PENTAIR

AURORA®

MODELS 481, 483 AND 485
FIRE PUMPS
INSTALLATION AND START-UP MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

Part #A-03-251 | © 2014 Pentair Ltd. | 04/24/14

CALIFORNIA PROPOSITION 65 WARNING:

⚠ WARNING This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

GENERAL. The life of your Aurora Pump can be extended considerably by carefully following the instructions contained herein. Each step of these instructions is of vital importance in assuring long life, efficient operation, reduced maintenance and greatest satisfaction with Aurora products.

UNPACKING THE PUMP. The packaging should be opened immediately upon its arrival from the factory, and the contents of each carton inspected for damage and shortage of components. Many Fire Pump accessories are shipped loose for field installation, and these items should be checked using the packing list to assure they will be on hand at the time of assembly.

The following standard accessories are shipped unassembled in a separate carton and are sometimes misplaced or overlooked until they are needed for the installation:

- Discharge pressure gauge (0-300 PSI or 0-600 PSI).
- Compound suction gauge (03"-0-150 PSI or 30"-0-300 PSI).
- Gauge cocks (1/4" - one for each gauge).
- Pipe nipples for connecting the gauges to the pump. (Street elbows are also furnished for Model 483 vertical Fire Pumps so gauges can be mounted in an upright position.
- Float-operated automatic air release valve.
- Casing relief valve (3/4"x3/4" or 1"x3/4") furnished on electric motor driven pumps only.

Other optional accessories may also be shipped loose, and it is wise to check the packing list for each option ordered well in advance of the actual time of assembly. Some common examples are:

- Eccentric tapered suction reducer.
- Concentric tapered discharge increaser.
- Hose manifold.
- Hose valves with caps and chains.
- Ball drip valve.
- Flow meter.
- Main relief valve (diesel driven pumps).
- Waste cone (diesel driven pumps).

Diesel driven Fire Pumps are furnished with additional standard accessories which are packaged separately. They include:

- Batteries, 12-volt (two for 12-volt engines; four for 24-volt engines).
- Battery rack(s) (one for 12-volt engines; two for 24-volt engines).
- Battery cables (four for 12-volt engines; six for 24-volt engines).
- Muffler (commercial grade is standard; residential grade is optional).
- Flexible exhaust connector.
- Additional fittings, clamps and/or flanges if needed to connect the muffler and flexible connector to the engine.

If a diesel fuel tank is included, the following components are not assembled, but packaged with the previously mentioned accessories:

- Fuel tank legs and floor flanges.
- Fuel level gauge.
- Lockable fuel cap.
- Vent/Flash arrestor.
- Lockable fuel supply valve.
- Fuel fill tube (2" pipe).
- Fuel vent tube (1/2" pipe).
- Tube fittings (four furnished, 1/2" NPT x 5/8 O.D. tubing).

Two flexible flame resistant fuel hoses are attached to the diesel engine by the manufacturer. Engine air cleaners may be mounted or loose, depending on the model and manufacturer of the engine.

Fire Pump controllers, whether for diesel or electric units, are shipped directly from the manufacturer unless mounted and wired by Aurora.

PUMP FOUNDATION. The foundation for your pump must be sufficiently rigid to absorb any vibration and stress encountered during operation. A raised foundation of concrete is preferable to assure a satisfactory base and protection against flooding while facilitating drainage and keeping the area clean.

The pump and driver base should be firmly bolted to the foundation using mounting bolts or studs accurately located per the applicable Aurora dimension sheet. Foundation bolts should be enclosed by a sleeve that is 2 to 4 diameters larger that the bolt to allow movement for proper alignment with the mounting holes.

PREPARING TO INSTALL YOUR PUMP. Your pump and driver will be mounted on a common base. The unit has been accurately aligned and securely mounted to the base at the factory. However, the alignment cannot be maintained during shipping, so the entire unit must be leveled and realigned at the time of installation.

LEVELING THE PUMP. Leveling the pump will require enough shims to support the unit base at the foundation bolts and at any other point of the base carrying a substantial weight load. The shims should be large enough to allow a gap of 3/4" to 1-1/2" between the base and the foundation for grouting.

The unit base should be lowered onto the foundation, being careful to avoid damaging the threads of the foundation bolts. The coupling guard should be removed and the flexible coupling halves disconnected. The coupling alignment should be observed during the leveling operation. Shims should be inserted and the unit base leveled using a spirit level. The shims should be adjusted until the unit leveled vertically and horizontally. Tighten the foundation bolts finger tight.

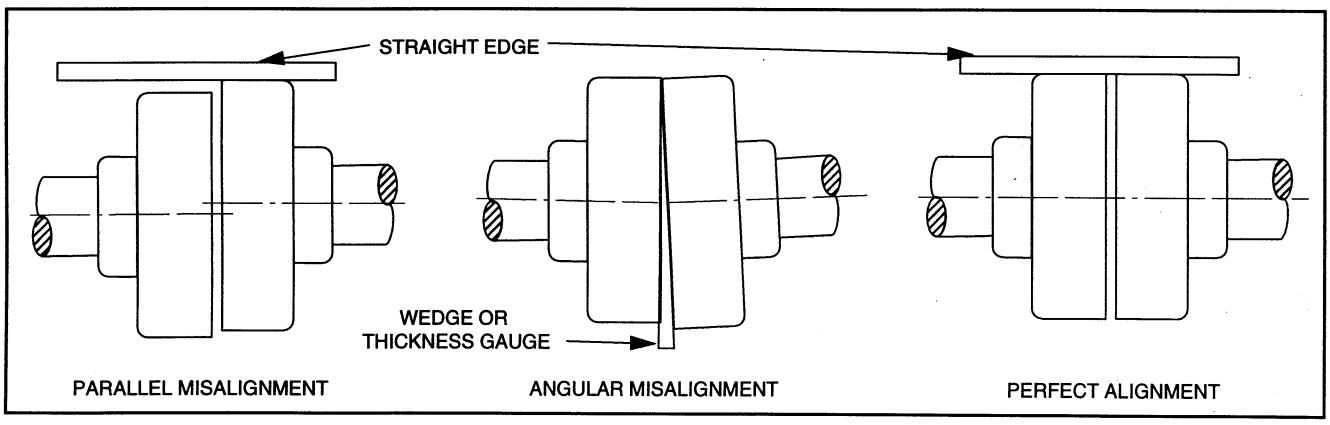
INITIAL ALIGNMENT OF THE FLEXIBLE COUPLING. The pump and driver were accurately aligned at the factory. However, the alignment cannot be maintained during shipping and it will be necessary to realign the entire unit at the time of installation. Flexible couplings are not universal joints. They should not be used to compensate for misalignment of the pump and motor shafts. Their function is to transmit power from the driver to the pump while compensating for thermal expansion and shaft end-movement. The coupling halves should be far enough apart so that they do not make contact when the motor shaft is forced to the limit of the bearing clearance toward the pump shaft.

