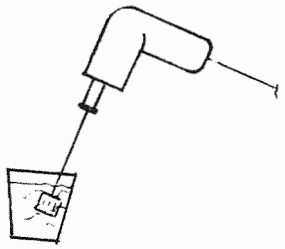
STEP #4

Examine the mixing chart (page 6) and pour the correct amount of A & B agents into separate measuring cups for the correct size fittings and thickness of insulation required. Some sizes require two or three separate mixes and pours. Pour the measured amounts of A & B material into the mixing cup. Be sure to use the same measuring cups for A & B on all mixes.



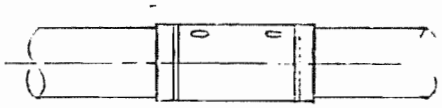
STEP #5

Using the 1/4" drill with mixer head attachment, mix the agents for approximately 30 seconds. After mixing you have approximately 45 seconds to pour the liquid before foaming action begins. Important: Pour a small amount of solvent into your small can for cleaning the mixer. Clean the mixer head after each use by submerging it in the solvent and triggering the drill enough to spin the mixer in the solvent.



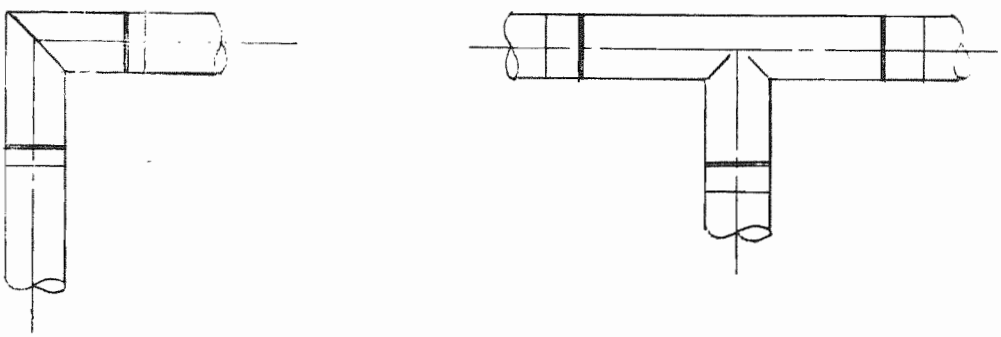
STEP #6

Pour foam into one of the holes and plug the hole with the plastic plug provided. Foam will grow until it comes out the opposite end. It is a good idea to apply a light coat of Johnson Paste Wax to the area around the relief hole so that the excess foam that comes out of the relief hole doesn't adhere to the sleeve. Remove excess foam from sleeve and insert plastic plug.



STEP #7

If you have used permanent bands you are now finished. If you used temporary bands and wish to inspect the foaming job, wait 15 min. and remove the bands and cover, repair any areas you wish and replace cover, or use a new top piece. Re-use the top piece with the holes in it as a mold for the next joint.
NOTE: Insulate els and tees in the same manner.



Flexible and Preformed Insulation

Wrap flexible batt insulation in joint area, covering entire joint. Batt insulation should be wrapped to approximately the same outside diameter as the jacket and taped in place.

Preformed insulation should be cut to fit the joint area snugly and taped in place.

The jacket should be fitted and caulked per Step #1 in "Poured In Place Insulation".

After completing Step #1, the joint is complete.

MEASURING CHART

TH'K REQ'D	MAT'L	CASING DIAMETER									
		4"	6"	8"	10"	12"	14"	16"	18"	20"	22"
1"	Cups A	1/4	1/2	2/3	3/4	1	1	1-1/4	1-1/3	1-1/2	1-3/4
	Cups B	1/4	1/2	2/3	3/4	1	1	1-1/4	1-1/3	1-1/2	1-3/4
1-1/2	Cups A	1/3	2/3	1	1-1/8	1-1/3	1-1/2	1-3/4	2	2-1/4	2-1/2
	Cups B	1/3	2/3	1	1-1/8	1-1/3	1-1/2	1-3/4	2	2-1/4	2-1/2
2"	Cups A	-	2/3	1	1-1/3	1-2/3	2	2-1/4	2-2/3	3	3-1/4
	Cups B	-	2/3	1	1-1/3	1-2/3	2	2-1/4	2-2/3	3	3-1/4

NOTE:

1. Quantities shown are for 12" long couplings. Adjust amounts as required to fill joints.
2. Larger mixes may require quantities shown broken down to two or three pours.
3. For best results, maintain A & B agents as close to 70°F as possible.

MIXING AND POURING TIME

Temperature °F	95°	85°	75°	66°	49°	32°
Mixing Time Sec.	20	20	30	50	90	120
Time to Rise Sec.	20	30	45	60	90	165

Insul-8 SYSTEMS BY Rovanco Corp.

SCALE: CH5 | APPROVED BY: | DRAWN BY

DATE: 4-30-80 | REVISED 10-26-83

MIXING CHART- FIELD JOINTS

DRAWING NUMBER

Bondstrand®
Series 1600
Pipe Engineering Guide

Pipe

Bondstrand Series 1600 pipe is filament-wound using continuous glass filaments and epoxy resins to provide a strong, uniform matrix through the entire wall. The pipe is available in 2- through 12-inch diameters and has excellent structural strength.

Series 1600 pipe is intended for applications up to 210°F (99°C) where the glass reinforcement does not require protection from chemical attack. For recommended chemical applications, see "Bondstrand Chemical Resistance Chart for Series 1200 and Series 1600 Piping," BC-2.

Fittings and Flanges

A complete line of fittings and flanges is available. In addition, standard 180° blank saddles for clamping and abrasion protection at supports and anchors, and maintenance couplings for quick repair are compatible with Series 1600 pipe.

Joints

Series 1600 pipe and fittings may be joined using Ameron's Quick-Lock® bonded bell and spigot joints, flanged connections or mechanical joints designed to fit steel pipe outside diameters.

1. Quick-Lock joints are assembled using Bondstrand RP-34, a thermosetting epoxy adhesive with excellent proven strength and performance. Joints assembled and cured in accordance with Ameron's instructions are as strong as the pipe under most loading conditions. A "pipe stop" in the bell end ensures predictable laying lengths for quality pipe assembly.

2. Flanges match the bolt hole size and pattern of ANSI Standard B16.1 for 125-pound cast iron flanges, and ISO International Standard 2229 and ANSI Standard B16.5 for 150-pound steel

Table 1
Physical Properties of Bondstrand Series 1600 Pipe

	at 70°F (21°C)	at 150°F (66°C)	at 210°F (99°C)
Circumferential			
Tensile stress, at weeping (ASTM D 1599)*	18,500 psi (128 MPa)	—**	—**
Modulus (Ameron)	3.65 x 10^6 psi (25,200 MPa)	3.44 x 10^6 psi (23,700 MPa)	3.16 x 10^6 psi (21,800 MPa)
Poisson's ratio (Ameron)	0.56	0.60	0.70
Longitudinal (ASTM D 2105)			
Tensile strength*	8,500 psi (59 MPa)	7,800 psi (54 MPa)	6,800 psi (47 MPa)
Modulus	1.60 x 10^6 psi (11,000 MPa)	1.35 x 10^6 psi (9,300 MPa)	1.16 x 10^6 psi (8,000 MPa)
Poisson's ratio	0.37	0.39	0.42
Beam (ASTM D 2925)			
Apparent elastic modulus	1.70 x 10^6 psi (11,700 MPa)	1.30 x 10^6 psi (9,000 MPa)	0.94 x 10^6 psi (6,500 MPa)
Coefficient of Linear Thermal Expansion	10 x 10^{-6} in./in./°F (18 x 10^{-6} m/m/°C)		
Coefficient of Thermal Conductivity	2.3 Btu·in./h·ft^2·°F (0.33 W/m·K)		

*Divide indicated stresses by a suitable factor, usually 3, to obtain an allowable design stress.
**Tensile stress at weeping increases with temperature in the short-time test of ASTM Test Method D 1599.

1 Mpa = 1 N/mm^2

Ameron®

flanges. Filament-wound flanges may be drilled to comply with ISO International Standard 2084 on special order. Bondstrand filament-wound epoxy flanges may be bolted against raised-face steel flanges without using spacers.

3. Mechanical joints, such as Dresser, Viking-Johnson, Rockwell, Straub and others which by means of an elastomeric gasket or gland are designed to seal against the outside diameter of standard steel pipe, will usually also work with Bondstrand Series 1600 pipe with little or no modification of the pipe ends. Contact your Ameron representative for further information. Bondstrand adaptors are available to fit ANSI/AWWA Standard C111 ductile iron and gray iron mechanical joints.

Approvals

1. Bondstrand Series 1600 epoxy pipe and filament-wound fittings joined with RP-6A adhesive meet FDA requirements for materials used in conveying foods intended for human consumption under U.S. Federal Regulations 21 CFR 175.105 and 21 CFR 177.2280. Bondstrand RP-34 epoxy adhesive is approved by the National Sanitation Foundation (NSF) for use in potable water service.

2. Bondstrand Series 1600 epoxy pipe and filament-wound fittings have been accepted by the U.S. military for use in buried jet fuel and other petroleum lines and air start systems.

Guidance for Proper Assembly

The Quick-Lock joints on most Series 1600 piping installations are bonded using Bondstrand RP-34 epoxy adhesives. Complete assembly instructions for bonded joints are found in Bondstrand Assembly Instructions—RP-34 Epoxy Adhesive, BA-6. Further helpful information on handling and assembly is given in the Bondstrand Guide for Installing Suspended Pipe, BEG-7, and the Bondstrand Guide for Installing Buried Pipe, BEG-3.

Table 2
Pipe Dimensions and Second Moments of Area

Nominal Diameter		Ameron Commodity Code	Diameter				Total Wall				Beam Second Moment of Area[1]	
			Inside		Outside		Minimum Thickness		Average Sectional Area			
in.	mm		in.	mm	in.	mm	in.	mm	$in.^2$	cm^2	$in.^4$	Million mm^4
2	50	33865	2.09	53.1	2⅜	60.3	0.140	3.56	1.13	7.3	0.65	0.27
3	80	33866	3.22	81.8	3½	88.9	0.140	3.56	1.70	11.0	2.19	0.91
4	100	33867	4.14	105.2	4½	114.3	0.180	4.57	2.73	17.6	5.92	2.47
6	150	33868	6.26	159.0	6⅝	168.3	0.180	4.57	4.06	26.2	19.6	8.15
8	200	33869	8.22	208.8	8⅝	219.1	0.200	5.08	5.83	37.6	48.4	20.2
10	250	33870	10.35	262.9	10¾	273.1	0.200	5.08	7.31	47.1	95.2	39.6
12	300	33871	12.35	313.7	12¾	323.9	0.200	5.08	8.69	56.0	160.	66.7

Note:
1. Values shown are for the composite moment of inertia of the total pipe wall cross-section in terms of the structural wall.

Table 3
Rated Pressures, Volumes and Weights of Pipe

Nominal Diameter		Rated Internal Operating Pressure[1] at 200°F (93°C)		Rated External Pressure[2] at 70°F (21°C)		Fluid Volume		Shipping Weight	
in.	mm	psi	bar	psi	bar	gal/ft	m^3/m	lb/ft	kg/m
2	50	550	38	>1000	>70.	0.18	0.0022	0.9	1.3
3	80	450	31	450	31.	0.42	0.0052	1.3	1.9
4	100	450	31	450	31.	0.70	0.0087	2.1	3.1
6	150	300	21	130	9.0	1.60	0.0199	3.1	4.6
8	200	250	17	79	5.5	2.76	0.0342	4.4	6.6
10	250	200	14	40	2.7	4.37	0.0543	5.6	8.3
12	300	175	12	23	1.6	6.22	0.0773	6.6	9.9

Notes:
1. Pipe internal pressure ratings are for pipe joined using Bondstrand RP-34 epoxy adhesive.
2. Pipe external pressure ratings are reduced linearly to 90 percent at 150°F (66°C), and to 80 percent at 210°F (99°C). Ratings given are 75 percent of minimum ultimate collapse pressure.

Guidance for Suspended Pipe

Ameron's recommendations for maximum support spacings at various operating temperatures in aboveground or suspended pipe installations are given in Table 4. The Bondstrand Engineering Guide for Suspended Pipe, BEG-13, provides guidance and helpful information on general design principles for optimum piping performance as well as hanger detailing and span adjustment for various fluid specific gravities. The guide also covers piping expansion and contraction, and includes information needed for the design of piping systems restrained against movement.

Guidance for Buried Pipe

The Bondstrand Guide for Installing Buried Pipe, BEG-3, gives information needed for the design and installation of buried piping systems. It recommends bedding and backfilling procedures for proper installation, and provides thrust values and other helpful information for the design of thrust blocks.

For Series 1600 pipe with sand bedding in stable soils, thrust blocks are not required for piping systems at ambient temperatures. For service at elevated temperatures, blocking will generally be required. For technical advice on a particular project, contact your Ameron representative and provide him with all the details of your installation.

Table 4
Recommended Maximum Support Spacings for Pipe at Various Operating Temperatures

Nominal Diameter		Recommended Support Spacing (s.g. = 1.0)					
		@ 100°F (38°C)		@ 150°F (66°C)		@ 210°F (99°C)	
in.	mm	ft	m	ft	m	ft	m
2	50	12.1	3.7	11.3	3.4	10.3	3.1
3	80	14.1	4.3	13.1	4.0	12.0	3.6
4	100	15.9	4.9	14.8	4.5	13.5	4.1
6	150	17.9	5.5	16.6	5.1	15.2	4.6
8	200	19.7	6.0	18.4	5.6	16.8	5.1
10	250	21.0	6.4	19.5	6.0	17.9	5.5
12	300	22.0	6.7	20.5	6.2	18.7	5.7

Notes:

1. Span recommendations are intended for normal horizontal piping support arrangements, a compromise between continuous spans and simple spans, but include no provision for weights (fittings, valves, flanges, etc.) or thrusts (branches, turns, etc.).
2. Span recommendations are calculated for a maximum long-time deflection of ½ inch to ensure good appearance and adequate drainage.
3. Fully continuous spans may be used with support spacings up to 20 percent greater for this deflection; in simple spans, support spacings should be 20 percent less.

Loads on Buried Pipe

In stable soils, Series 1600 pipe properly bedded in compacted sand (see part 4, "Bondstrand Guide for Installing Buried Pipe," BEG-3) will carry H20 wheel loadings of 16,000 pounds (7300 kg) or more if a cover of at least 3 feet (0.9 m) over the pipe is provided. Maximum cover loads for each size are given in Table 5. Heavier wheel loads, less cover than 3 feet, more cover than allowed in table, or unstable soil will require engineering evaluation. The annexes to ASTM Standard Practice D 3839 and the appendix to ASTM Test Method D 2412 provide information for calculation of loads on pipe and approximate pipe deflections.

Table 5
Load-Deflection Characteristics and Maximum Cover Over Pipe

Nominal Diameter		Stiffness Factor[1]		Pipe Stiffness[1]		Max. Cover[2] in feet			Max. Cover[2] in meters		
							lb./in.²			bars	
in.	mm	lbf·in.	N·m	lbf/in.²	kN/m²	<100	125	150	<6.9	8.6	10.3
2	50	820	92	3,900	27,000	30	30	30	9.1	9.1	9.1
3	80	820	92	1,140	7,900	30	30	30	9.1	9.1	9.1
4	100	1,660	187	1,100	7,600	30	30	30	9.1	9.1	9.1
6	150	1,660	187	330	2,300	24	23.5	23	7.3	7.2	7.0
8	200	2,200	250	200	1,380	22.5	22	21	6.9	6.7	6.4
10	250	2,200	250	102	700	22.5	21	19.5	6.9	6.5	6.0
12	300	2,200	250	60	410	23	21	19	7.0	6.4	5.8

Notes:

1. Stiffness factor and pipe stiffness are short-time characteristics at 5 percent deflection derived from tests at 70°F (21°C) in accordance with ASTM Test Method D 2412.
2. Maximum cover is based on a column of soil at 120 pounds per cubic foot (18.9 kN/m³) and a sand bedding with a modulus of soil reaction (E') of 1000 pounds per square inch (6900 kN/m²).

Heat Transfer in Air

To obtain heat flow rate in Btu/h(W), multiply the heat transfer coefficient from Table 6 by the pipe length in feet and the temperature difference in degrees F. For example, assume a 300-foot length of 8-inch Bondstrand is carrying a fluid at 140°F in an ambient air temperature of 60°F. Calculate the heat flow rate as

Φ = 3.66 (140 - 60) (300)
= 87,800 Btu/h

or in SI units

Φ = 6.33 (60 - 16) (92)
= 25,600 Watts.

If the fluid is water at 23.8 pounds per foot of pipe and there is no flow, the temperature drop of the fluid is 87,800/(300 x 23.8) or 12°F per hour. If the fluid is flowing at 5 feet per second, the required flow time is only 300/5 or 60 seconds, and the temperature drop in the fluid is only 12/60 or 0.20°F.

Head Loss

Figure 1 permits the determination of head loss in pipe due to friction from a known fluid discharge or quantity of flow. The graph is based on the Hazen-Williams equation for water at 70°F (21°C) using a C-factor of 150 for Bondstrand pipe.