In order to properly align the coupling, you will need a taper gauge or set of feeler gauges and a straightedge or, if available, a dial indicator.

There are two types of misalignment encountered with flexible couplings: angular misalignment, in which the shafts are not parallel, and parallel misalignment where the shafts are parallel but not on the same axis.

To check angular alignment, insert a feeler gauge or taper gauge at any four places 90 degrees apart around the coupling halves. Insert shims under the driver feet or adjust pump and/or driver position until the same reading is obtained at all four check points. The pump and driver will then be in angular alignment.

To check angular alignment with a dial indicator, clamp the dial indicator to the pump coupling half so that the ball on the indicator just rests on the face of the motor coupling half. A chalk mark should be made at the point where the ball contacts the coupling half. Both the pump shaft and the motor shaft should be rotated an equal amount so that the reading is taken at all check points with the ball on the chalk mark. Insert shims as required.



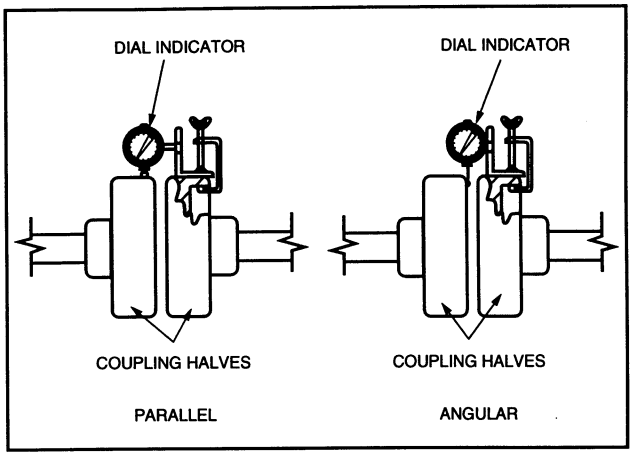


FIGURE 2 CHECKING ALIGNMENT WITH DIAL INDICATOR

To check parallel alignment, a straightedge is held against the edges of the coupling halves 90 degrees apart around the coupling. The straightedge should be parallel to the pump and driver shafts at all times. Insert shims or adjust pump and/or driver position until the straightedge lies flat against both coupling halves at all four check points. The pump and driver will then be in proper parallel alignment.

To check parallel alignment with a dial indicator, the indicator should be clamped to the pump coupling half with the ball resting on the periphery of the driver coupling half. A chalk mark should be made on the motor coupling half at the point of contact of the indicator ball, and the shafts rotated equally so that the reading is taken on the chalk mark at all checkpoints. Insert shims or adjust the pump and/or driver position to obtain the same reading at all checkpoints.

NOTE

Any adjustment to correct one direction of alignment may affect the other direction. Therefore it is necessary to recheck both angular and parallel alignment after each adjustment.

When the unit is properly aligned, the foundation bolts can be tightened, but not too firmly. Waste material should be stuffed into the sleeves around the foundation bolts to prevent grout from filling the sleeves during grouting.

PIPING. Suction and discharge piping must be properly installed and attached to pump. Positioning of the unit according to the above recommendations will allow the piping to be connected without straining or twisting the pump casing. Piping must be supported by stands or hangers and not by the pump casing. If an eccentric suction reducer is used, it must be installed with its top horizontal; tapered side should be on the bottom.

Standard Fire Pump fittings are to be properly installed. Gauges, gauge cocks and nipples are furnished for all Fire Pumps. The compound gauge is to be installed in the suction flange tap; the pressure gauge goes in the discharge flange tap. Pipe elbows are provided on vertical Fire Pumps to allow the gauges to be installed in an upright position.

A float-operated automatic air release valve is furnished for all Fire Pumps, and is to be installed in the top (or highest point) of the casing. Piping for this valve is not furnished by Aurora Pump. A 1/2" pipe nipple is needed to connect it to the casing.