Head loss in fittings may be determined from Figure 1 after obtaining their equivalent pipe lengths using Figure 2. For example, find the equivalent pipe length (L_e) for water flowing through a 6-inch diameter elbow at a rate of 100 gallons per minute. Beginning at the bottom of the chart given in Figure 2 at a flow of 100 gpm, proceed vertically to intersect the 6-inch diameter curve, and read L = 24 feet on the left ordinate. Multiply this value by the K value given for 90 degree elbows to obtain equivalent pipe length,

L_e = 24 x 0.5 = 12 feet

Table 6
Typical Heat Transfer Coefficients for Bare Pipe in Still Air[1]

Nominal Diameter		Moderate Temperatures[2]		Severe Temperatures[3]	
in.	mm	Btu/h·°F per ft of pipe	W/°C per m of pipe	Btu/h·°F per ft of pipe	W/°C per m of pipe
2	50	1.15	1.98	1.33	2.30
3	80	1.66	2.87	1.93	3.33
4	100	2.02	3.50	2.33	4.04
6	150	2.90	5.02	3.35	5.79
8	200	3.66	6.33	4.21	7.28
10	250	4.52	7.82	5.20	9.00
12	300	5.31	9.19	6.12	10.6

Notes:
1. Heat lost in a 10 mph wind will be about twice as great.
2. Temperature of inside pipe surface = 140°F (60°C); ambient air temperature = 50°F (10°C).
3. Temperature of inside pipe surface = 200°F (93°C); ambient air temperature = 32°F (0°C).

Figure 1.
Head loss in Bondstrand pipe as a function of flow rate.

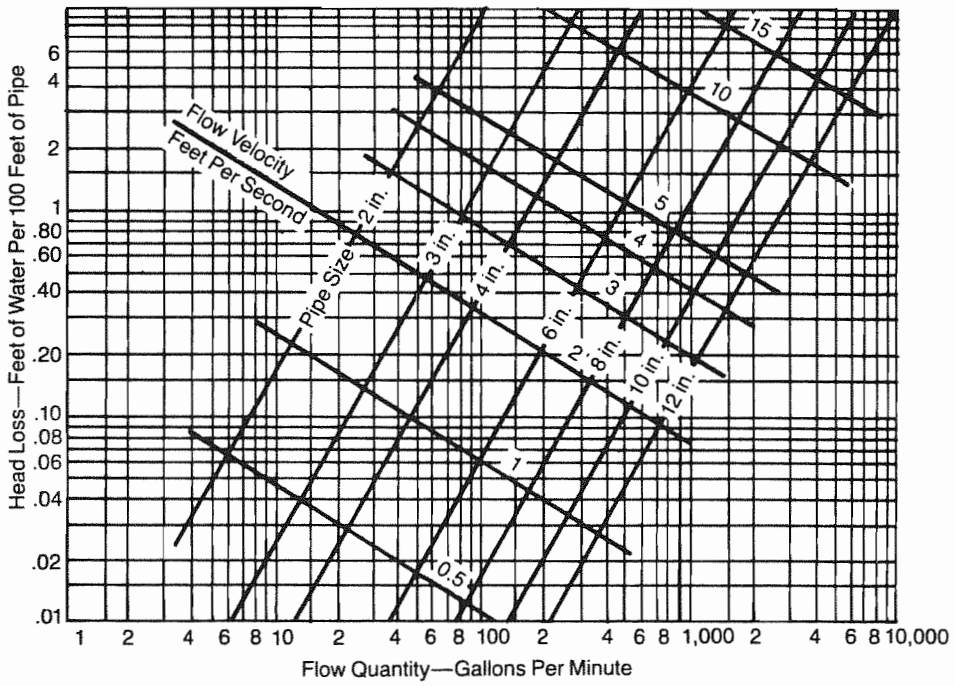
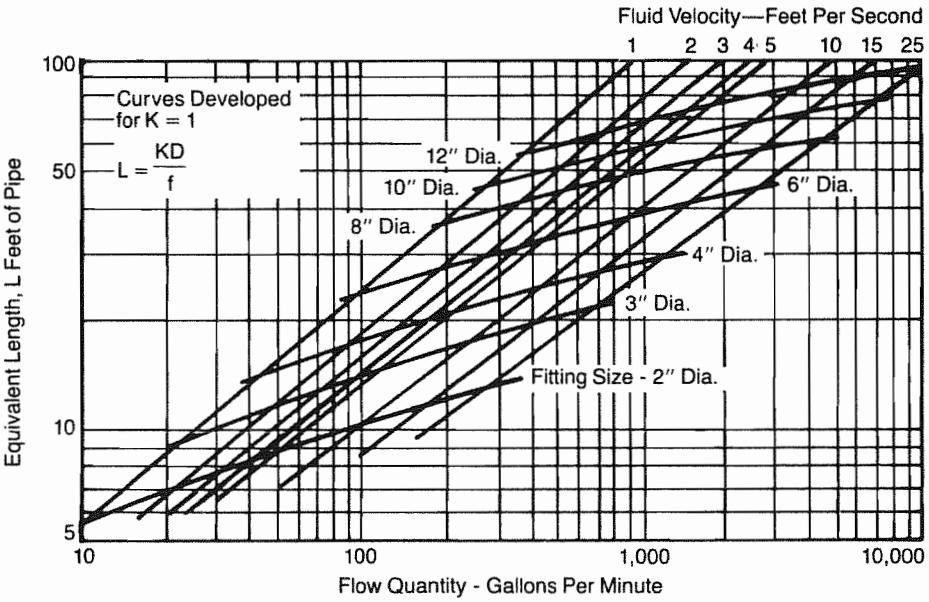


Figure 2.
Chart for determining equivalent pipe length of Bondstrand Quick-Lock fittings.



Description	Values of K (Note 2)
45° Elbow	0.3
90° Elbow	0.5
180° Return Bend	1.3
Tees 	0.4
	1.4
	1.7

Reducers, Tapered Body (See Note 1)

Size	6x4	8x4	8x6	10x6	10x8	12x8	12x10
K Value	0.42	0.57	0.31	0.57	0.27	0.47	0.17

Notes:

1. Use smaller diameter for determining equivalent pipe length for reducers.

2. Ehrlich, Stanley W., "Cryogenic-Systems Piping," *Piping Handbook*, ed. King, Reno C. and Sabin Crocker McGraw-Hill Book Co., 5th Edition, N.Y., pp11-37, 38.

Reference Literature

1. Bondstrand Fittings Engineering Guide, BEG-6.

2. Bondstrand Chemical Resistanc Chart, Series 1200/1600 Pipe and Fittings, BC-2.

3. Bondstrand Engineering Guide f Suspended Pipe, BEG-13.

4. Bondstrand Assembly Instructior RP-34 Epoxy Adhesive, BA-6.

5. Bondstrand Assembly Instructior RP-6A Epoxy Adhesive, BA-14.

6. Guide for Installing Buried Bondstrand Pipe, BEG-2.

7. Epoxy Fiberglass Pipe and Its Applications, BER-4.

Your Bondstrand distributor also ha literature on thermally induced loac head loss, fire resistance, blocking requirements, and other special subjects which he will be pleased t supply on request.

Important Notice

This product literature and the recommendations for usage it cont are based on test data reasonably believed to be reliable. It is intende that this literature be used by persor having specialized training in accordance with currently accepte industry practice and normal opera conditions. Variations in environme changes in operating procedures, extrapolation of data may cause unsatisfactory results. We recomme that your engineers verify the suitat of this product for your intended adaptation. Since we have no contr over the conditions of service, we expressly disclaim responsibility for results obtained or for any consequential or incidental damage any kind incurred.

Written comments regarding this document are invited. Please write Director of Engineering, Ameron Corrosion Resistant Piping Division 595 West Lambert Road, Brea, California 92621.

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Guide for Installing Buried Pipe

Introduction

To ensure long life and trouble-free service from a piping system, proper application of the essential principles of excavation, laying and jointing, bedding, backfilling and field testing is required. If pipe is installed by a contractor it is equally essential that these principles be reflected in the phrasing of contract documents and that the customer enforce them through its inspection.

The recommended practices presented in this guide for the installation of buried Bondstrand pipe are developed from the two basic concepts outlined below. Both should be rigorously maintained to obtain best results.

First, the manufacturer's recommendations for assembling pipe sections and curing the joints should be carefully followed. Second, each section of pipe should have its support well distributed under the pipe rather than concentrated at points or along a narrow portion of the pipe bottom. This is accomplished by providing proper bedding.

These instructions are intended to be used as a guide and should be amended and expanded to meet the requirements of a specific job. Because any specification should be properly administered and enforced, there is no assurance—specific or implied—that inclusion of these paragraphs in a specification will insure a successful job; however, they should assist materially in accomplishing this objective.

1. Receiving, Storing and Handling of Pipe

1.1 Inspect incoming shipments of Bondstrand pipe and fittings for abuse in shipping. Broken pipe bundles, crushed fittings boxes, scratched and gouged pipe and pipe with crushed or split ends are evidence of such abuse. If abuse is evident, damage claims procedures must be initiated prior to accepting the shipment. Under shipping procedure, title passes at the time of shipment.

1.2 Do not throw or drop pipe and fittings—protect from all types of impact. Bondstrand may be damaged by careless handling, sometimes without exhibiting visible effects on the pipe surface.

1.3 Pipe or pipe bundles may be stored for extended periods in stacks up to 4 feet high. The sides must be stabilized to prevent slumping. A leveled, soft earth surface free of rocks and other hard or sharp objects is recommended. If stored in racks or on bearing boards, the supports should be at least 3 inches wide and smooth or cushioned. The supports should be placed at two locations approximately 4 or 5 feet from each end for 20-foot lengths. For 40-foot lengths, 4 supports should be used with two of them placed approximately 4 or 5 feet from each end and the other two placed at 10-foot intervals to support the middle of the pipe.

1.4 Follow normal procedures for stringing pipe along work site, placing pipe where it will be protected from traffic and impact.

1.5 Pipe supplied in 20-foot lengths should be lifted and carried at the center by hand or using webbed straps or rope. If handled at the ends, avoid touching and contaminating the joining surfaces.

1.6 Pipe supplied in 40-foot lengths should be lifted (and carried) at two points about 10 feet from each end. Use rope or web slings for mechanically lifting the pipe. Weights of 40-foot lengths are:

Diameter (in.)	Weight (40-ft length) lb
4	75
6	120
8	170
10	215
12	250

1.7 For work on the pipe, such as cutting, preparing ends, or cleaning, two-point support is recommended for 20-foot lengths, and three-point support for 40-foot lengths.

Note: Do not place supports under bells, spigots or factory-made joints.

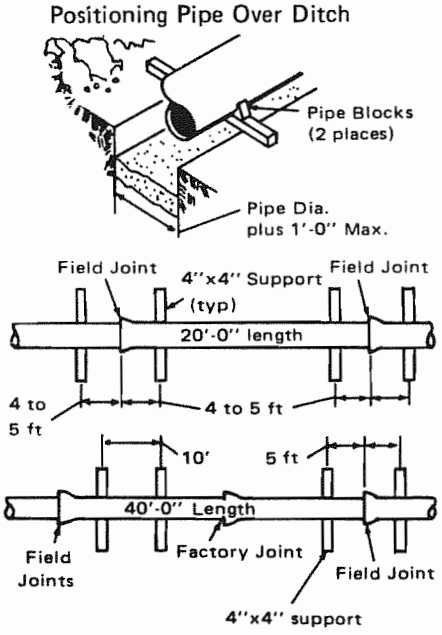
2. Assembly of Pipe and Fittings

2.1 Prepare and assemble Bondstrand Quick-Lock® joints in accordance with the Bondstrand Assembly Instructions, using special care to keep joint surfaces clean and dry.

Note: Be sure all pipe assemblers are thoroughly trained in Bondstrand assembly procedures, and recognize the importance of using proper techniques.

2.2 Position pipe on timbers across ditch as shown in figure below. Block into position to hold alignment and prevent lateral movement. For larger sizes the use of a winch is recommended to assemble and hold joint as illustrated in Bondstrand Assembly Instructions.

Positioning Pipe Over Ditch



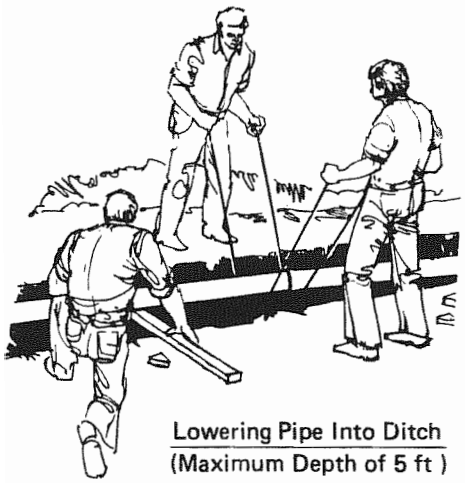
Ameron®

3. Placing Pipe in Ditch

3.1 Join the pipe sufficiently in advance of the pipe lowering operation so that no movement of the pipe will take place at location where joints are being cured. Any vibration or movement of uncured or partially cured joints will increase the risk of joint failures.

3.2 With power equipment or manpower, raise the pipe slightly to slide the timber support from under the pipe. Lower the pipe into the ditch. Do not drop or lower suddenly (see fig. below). Repeat the above operation at each support. Use rope or webbed sling for lifting pipe.

If manpower is used, it is suggested that two men be used for lifting and lowering 6-inch pipe, and four men be used for the 8-inch and 10-inch pipe.



Lowering Pipe Into Ditch (Maximum Depth of 5 ft)

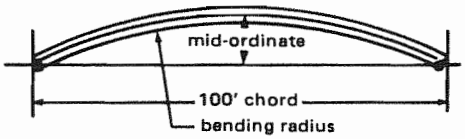
3.3 Should the depth of the trench measured from the top of the supports upon which the pipe is assembled to the trench bottom exceed 5 feet, do not lower the pipe into the trench by the method outlined in 3.2 as it may overstress the pipe. It shall be the customer's responsibility to submit specific laying conditions (trench depth, handling equipment, pipe diameter, etc.) to Ameron for an evaluation and recommendation for trench depths in excess of 5 feet.

3.4 Pipe may be placed in the ditch on a curved alignment provided the curvature in the installed pipe is uniform and does not exceed the following:

Pipe Diameter (in.)	Mid-Ordinate to 100-ft Chord Length (ft)	Bending Radius (ft)
2	16.5	84
3	10.5	124
4	8.1	159
6	5.3	235
8	4.1	305
10	3.2	381
12	2.7	451

Curvature may be vertical, horizontal, or a combination of these. Restraints, if required for alignment control, shall each bear along a minimum of 4 inches of pipe surface.

Curvature Control Terminology



4. Bedding and Backfill

4.1 Bedding in the pipe zone should be sand and must not include rocks larger than 3/8 inches or sharp rocks of any size in direct contact with the pipe wall. Sand bedding under the pipe should be a minimum of 2 inches in thickness. Sand shall pass a 3/8-inch screen and not more than 15% shall pass a No. 200 sieve.

4.2 Accurately grade the trench bottom and sand bed to provide uniform bearing and support for each section of pipe along its entire length. (This will require a shallow depression for bells and couplings.) The grade shall have no abrupt changes in direction or slope except at fittings.

4.3 Do not cover the pipe joints until all required pressure tests are performed.

4.4 Sand shall be uniformly compacted around the pipe with particular care given to the bedding beneath the haunches of the pipe. Sand may be densified by hydraulic methods if the native soil in which the trench is excavated is free draining. If trench is not free draining, placement of damp sand will facilitate compaction. Sand bedding and backfill should extend a minimum of 6 inches above the pipe.

Note: Filling the pipeline with water or other means shall be used to prevent "flotation" of the buried pipe if hydraulic methods of consolidation are used in cohesionless soils.

4.5 Backfill shall be deposited in 6-inch maximum layers to a point at least two feet above the top of the pipe, each layer being compacted with suitable tampers to 85% of maximum density as determined in accordance with ASTM D1557 for cohesive soils, or to 70% relative density in accordance with ASTM D2049 for cohesionless soils which fail to produce a well-defined, moisture-density relationship when tested in accordance with ASTM D1557. Compacting shall be done so as to avoid damage to pipe wall. Remainder of backfill shall be placed as directed by the engineer.

In-place tests of soil density are made in accordance with ASTM D1556 or ASTM D2167.

Note: Mechanical compactors may be used provided harmful shock loads are not transmitted to the pipe. Maintaining a space of at least one foot between tamping feet and pipe wall should avoid damage to the pipe wall.

4.6 Where live load conditions do not exceed the conventional H20-S16 loading, minimum depth of burial measured from top of pipe should be three (3) feet for all diameters. At road crossings where the loading exceeds H20-S16, the pipe must be buried deeper, or consideration must be given to the use of a casing pipe. If casing is required, the use of collars or sleeves is suggested to provide protection for the pipe exterior. The pipe manufacturer will supply data on increased depth of burial upon request provided complete loading and soil conditions are submitted by the customer for an engineering analysis.

5. Thrusts

5.1 Evaluation of the need for thrust blocks is the responsibility of the engineering agency designing the system. Decision will depend on the exposure to temperature change, surges of internal pressure and geometry of the pipeline layout. For each of these factors, singly or in combination, the effect of movement and thrusts on the pipe joints and fittings must be evaluated.