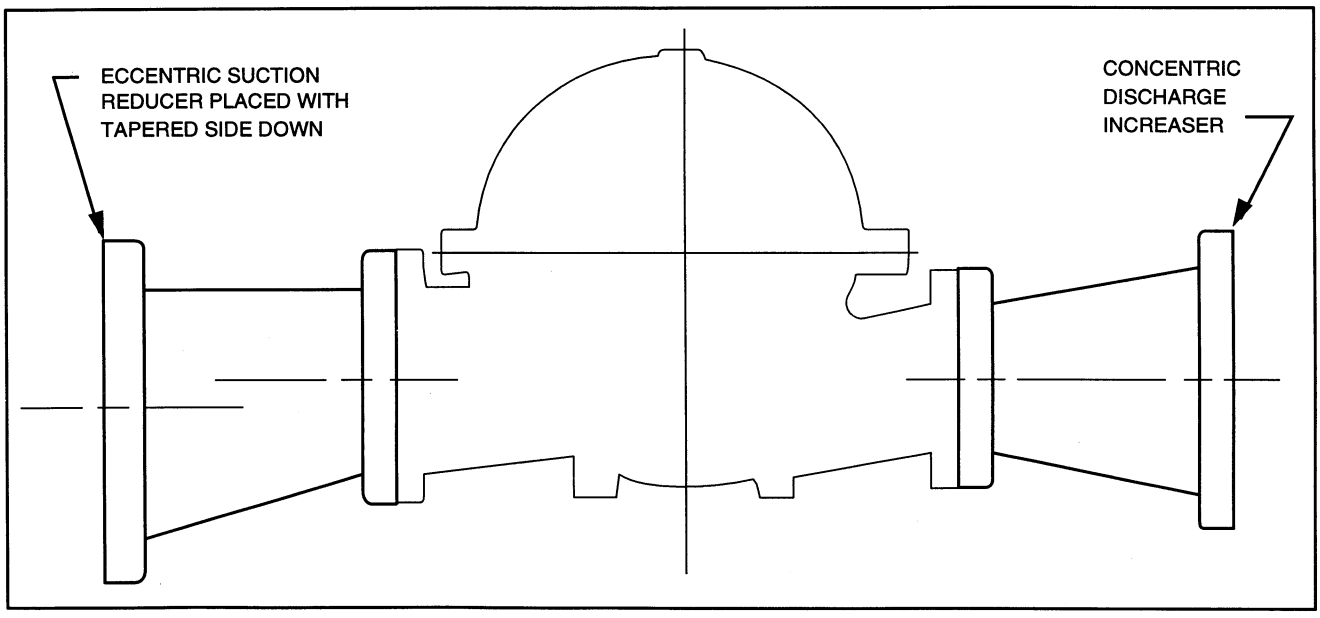


FIGURE 3 PROPER INSTALLATION OF TAPERED REDUCERS

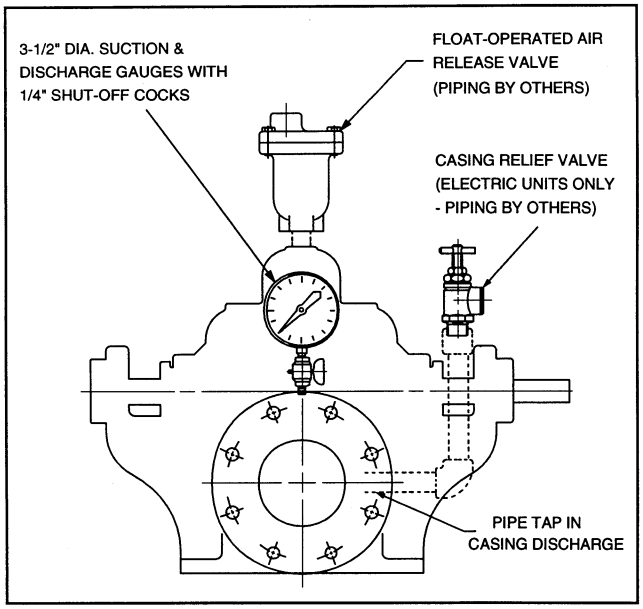


FIGURE 4 STANDARD ACCESSORIES

For best results on two-stage Fire Pumps, the casing taps in both stages should be piped to the automatic air release valve.

On vertical Fire Pumps, the automatic air release valve is connected to the uppermost tap in the suction branch on the "back" of the lower casing half. A small vacuum check valve is furnished to prevent drawing air into pump if the suction pressure drops.

A 3/4" pressure relief valve is provided for all electric motor driven Fire Pumps. It is to be installed in or piped to the tap in the side of the discharge neck on the pump casing. The outlet may be piped to a drain if desired. If bearing arm drain taps are piped to waste, the piping must be separate from that of the relief valve outlet.

PRESSURE SENSING LINE. A 1/2" (minimum) pressure sensing line must be connected to the pressure switch of each controller (Fire Pump and Jockey Pump) to monitor the system pressure. The connection should be made to the Fire Pump system at a point downstream from the check valve as illustrated in Figure A-7 5.2.1(a) in N.F.P.A. 20.

CONTROLLER WIRING. Wiring of the Fire Pump and Jockey Pump controllers should be made by qualified personnel in accordance with N.E.C. and other applicable local codes. Wiring to the electric motors should be connected as indicated in the specific wiring diagrams furnished with each controller. It should be noted that fuses are not furnished in the Jockey Pump controller unless specifically ordered.

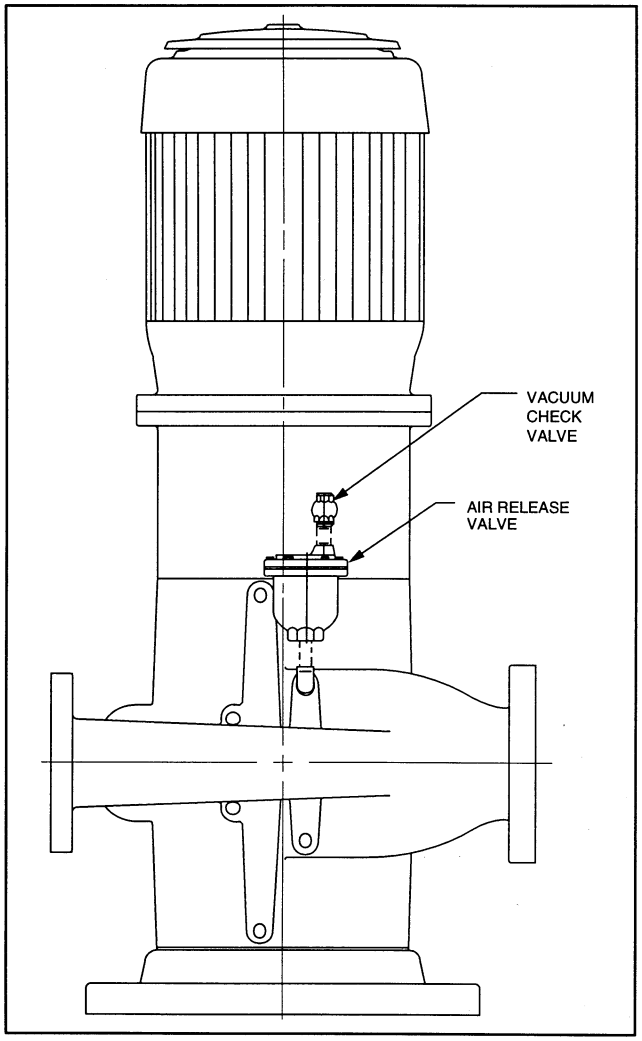


FIGURE 5 AIR RELEASE VALVE INSTALLED ON MODEL 483 VIRTICAL FIRE PUMP

SPECIAL CONSIDERATIONS FOR DIESEL ENGINES

ENGINE FLUIDS. Many diesel engines are shipped dry and must have lubricating oil and coolant added prior to start-up. It is the installer's responsibility to assure that all fluid levels are correct to avoid damage to the engine.

DIESEL ENGINE WIRING. The Fire Pump controller must be wired to the diesel engine's junction box. This is usually a simple matter of connecting like-numbered terminals of each with the correct wire gauge size. Refer to panel manufacturer's wiring diagram.