(Additional information is found in Bondstrand Engineering Guides.)

5.2 Temperature changes produce stress in buried pipe which is restrained by friction of the surrounding bedding, by passive soil pressures at fittings, or by thrust blocks. Forces developed at fittings in fully restrained pipe are tabulated below.

Thrust in Pounds-Force at Fittings Due to 140°F Temperature Change in Epoxy Pipe

Nom. Dia. (in.)	At Tees or Ends	90° Elbows	45° Elbows
2	1,880	2,660	1,440
3	2,830	4,000	2,170
4	4,550	6,430	3,480
6	6,760	9,560	5,170
8	9,710	13,700	7,430
10	12,200	17,300	9,340
12	14,500	20,500	11,100

Initial temperature = 60°F; operating temperature = 200°F

5.3 Hydrostatic thrusts at fittings depend on the degree of restraint on the pipe bonded to those fittings. In a fully restrained pipe (blocked against movement at both ends) with all joints bonded, the Poisson effect produces considerable tension in the pipe wall; that is, as internal pressure is applied, the pipe expands circumferentially and at the same time tries to shorten longitudinally. This tensile force in the Bondstrand pipe wall acts to reduce by about 50 percent the hydrostatic thrust on a fitting. Hydrostatic thrusts at fittings in fully restrained systems may be obtained for 100 psi pressure from the following table and determined for other pressures by proportion.

Hydrostatic Thrust in Pounds-Force at Bondstrand Fittings Caused by 100 psi Pressure in a Fully Restrained System

Nom. Dia. (in.)	Tee	Elbow 90°	Elbow 45°	45° Lateral
2	170	245	130	170
3	405	575	310	405
4	675	950	515	675
6	1550	2200	1200	1550
8	2650	3750	2050	2650
10	4200	5950	3200	4200
12	6000	8450	4600	6000

Reducers			
3 x 2	235	8 x 6	1100
4 x 2	505	10 x 6	2650
4 x 3	270	10 x 8	1550
6 x 3	1150	12 x 8	3350
6 x 4	875	12 x 10	1800
8 x 4	1975		

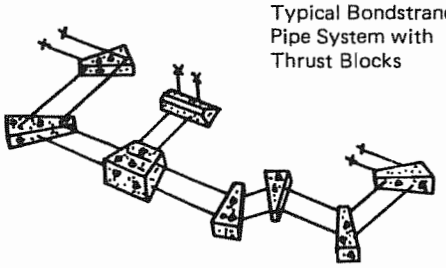
5.4 Valves should normally be blocked as indicated in 6.8 to support their weight, resist their thrust and to prevent excessive loads on the pipe connections because of applied torque.

5.5 Thrust blocks are required at hydrants and at 6-inch or larger diameter tees and elbows for fire water mains regulated by Factory Mutual Insurance.

6. Thrust Blocks—Design and Construction

6.1 Once the applied thrusts are determined, the designer of the thrust block must consider soil strength, soil stability and location of the water table. Blocks must have (1) adequate bearing area to resist the soil thrust, (2) bearing surface against undisturbed soil and (3) the resultant thrust vector passing perpendicularly through the center of the bearing surface (except for valves as in 6.8). Should the soil be unstable or the installation below the water table, the engineer will have to make special provision to ensure stability.

It is important to note that any connecting metallic pipe must be anchored at the point of connection to the RTR pipe to prevent excessive stresses being transferred to the RTR pipe.



Typical Bondstrand Pipe System with Thrust Blocks

6.2 Safe bearing pressures for several soil conditions are as follows:

Safe Bearing Pressure of Soils

Soil	S_p Safe Bearing (lbs/ft^2)
Rock, hard thick layers	400,000
Rock, equal to good masonry	50,000
Rock, equal to best brick	30,000
Rock, equal to poor brick	10,000
Clay, always dry	8,000
Clay, fairly dry	4,000
Clay, soft	2,000
Gravel, coarse sand, firm	16,000
Sand, compact, firm	8,000
Sand, clean, dry	4,000
Quicksand, alluvial soil*	— —

*Piles or tie rods may be required in loose or soft soils, particularly when below the water table.

6.3 Bearing area required is computed using the formula:

$$A_t = \frac{R}{S_p}$$ Where:

A_t = Bearing area of thrust block in square feet
R = Reaction in pounds
S_p = Allowable soil bearing pressure in pounds per square feet

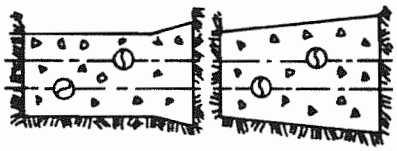
6.4 Thrust blocks for Bondstrand pipe systems should be poured after hydrostatic testing of the pipe. This will allow for clear visual inspection of all fitting joints during the test. To retain pipe in proper alignment while testing, the placement of sand bedding and backfill per 4.4 may be required. Joints may be left exposed for observation during test.

6.5 Thrust blocks should be shaped with the "designed bearing area" against virgin earth of the trench wall. Smaller blocks using a dry mix may be shaped by hands but larger blocks (2 square feet or greater) will require forms.



The trench should be undercut beneath the pipes at least 6 inches to give additional thrust resistance and to provide for an adequate concrete envelope around the fittings. At least 6 inches of concrete should be over the top of the pipe.

The center of the thrust block should coincide with the horizontal centerline of the pipe.

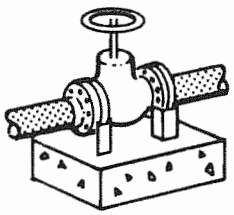


6.6 Unless otherwise specified by the engineer, an acceptable concrete is 1 part Portland cement, 2 parts washed sand and 3 parts washed gravel with enough water for a relatively dry mix. The dry mix is easier to shape and offers higher strength.

6.7 It is important that the concrete be "worked" thoroughly around the elbows for maximum surface contact. Take care that entire area between the fittings and the freshly cut trench wall is filled with concrete and free of voids.

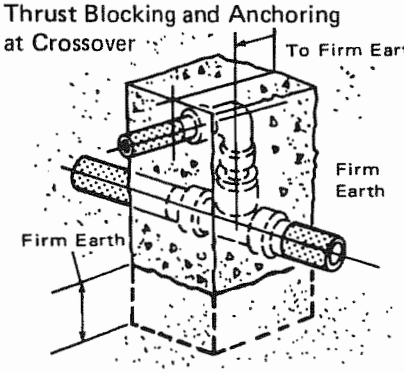
Maintain at least a 2-inch space between concrete vibrators and pipe or fittings while compacting concrete. Even indirect contact through concrete aggregate may deliver excessive impact loads; this must be avoided.

6.8 Valve blocks should be poured under valves with the necessary steel that can be connected to the valve. This supports the weight of the valve and resists any torque or twisting action caused by opening and closing of the valve.



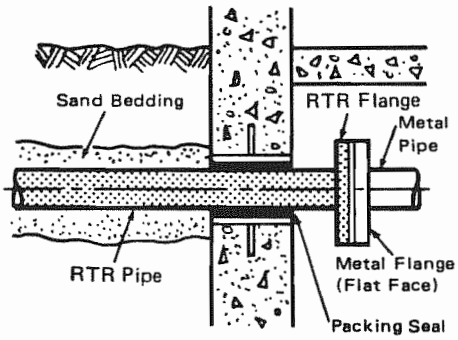
6.9 Thrust blocks for a crossover should be poured so that the crossover is encapsulated.

Thrust Blocking and Anchoring at Crossover



7. Manhole Penetrations and Connections

7.1 Bondstrand piping shall be laid in such a manner as to bypass manholes unless the drawings indicate otherwise. When Bondstrand pipe extends through a concrete wall, it shall be fitted into a metal pipe sleeve a minimum of two inches larger in [illegible] than the Bondstrand pipe size. The opening between the metal pipe sleeve and the Bondstrand shall be caulked with a waterproof compound which will dry to a firm but pliable mass.



7.2 Flange connections shall be assembled in accordance with Bondstrand Flange Assembly Instructions.

7.3 When connecting Bondstrand to a metal piping system, anchor metal line to avoid stress transfer to Bondstrand.

7.4 Support valves independently of the pipe.

8. Field Tests—Using Fluids

8.1 Pneumatic tests are not recommended because of safety considerations.

8.2 All free air in the Bondstrand pipe must be replaced by the test fluid. Provide taps for air and vapor removal at all high points in the sytem.

Important Notice

This product literature and the recommendations for usage it contains are based on test data reasonably believed to be reliable. It is intended that this literature be used by personnel having [illegible] with current, accepted industry practice and normal operating conditions. Variation in environment, changes in operating procedures, or extrapolation of data may cause unsatisfactory results. We recommend that your engineers verify the suitability of this product for your intended adaptation. Since we have no control over the conditions of service, we expressly disclaim responsibility for the results obtained or for any consequential or incidental damages of any kind incurred.

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BEG-3

TAPECOAT® Product Data

PRODUCT NAME:

TC MASTIC - HIGH TEMPERATURE BRUSH-APPLIED COATING

MANUFACTURER:

THE TAPECOAT COMPANY
A Division of TC Manufacturing Co., Inc.
1527 LYONS STREET
EVANSTON, IL 60204
PHONE: (312) 866-8500
TELEX: 25-4708 (TELESERV DFLD)

THE TAPECOAT COMPANY
OF CANADA, INC.
A Division of TC Manufacturing Co., Inc. USA
25 HAAS ROAD
REXDALE, ONTARIO, CANADA
PHONE: (416) 743-8705

PRODUCT DESCRIPTION:

BASIC USE: TC MASTIC - HIGH TEMPERATURE COATING is used in both above and below ground applications to combat corrosion on metal surfaces where high temperatures may occur. Valves, mechanical couplings, flanges and other irregular surfaces can be protected with this coating. It is also designed to protect foam insulation on insulated pipe.

COMPOSITION: A one-part solvent drying coating with chemically inert resins and fillers.
Solids by volume: 70%

TECHNICAL DATA:

VISCOSITY: 4,000 cps
FLASH POINT: 110-115°F
APPLICATION TEMPERATURE:
-20°F to 120°F
OPERATING TEMPERATURES:
-30°F to 280°F
FILM THICKNESS: 20 Mils Wet; 14 Mils Dry.
DRYING TIME AT 70°F:
To touch, 20 minutes
To backfill, 1 hour

APPLICATION:

Surface Preparation: Surface must be clean and dry. Moisture, dust, dirt, rust or other foreign matter should be removed by scraping or wire brushing. Oil and grease should be removed with a suitable solvent. On previously coated surfaces, remove all loose or incompatible coating.

Material Preparation: Slight stirring is required prior to use.

Method of Application: Brush or Glove.

Coverage: 80 square feet per gallon.

Clean Up: MT Product (available from The Tapecoat Company)

Precautions: Keep container away from heat and open flame. Keep container tightly closed when not in use. Use only where there is adequate ventilation and avoid prolonged breathing of vapor. Avoid prolonged or repeated contact with skin. Do not use in contact with potable water.

AVAILABILITY:

Available from stock in 1, 5 and 55 gallon containers. Net weight per gallon approximately 10 lbs.

WARRANTY: This product has been designed for use by persons having practical skill and experience in application of industrial coatings. Before using, user shall determine the suitability of this product for his intended use. Since seller has no control over the specific application of this product, seller's sole warranty with respect to such product is that it is of merchantable quality and meets the quality control standards of The Tapecoat Company. Seller makes no other warranty, express or implied, and seller disclaims all warranties except as set forth hereon.

Seller shall not be liable under any circumstances for consequential or incidental damages. Seller's liability for breach of warranty hereunder is limited to the purchase price of the quantity of the seller's product proved to be defective.

WARRANTY:

This product has been designed for use by persons having practical skill and experience in application of industrial coatings. Before using, user shall determine the suitability of this product for his intended use. Since seller has no control over the specific application of this product, seller's sole warranty with respect to such product is that it will conform to the description thereof on the label and that such product is of merchantable quality and meets quality control standards of The Tapecoat Company.

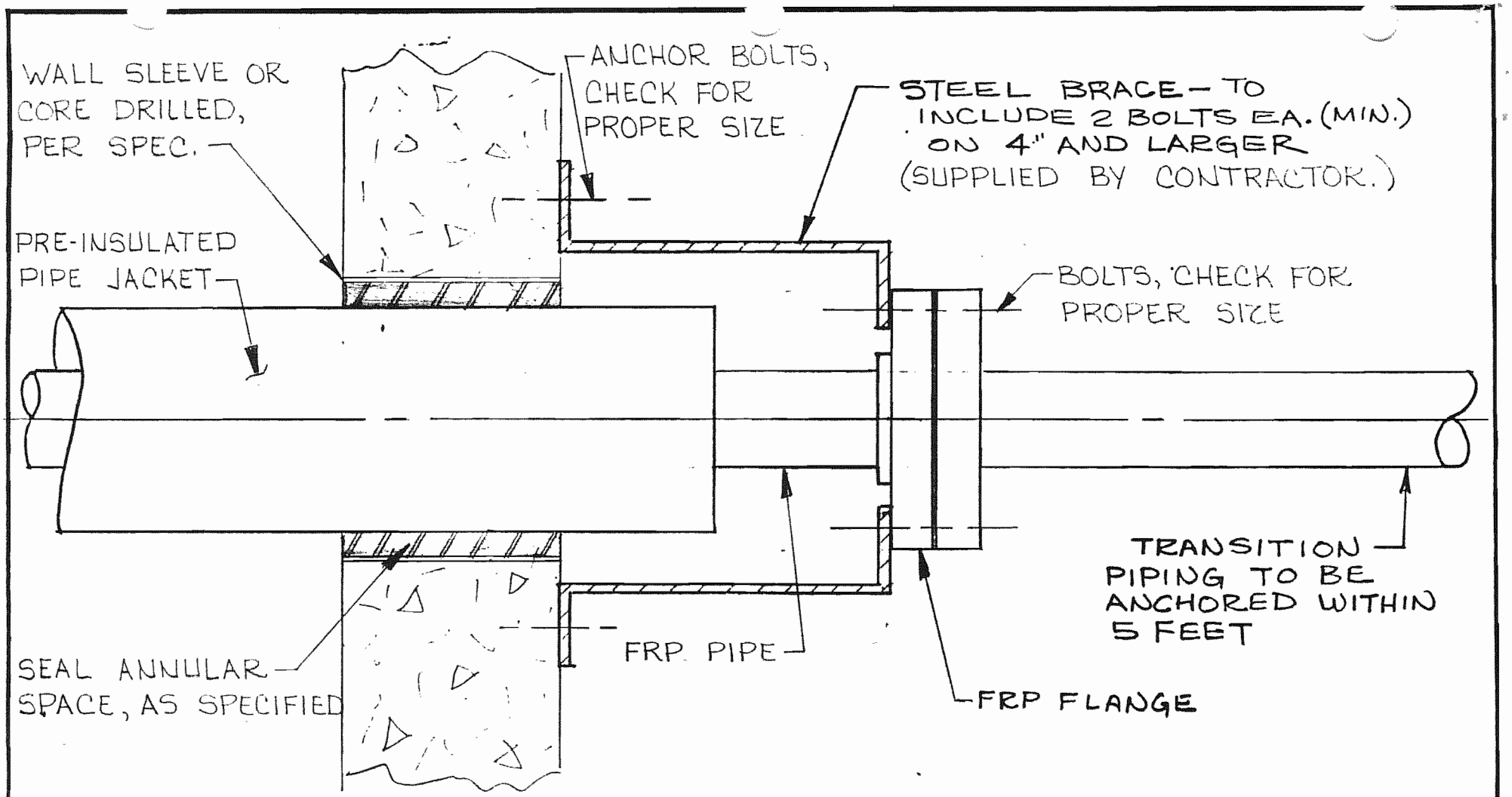
Seller makes no other warranty, express or implied, and seller disclaims all warranties in excess of that set forth above.

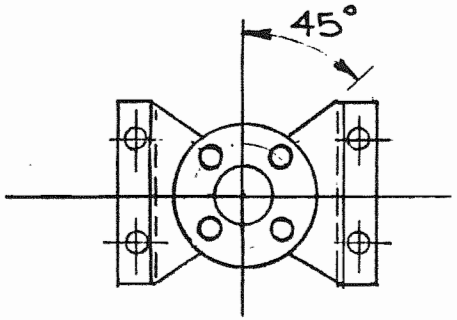
Seller shall not be liable under any circumstances for consequential or incidental damages. Seller's liability for breach of warranty hereunder is limited to the purchase price of the quantity of the seller's product proved to be defective.

TECHNICAL SERVICE:

Company sales and service men are located in all major metropolitan areas throughout the U.S.A. In addition, laboratory facilities and complete technical service is available from the home office.