The electric solenoid valve in the diesel engine cooling loop piping must be wired to the engine junction box. Either red wire goes to terminal 1; the other red wire goes to terminal 11; the green wire is grounded to the engine block.

Engines may have 12-volt or 24-volt systems, but all batteries furnished are 12-volt. Since dual battery sets are required by N.F.P.A. 20, two batteries are furnished for 12-volt systems and four batteries are furnished for 24-volt systems.

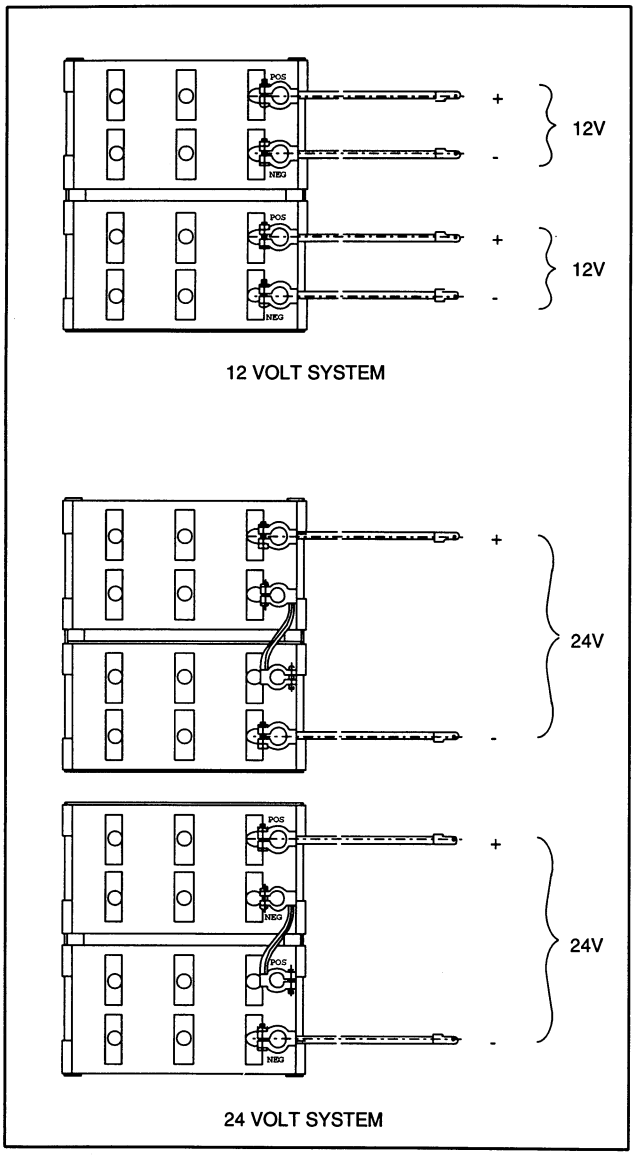
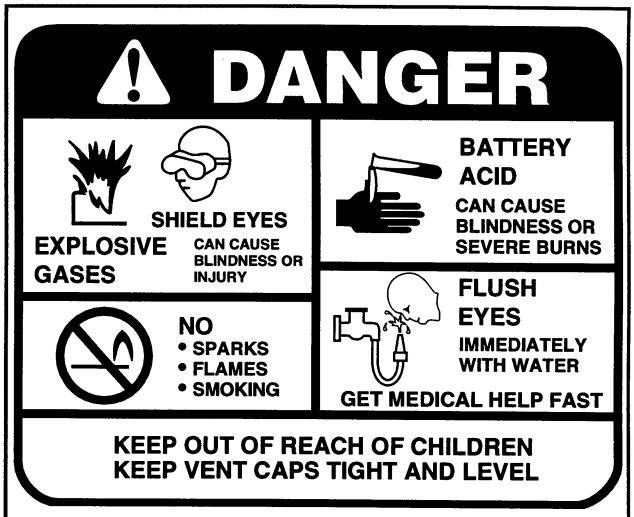


FIGURE 6 BATTERY CABLE ARRANGEMENTS

Aurora's standard battery racks are designed to keep the batteries elevated off the floor for housekeeping purposes. They must be placed on a suitable level surface as close to the diesel engine as possible. Each rack holds two batteries; one rack is required for 12-volt systems and two racks for 24-volt systems. If two racks are used, they are to be placed side-by-side and not stacked.

Electrolyte is not furnished by Aurora Pump; it must be procured locally (approximately 16 quarts per battery).

Electrolyte must be added and the batteries charged at a low rate for at least 24 hours prior to start-up. It is recommended for safety reasons, that the batteries be filled with electrolyte only after being placed in their permanent positions in the pump room.



Batteries contain sulphuric acid electrolyte. This is a highly **CORROSIVE POISON**. They also produce a mixture of hydrogen and oxygen gasses which will **EXPLODE** if itgnited.

WHEN WORKING ON OR NEAR BATTERIES, MIXING OR POURING ACID SOLUTIONS, ALWAYS WEAR PROTECTIVE CLOTHING AND PROTECT EYES WITH SAFETY GOGGLES. KEEP SPARKS, FLAMES AND CIGARETTES AWAY.

KEEP BATTERIES AND ACID OUT OF THE REACH OF CHILDREN.

If acid contacts skin or eyes, flush affected parts with clean water immediately and repeat for 15 minutes. Then seek prompt medical attention.

If acid is taken internally, call medical help immediately. Drink large quantities of water, milk or milk of magnesia, beaten eggs or vegetable oil.

Acid spilled on clothing, workbench or floor may be neutralized with baking soda or ammonia solutions, in metallic containers.

Use only glass, ceramic or acid resisting plastic vessels. Never discard used containers before they have been rinsed clean, then puncture them to prevent further use.

When charging batteries, keep area well ventilated and bar general access. Connect/disconnect batteries only when charge is switched off. Make sure tools cannot short circuit battery terminals. Keep vent caps on battery during charging.