VARDAL 100 P 1833F





END VIEW

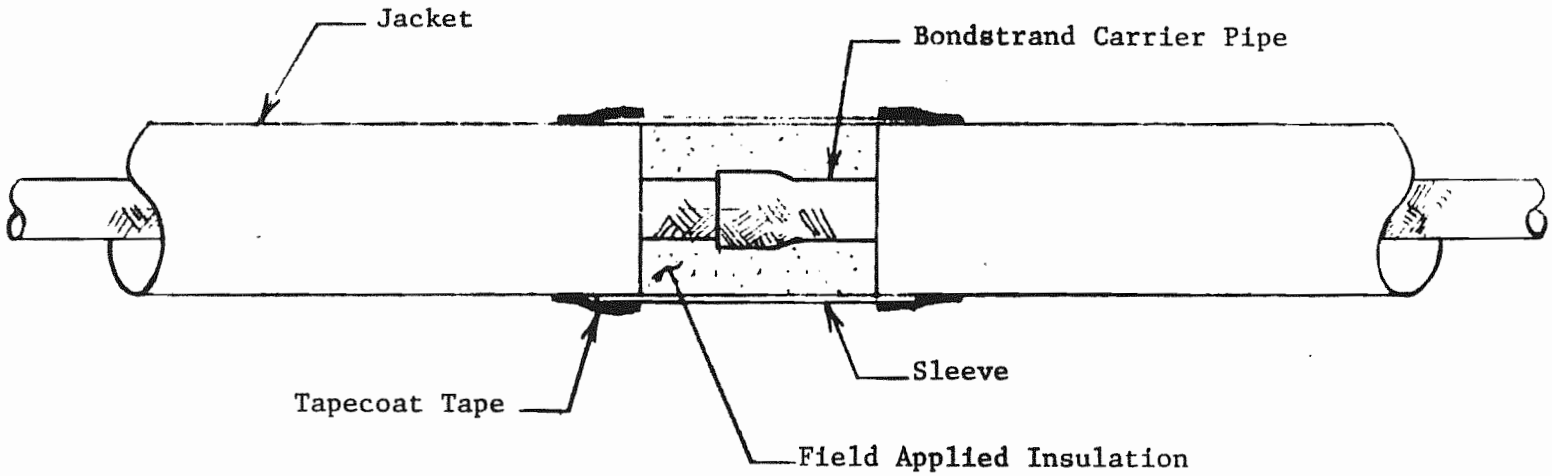
Insul-8 SYSTEMS BY Rovanco Corp.

SCALE: CH	APPROVED BY:	DRAWN BY
DATE: 8-27-84		REVISED

FRP TRANSITION ANCHOR

DETAIL

DRAWING NUMBER 12-A



Insul-8 SYSTEMS BY Rovanco Corp.

SCALE: ~	APPROVED BY:	DRAWN BY
DATE:		REVISED

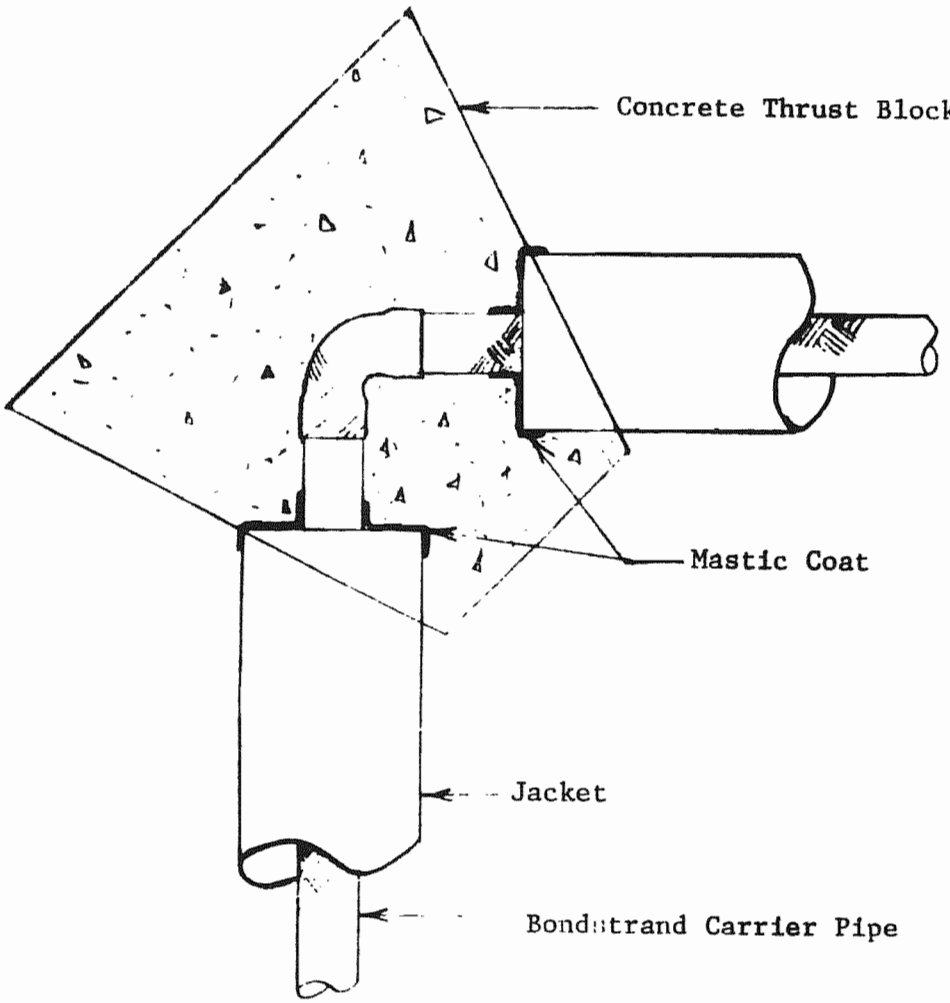
TYPICAL BONDSTRAND JOINT

TWIN FALLS HIGH SCHOOL

DRAWING NUMBER 817

94175

VARDAL ENGR



Insul-8 SYSTEMS BY Rovanco Corp.

SCALE:	APPROVED BY:	DRAWN BY
DATE:		REVISED

BONDSTRAND 90° ELBOW IN THRUST BLOCK

TWIN FALLS HIGH SCHOOL	DRAWING NUMBER 817-1

WHITE PLUMBING & HEATING, Inc.

P.O. BOX 1741 | TWIN FALLS, ID 83303-1741 | PHONE 208-733-4556

SHOP DRAWING FOR APPROVAL

TO: Heath Engineering Company DATE 4/18/85

377 West 800 North

Salt Lake City, Utah 84103

CONTRACT NO. J-501 TRANSMITTAL NO. 4A NEW SUBMITTAL XX

RESUBMITTAL ..... TRANSMITTAL NO. ..... P. O. NO. 1225

PROJECT Geothermal Project T.F.H.S. LOCATION Twin Falls, Idaho

SPECIFICATIONS SECTION ..... FOR BUILDING .....

PAR NO.	DESCRIPTION OF EQUIPMENT	MANUFACTURER	PUB. NO.	COPIES SUB'M.	ACTION TAKEN	COPIES RET'D.
	Site Plan drawings	Rovanco		8		

Please return ..... approved copies to this office.