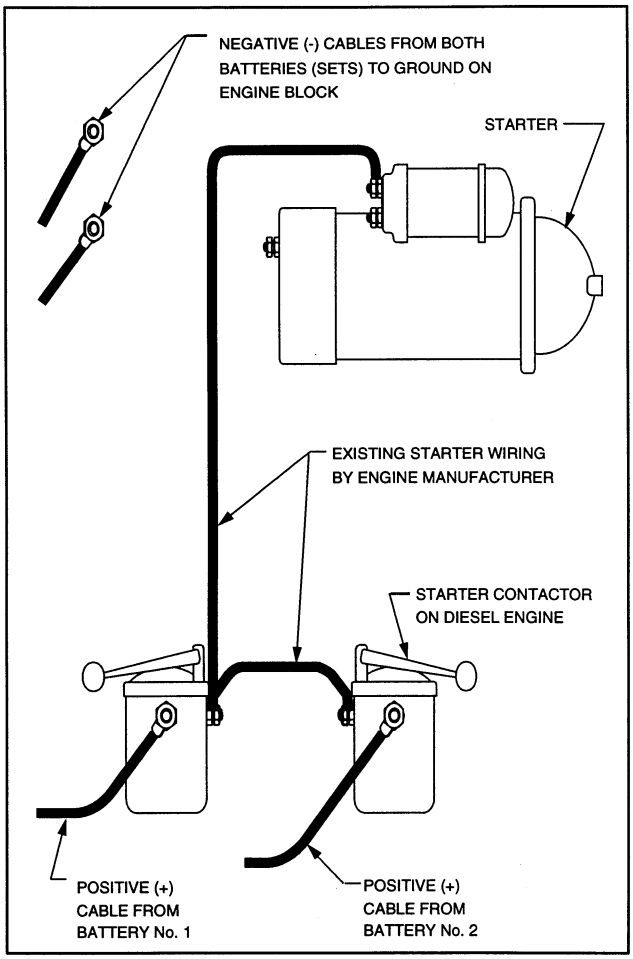


FIGURE 7 STARTER AND CONTACTOR CONNECTIONS

The positive battery terminal of each battery (or pair of batteries for 24-volt systems) is connected to one of the engine's starter contactors. The negative terminals are to be connected to the engine block or other suitable ground. Aurora Pump's standard battery cable wire gauge sizes are selected for a maximum 10-foot circuit length (5-foot cables). Longer cables will require heavier gauge wire to be used.

Power wiring to the engine's jacket water heater must be completed only after it has been assured that there is sufficient coolant in the engine. Most heaters are continuously energized when wiring is connected and will burn out the heating element if no water is present. This failure is not covered by warranty. Refer to engine manufacturer's data sheet for correct voltage of the heater.

DIESEL ENGINE COOLING LOOP PIPING. The cooling loop system diverts a small amount of water from the pump discharge through the engine's heat exchanger to help control the operating temperature of the engine. Prior to start-up, it is recommended that this piping be checked for damage or displacement that might have occurred during shipment.

During normal operation, the top two valves of the cooling loop (in the by-pass line) are to be closed, and the lower two valves (in the pressure regulated line) are to be open. Failure to observe this may result in over-pressurization of the heat exchanger when the pump is started, causing damage to the engine.

Piping FROM the engine's heat exchanger to a drain is to be provided by the installer. It is important to use the recommended size piping to reduce back pressure and avoid over pressurizing the heat exchanger.

A length of PVC tubing is provided by Aurora to be connected to the petcock in the cooling loop piping in

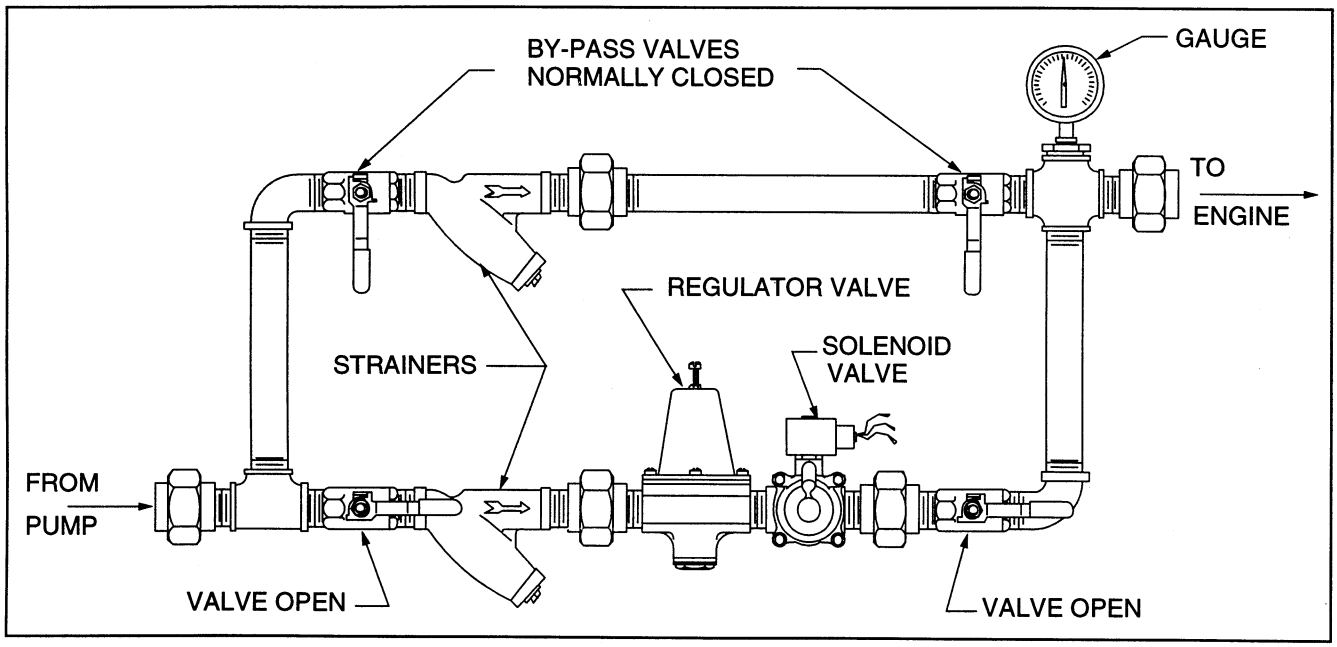


FIGURE 8 COOLING LOOP SHOWING NORMAL POSITION OF VALVES

order to vent the system and visually verify the flow of water through the heat exchanger.

DIESEL ENGINE FUEL SYSTEM. The fuel tank should be installed so that the supply outlet is at the same elevation as the engine's fuel pump. Since the unit base is usually elevated as described earlier, this may require that the fuel tank is likewise elevated. The means of elevating the tank is the responsibility of the installer. Substituting the legs furnished with the tank with pipes of greater length is not a recommended method of elevating the tank.

All fuel fittings shown on pages 255 & 256 of Section 916 are shipped loose for field installation. They are to be assembled as shown in Figure 9, below, to be consistent with Figure A-8-4.6 of N.F.P.A. Pamphlet 20. Installation may vary at the discretion of the installer with the approval of the local authority having jurisdiction. Note that some sections of common piping needed to complete this installation are not furnished by Aurora and must be procured locally.

Tube fittings are provided to allow the use of 5/8" O.D. tubing for the fuel supply and return lines (the tubing itself is NOT furnished by Aurora). If hard piping is used, these tube fittings are simply to be discarded.

Diesel fuel is not furnished by Aurora and must be procured locally prior to start-up.

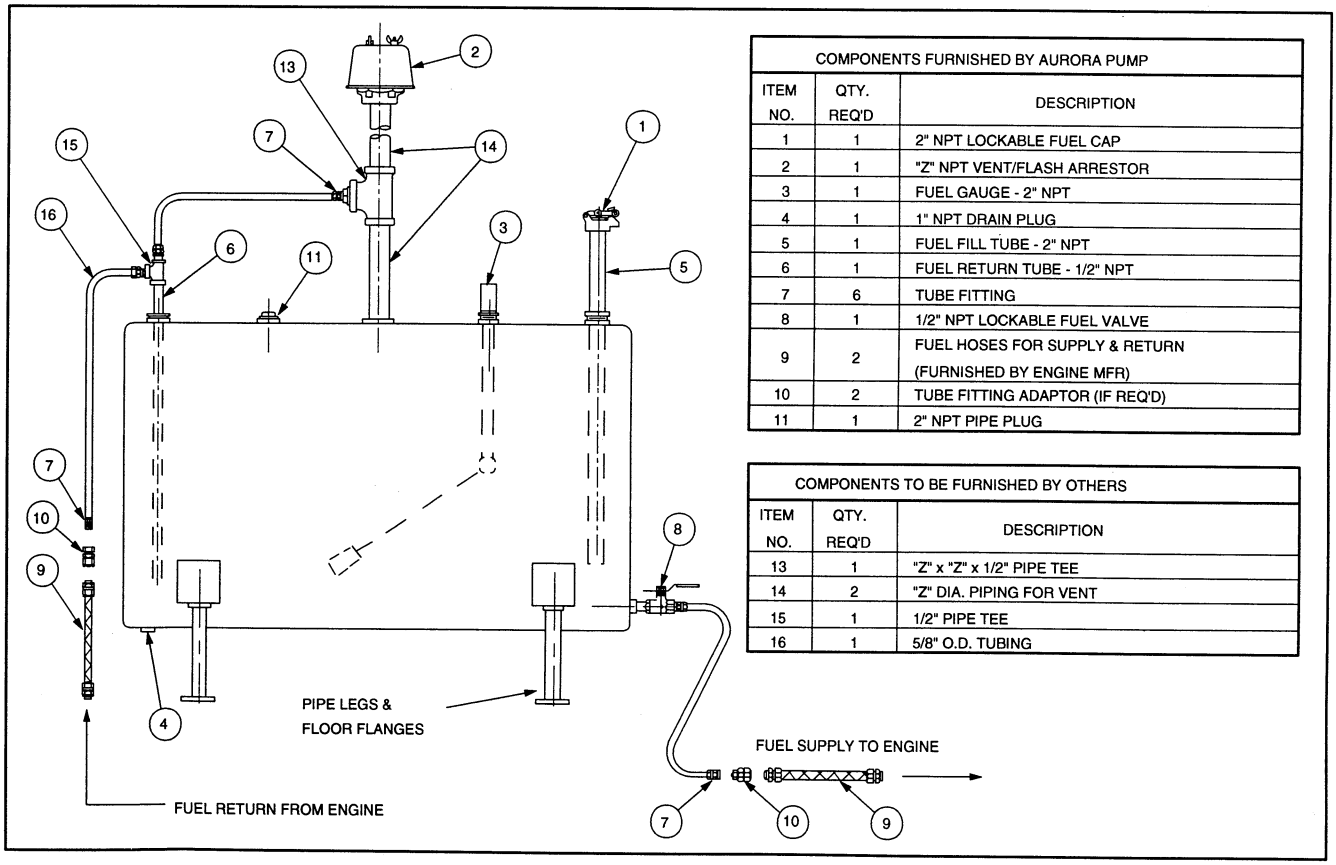
DIESEL MUFFLER AND EXHAUST SYSTEM. A commercial grade muffler and flexible connector are furnished as standard on diesel Fire Pumps. If necessary, additional fittings needed for connecting these to the engine are also provided.

Commercial grade mufflers have NPT connections on 3" & 3-1/2" sizes, slip-on (automotive type) connectors for 4", 5" and 6" sizes, and 125# ANSI flanged connections for larger sizes.

Optional residential grade mufflers have NPT connections on 3" and 3-1/2" sizes; ANSI 125# flanges on 4" and larger sizes.

Piping, elbows and other components required to route the exhaust to the outside are not provided by Aurora. It is suggested that the building contractor or on-site engineers design and install the remainder of the exhaust system.

Mufflers are sized by Aurora to allow the engine to operate at its rated speed with nominal back pressure. However, if more than 25 feet of additional piping and/or more than 4 90-degree elbow are required to complete the system, it is important to contact the factory for re-



COMPONENTS FURNISHED BY AURORA PUMP		
ITEM NO.	QTY. REQ'D	DESCRIPTION
1	1	2" NPT LOCKABLE FUEL CAP
2	1	"Z" NPT VENT/FLASH ARRESTOR
3	1	FUEL GAUGE - 2" NPT
4	1	1" NPT DRAIN PLUG
5	1	FUEL FILL TUBE - 2" NPT
6	1	FUEL RETURN TUBE - 1/2" NPT
7	6	TUBE FITTING
8	1	1/2" NPT LOCKABLE FUEL VALVE
9	2	FUEL HOSES FOR SUPPLY & RETURN (FURNISHED BY ENGINE MFR)
10	2	TUBE FITTING ADAPTOR (IF REQ'D)
11	1	2" NPT PIPE PLUG

COMPONENTS TO BE FURNISHED BY OTHERS		
ITEM NO.	QTY. REQ'D	DESCRIPTION
13	1	"Z" x "Z" x 1/2" PIPE TEE
14	2	"Z" DIA. PIPING FOR VENT
15	1	1/2" PIPE TEE
16	1	5/8" O.D. TUBING

FIGURE 9 DIESEL FUEL TANK AND FITTINGS

evaluation of the system with respect to back pressure. A larger muffler and piping may be required to allow the engine to operate properly.