cc: File
Field

CONTRACTOR **WHITE PLUMBING & HEATING, Inc.**

MAILING ADDRESS **P.O. Box 1741, Twin Falls, ID 83303-1741**

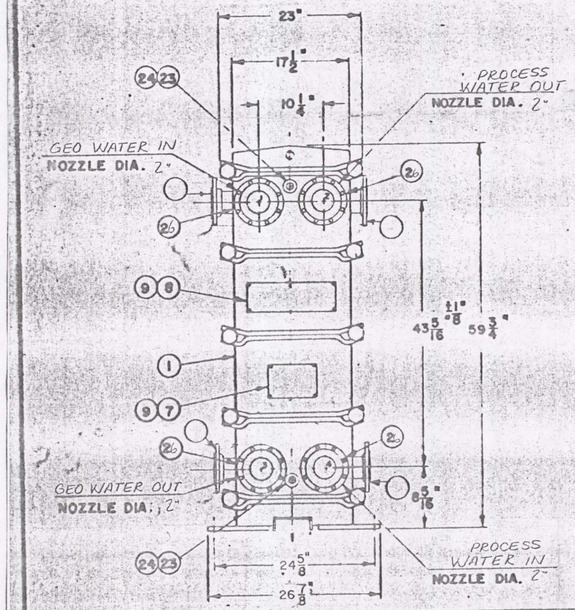
By J. J. White

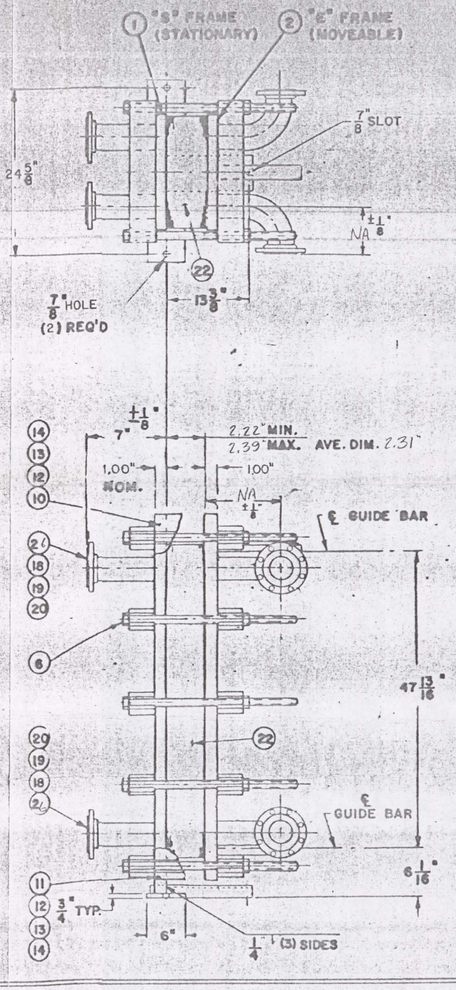
STANDARD TWIN FALLS

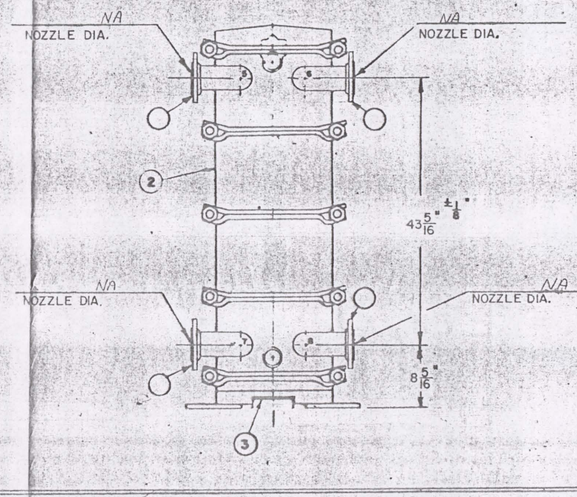
Supplier: Rovanco

c/o Industrial Sales
2719 Lemel Circle
Salt Lake City, Utah 84115

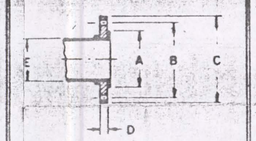
Bill Lund 801-487-9831







PARTS LIST				
ITEM NO.	DESCRIPTION		DRAWING No.	NO. REQ'D PER ASSY
1	STATIONARY FRAME ASS'Y.	SA-516-70	D-202149-2	1
2	MOVEABLE FRAME ASS'Y.	SA-516-70	D-202152-2	1
3	REAR SUPPORT		A-202192	1
4	UPPER GUIDE BAR (WKG. LGTH. 14")		C-202548	1
5	LOWER GUIDE BAR (WKG. LGTH. 10")		C-202547	1
6	BOLT ASS'Y. (WKG. LGTH. 26 7/8") 3 1/4" DIA	CARBON STEEL SA-193-B7	B-202087	10
7	DATA NAMEPLATE		B-202112	1
8	NAMEPLATE		B-200734	1
9	DRIVE PIN		A-200829	8
10	SHROUD, TOP		C-202190	1
11	SHROUD, SIDE (WIDTH 41/16")		C-202191-	2
12	SHROUD, STUD		A-200830	20
13	SHROUD, NUT		A-200831	20
14	SHROUD, WASHER		A-200832	20
15	SKID		B-200874	1
16	LAG SCREW		A-200896	3
17	WASHER		A-38708-2	3
18	FLANGE PROTECTOR		A-200891	4
19	FLANGE PROTECTOR PIN		A-200892	16
20	FLANGE PROTECTOR WASHER		A-200893	16
21	SHIPPING BAG		A-200895	1
22	PLATE (SEE PLATE SPEC. TABLE)		D-202355	17
23	GUIDE BAR BOLT		A-202091-1	2
24	GUIDE BAR WASHER		A-202095-1	2
26	NOZZLE 2" STR ("S" FRAME)		D-202168-1	4



NOTES
1. FLEXIBILITY IN PIPING SYSTEM IS RECOMMENDED TO PROVIDE FOR THERMAL EXPANSION AND VIBRATION.
2. FABRICATE PER ASME SPECS.
3. ONLY NOZZLES AT LOCATIONS SHOWN IN "FRAME HOLE DATA" ARE APPLICABLE FOR THIS ORDER.

№ 84185

Certified by CB Date MAY 20 1985
TEXAS DIVISION - TRANTER, INC.

NOZZLE DIMENSIONS		
DIM. \ SIZE	2"	4"
A	3 7/8"	6 3/16"
B	4 3/4"	7 1/2"
C	6"	9"
D	3/4"	15/16"
E	2 3/8"	4 1/2"

SPECIFICATIONS	
DESIGN PRESSURE	125 PSIG
TEST PRESSURE	150 PSIG
DESIGN TEMP.	125 °F
NO. OF PLATES	17
SURFACE AREA	60.5 SQ.FT.
WEIGHT	1287 LBS.
NOZZLES	150 LB ASA LAP JOINT FLANGE
PAINT	BIG SKY BLUE

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TEXAS DIVISION - TRANTER, INC.
WICHITA FALLS, TEXAS 76307

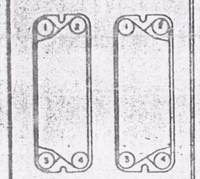
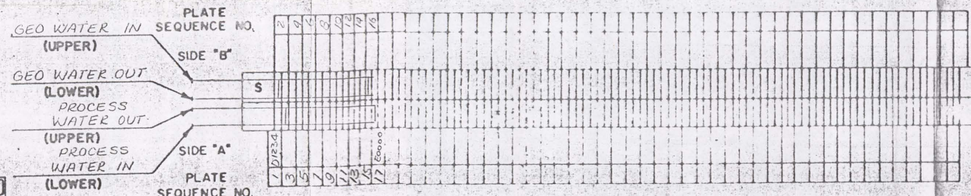


PLATE SPECIFICATIONS			
SIDE "A"		SIDE "B"	
HOLE PUNCH NO.	NO. REQ'D.	HOLE PUNCH NO.	NO. REQ'D
1234	UX216 7	1234	5 UX-216 UX-226
1230	"	1230	"
1204		1204	
1034		1034	
0234		0234	
1200		1200	
0034		0034	
0204		0204	
1004		1004	
1030		1030	
D1234	UX216 1		
E0000	UX216 1		
TOTAL	9	TOTAL	8



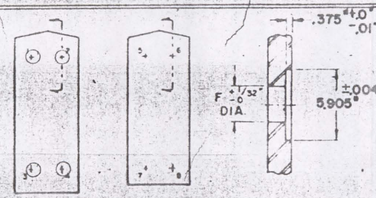
ELEMENT COMPOSITION DIAGRAM

PLS # 1 THRU 7 ARE UX-216
ODD # PLS # 9 THRU 17 ARE UX-216
EVEN # PLS. # 8 THRU 16 ARE UX-226

NOTES:
1. GASKETS FACE "S" FRAME
2. NO NUMBER INDICATES A (4) HOLE PLATE (1234)

PERFORMANCE									
SECTION	FLUID NAME	FLOW RATE (GPM)	INLET TEMP. °F	OUTLET TEMP. °F	PRESSURE DROP (PSI)	PLATE ARRANGEMENT	MATERIAL PLATE	MATERIAL GASKET	MATERIAL NOZZLE
1	GEO WATER	60.	92	85	4.89	8 X 1	304	NBR	316L
	PROCESS W.	90	78	85.48	2.30	8 X 1	304	NBR	316L

NOZZLE LOCATION	"F" ±1/32 DIA. HOLE
1	27/16"
2	27/16"
3	27/16"
4	27/16"
5	
6	
7	
8	



FRAME HOLE DATA

NON CODE

REV	REVISION	BY	DATE
	REL. FOR PRDO.	Jm	4-26-85
0	ISSUED FOR APPROVAL	Jm	4-26-85

TOLERANCE ON DIMENSIONS UNLESS OTHERWISE SPECIFIED ± 1/4"

TAG: 1220

TEXAS DIVISION - TRANTER INC.
WICHITA FALLS, TEXAS

PROPERTY OF TEXAS DIVISION-TRANTER INC AND NOT TO BE REPRODUCED WITHOUT THEIR CONSENT

CUSTOMER: WHITE PLUMBING & HEATING

CUSTOMER REFERENCE DATA

PO NO	1220	MFG NO	10738 & 10739
SERIAL NO	P-83199-H AND P-83200-H	DWG NO	

TITLE: SUPERCHANGER (MOD. III) - MODEL UX-216-UJ-17

DRAWN BY	JM	CHECKED BY	CB
APPROVED BY		DATE	4-24-85
DATE	4-24-85	DATE	
S/O	84185	DWG NO	D-84185-1
REV	1		