The flexible connectors furnished by Aurora are intended for use as a vibration control device and cannot be substituted for elbows in the piping system. It is recommended that the flexible connector be placed as close to the engine's exhaust outlet as possible. The muffler and piping must be supported to prevent strain on any diesel engine component.

START-UP & FIELD ACCEPTANCE TEST

GENERAL. The following is a general outline for starting and field testing Fire Pump systems. It is recognized that requirements and methods may vary depending on local customs and practices. Those involved in Fire Pump sales MUST fully understand all local requirements and N.F.P.A. Pamphlet 20. A general method to follow is outlined below.

Be specific and complete when ordering Fire Pumps and accessories so that all necessary and correct items are on hand for the start-up. Since trouble cannot be tolerated on the day of the field acceptance test...

Visit the jobsite after delivery of the equipment to verify that all components ordered have been received and are correct for the installation.

Visit the jobsite again after installation to assure that the components have been correctly assembled and installed.

After the installation is complete and the Fire Pump system is pressurized and checked by the contractor, the following items must be verified:

A. Coupling has been properly aligned.

B. Motor has been "bumped" to check for proper rotation.

C. Diesel engine (where applicable) has been properly serviced, necessary fluids added, batteries filled and charged, jacket water heater operating.

INITIAL TEST. The following steps are basic for an initial test of the Fire Pump system:

A. Close the valves on all discharge outlets.

B. Open the suction valve.

C. Having read the controller manual and gained an understanding of its operation, set the Fire Pump controller to "manual". The Jockey pump panel should be set to the "off" position.

D. With the controller door closed, start the Fire Pump.

E. Adjust the packing to allow approximately 60 drops per minute to flow from each packing box. Further adjustment may be required later, so a recheck upon completion of the test is advised.

F. Close the relief valve completely for a brief period to verify that the shut-off pressure agrees with that on the certified factory test curve.

G. Adjust the casing relief valve (electric-driven units only) to allow enough flow to keep the pump cool.

H. Stop the Fire Pump.

J. Set the Fire Pump controller to the "automatic" position.

K. Slowly lower the system pressure with the control valve. The Fire Pump should start. Observe this starting pressure and adjust if necessary. (Adjustment procedure varies with controller manufacturer.) Stop the Fire Pump.

FIELD ACCEPTANCE TEST. Personnel on hand for the Fire Pump field acceptance test should include the controller representative, diesel engine service technician (if applicable), representatives of the insuring agency and local fire authority, as well as those responsible for building maintenance and supervision.

Equipment needed for the field acceptance test includes:

1) Calibrated Ammeter

2) Volt meter

3) Tachometer

4) Pitot Tube & gauge

5) Calibrated suction and discharge gauges with 1/4% accuracy. (Gauges furnished with the pump are 2%-3% accurate and could be troublesome for the field acceptance test.)

6) 50 feet of 2-1/2" hose for each connection on the hose manifold

7) Play pipe with suitable nozzle for each hose

While field acceptance tests vary by location, the following steps are usually taken. Additional operations

may be required depending on the special needs in some territories.

1) A hose and play pipe are connected to each valve on the hose manifold.

2) The discharge valve leading to the building's fire system is closed.

3) The discharge valve leading to the hose manifold (or "test header") is opened.

4) The suction valve is opened.

5) All relief valves are closed.

6) One hose valve on the hose manifold is opened.

7) With the Fire Pump operating, the hose valve is adjusted for a flow of 500 GPM at the play pipe as indicated by the pitot tube. Refer to the table to determine the pressure vs. flow for the size play pipe used for this test.

NOZZLE PRESSURE	GPM AT VARIOUS NOZZLE SIZES					
	1-1/8	1-1/4	1-3/8	1-1/2	1-5/8	1-3/4
10	100	130	160	195	235	285
20	160	203	245	290	348	410
30	206	254	308	366	430	498
35	222	275	332	395	464	538
40	238	294	355	423	496	575
45	252	311	377	448	525	610
50	266	328	397	473	555	643
55	279	344	417	496	582	675
60	291	360	435	518	608	716
62	296	366	442	526	618	728
64	301	371	449	535	628	732
66	305	377	456	543	637	739
68	310	383	463	551	647	750
70	315	388	470	559	656	761
72	319	394	477	567	666	772
74	323	399	483	575	675	783
76	328	405	490	583	684	793
78	332	410	496	590	693	803
80	336	415	502	598	702	814
85	347	428	518	616	723	839
90	357	440	533	634	744	863
95	355	452	547	651	765	887
100	376	464	562	668	784	910
105	385	476	575	685	804	932
110	394	487	589	701	823	954
115	403	498	602	717	841	976
120	412	509	615	732	859	997

8) By opening additional valves and measuring the flow equal to 500 GPM, readings of 1000 GPM, 1500 GPM, 2000 GPM, etc. can be determined.

9) Open the necessary hose valves to obtain the total rated flow. When this flow is assured, check and record the following data:

a) Suction gauge pressure

b) Discharge gauge pressure

c) RPM with tachometer

d) Voltage

e) Amps (on all legs)

10) Verify that the flow remained constant during the above data readings.

11) Adjust hose valves to achieve 150% of rated flow. Proceed as before and record the necessary data.

12) Repeat these steps as required by supervising authorities to obtain the desired number of points on the test curve.

13) Finally, close all valves and record the above readings in Step 9 at shut-off (zero GPM) condition.

If a number of automatic and/or manual starts are to be demonstrated, this series of tests can now be conducted.

The Jockey Pump controller must be set to start the Jockey Pump at a pressure greater than that of the main Fire Pump. The following procedure may be used to accomplish this.

1) The main Fire Pump controller is set to the "off" position.

2) The Jockey Pump controller is set to the "automatic" position.

3) The system pressure is slowly reduced by opening the test valve until the Jockey Pump starts. Observe the pressure at which the Jockey Pump starts.

4) Allow the Jockey Pump to continue running until the system pressure rises enough to stop the pump automatically. Typically, there is a minimum of 10 PSI between the "pump start" and "pump stop" pressure readings.

5) Adjust the set points in the Jockey Pump controller as necessary to achieve the desired results. As with the main Fire Pump controller, adjustment methods vary with controller manufacturer.

IMPORTANT

Upon successful completion of the field acceptance test, the following points must be verified:

A. The discharge valve leading to the outside hose manifold should be closed.

B. The discharge valve leading to the building fire protection system should be opened.

C. The casing relief valve should be set to a pressure just below the shut-off pressure of the pump.

D. The main relief valve (if applicable) should be set to a pressure just above the maximum system pressure.

E. Both the Fire Pump and Jockey Pump controllers should be set to the "automatic" position.

F. Any alarm systems disabled during the tests should be reactivated.

G. The individual or authority responsible for maintaining the building's fire protection system must be made aware of all settings and the operational condition of the system before leaving the site.

WARRANTY

Seller warrants equipment (and its component parts) of its own manufacture against defects in materials and workmanship under normal use and service for one (1) year from the date of installation or start-up, or for eighteen (18) months after the date of shipment, whichever occurs first. Seller does not warrant accessories or components that are not manufactured by Seller; however, to the extent possible, Seller agrees to assign to Buyer its rights under the original manufacturer's warranty, without recourse to Seller. Buyer must give Seller notice in writing of any alleged defect covered by this warranty (together with all identifying details, including the serial number, the type of equipment, and the date of purchase) within thirty (30) days of the discovery of such defect during the warranty period. No claim made more than 30 days after the expiration of the warranty period shall be valid. Guarantees of performance and warranties are based on the use of original equipment manufactured (OEM) replacement parts. Seller assumes no responsibility or liability if alterations, non-authorized design modifications and/or non-OEM replacement parts are incorporated If requested by Seller, any equipment (or its component parts) must be promptly returned to Seller prior to any attempted repair, or sent to an authorized service station designated by Seller, and Buyer shall prepay all shipping expenses. Seller shall not be liable for any loss or damage to goods in transit, nor will any warranty claim be valid unless the returned goods are received intact and undamaged as a result of shipment. Repaired or replaced material returned to customer will be shipped F.O.B., Seller's factory. Seller will not give Buyer credit for parts or equipment returned to Seller, and will not accept delivery of any such parts or equipment, unless Buyer has obtained Seller's approval in writing. The warranty extends to repaired or replaced parts of Seller's manufacture for ninety (90) days or for the remainder of the original warranty period applicable to the equipment or parts being repaired or replaced, whichever is greater. This warranty applies to the repaired or replaced part and is not extended to the product or any other component of the product being repaired. Repair parts of its own manufacture sold after the original warranty period are warranted for a period of one (1) year from shipment against defects in materials and workmanship under normal use and service. This warranty applies to the replacement part only and is not extended to the product or any other component of the product being repaired. Seller may substitute new equipment or improve part(s) of any equipment judged defective without further liability. All repairs or services performed by Seller, which are not covered by this warranty, will be charged in accordance with Seller's standard prices then in effect.

THIS WARRANTY IS THE SOLE WARRANTY OF SELLER AND SELLER HEREBY EXPRESSLY DISCLAIMS AND BUYER WAIVES ALL OTHER WARRANTIES EXPRESSED, IMPLIED IN LAW OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Seller's sole obligation under this warranty shall be, at its option, to repair or replace any equipment (or its component parts) which has a defect covered by this warranty, or to refund the purchase price of such equipment or part. Under the terms of this warranty, Seller shall not be liable for (a) consequential, collateral, special or liquidated losses or damages; (b) equipment conditions caused by normal wear and tear, abnormal conditions of use, accident, neglect, or misuse of said equipment; (c) the expense of, and loss or damage caused by, repairs or alterations made by anyone other than the Seller; (d) damage caused by abrasive materials, chemicals, scale deposits, corrosion, lightning, improper voltage, mishandling, or other similar conditions; (e) any loss, damage, or expense relating to or resulting from installation, removal or reinstallation of equipment; (f) any labor costs or charges incurred in repairing or replacing defective equipment or parts, including the cost of reinstalling parts that are repaired or replaced by Seller; (g) any expense of shipment of equipment or repaired or replacement parts; or (h) any other loss, damage or expense of any nature.

The above warranty shall not apply to any equipment which may be separately covered by any alternate or special warranties.

PERFORMANCE: In the absence of Certified Pump Performance Tests, equipment performance is not warranted or guaranteed. Performance curves and other information submitted to Buyer are approximate and no warranty or guarantee shall be deemed to arise as a result of such submittal. All testing shall be done in accordance with Seller's standard policy under Hydraulic Institute procedures.

LIABILITY LIMITATIONS: Under no circumstances shall the Seller have any liability under the Order or otherwise for liquidated damages or for collateral, consequential or special damages or for loss of profits, or for actual losses or for loss of production or progress of construction, regardless of the cause of such damages or losses. In any event, Seller's aggregate total liability under the Order or otherwise shall not exceed the contract price.

ACTS OF GOD: Seller shall in no event be liable for delays in delivery of the equipment or other failures to perform caused by fires, acts of God, strikes, labor difficulties, acts of governmental or military authorities, delays in transportation or procuring materials, or causes of any kind beyond Seller's control.

COMPLIANCE WITH LAW: Seller agrees to comply with all United States laws and regulations applicable to the manufacturing of the subject equipment. Such compliance shall include: The Fair Labor Standards Acts of 1938, as amended; Equal Employment Opportunity clauses of Executive Order 11246, as amended; Occupational Safety and Health Act of 1970 and the standards promulgated thereunder, if applicable. Since compliance with the various Federal, State, and Local laws and regulations concerning occupational health and safety, pollution or local codes are affected by the use, installation and operation of the equipment and other matters over which Seller has no control, Seller assumes no responsibility for compliance with those laws and regulations, whether by way of indemnity, warranty, or otherwise. It is incumbent upon the Buyer to specify equipment which complies with local codes and ordinances.



AURORA®
800 Airport Road
North Aurora, Illinois 60542
630-859-7000
www.aurorapump.com