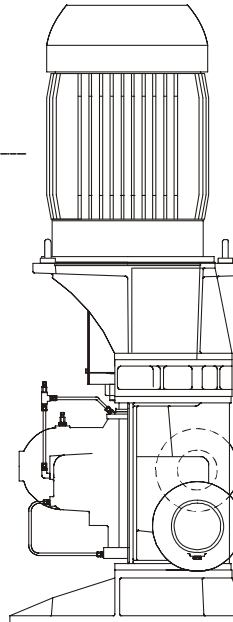
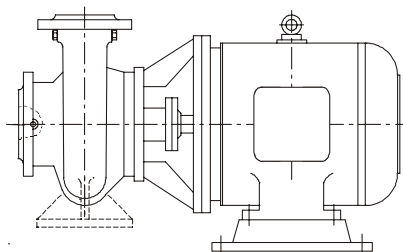
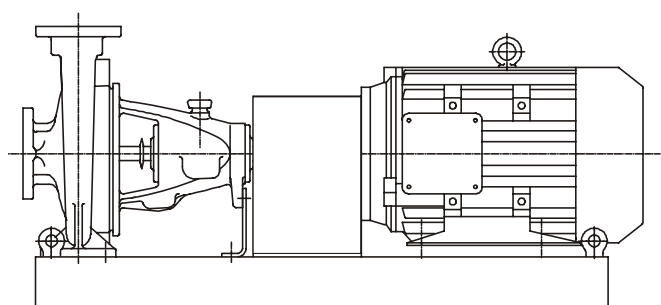
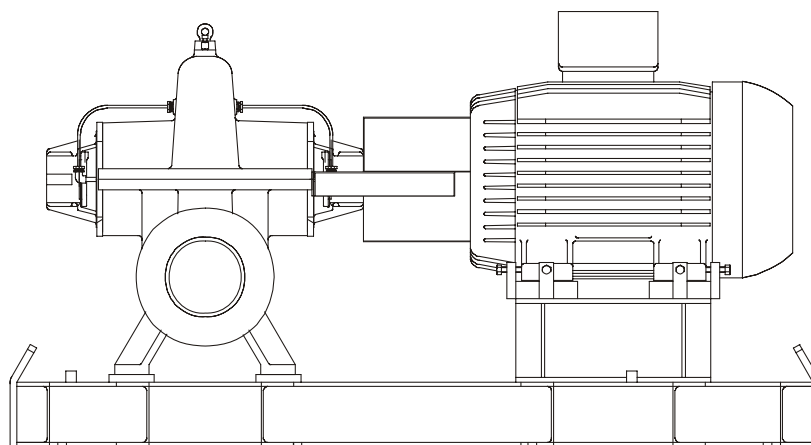


GUIDE TO THE INSTALLATION OF SPP PUMPS



SPP Pumps Limited.
Theale Cross
Reading
Berkshire
ENGLAND
RG31 7SP

Telephone:
+44 (0)1189 323123

Fax:
+44 (0)1189 323302

Document No: W00-002E
Revision No: 3
Revision Note No: R 38445

Date Issued: Mar 2005
Produced at SPP Pumps,
Limited, Coleford, England

General Safety Instructions

The products supplied by SPP Pumps Limited have been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimised by the use of guards and other design features. Some hazards cannot be guarded against and the instructions below **MUST BE COMPLIED WITH** for safe operation.

These instructions cannot cover all circumstances, **YOU** are responsible for using safe working practices at all times.

- 1 SPP Pumps products are designed for installation in designated areas, which are to be kept clean and free of obstructions that may restrict safe access to the controls and maintenance access points.
- 2 Access to the equipment should be restricted to the personnel responsible for installation, operation and maintenance and they must be trained, adequately qualified and supplied with the appropriate tools for their respective tasks.
- 3 SPP Pumps Limited requires that all personnel that are responsible for installation, operation or maintenance of the equipment, have access to and study the product instruction manual **BEFORE** any work is done and that they will comply with all local and industry based safety instructions and regulations.
- 4 Ear defenders should be worn where the specified equipment noise level exceeds locally defined safe levels. Safety glasses or goggles should be worn where working with pressurised systems and hazardous substances. Other personal protection equipment must be worn where local rules apply.
- 5 Do **NOT** wear loose or frayed clothing or jewellery that could catch on the controls or become trapped in the equipment.
- 6 Read the instruction manual before installation, operation or maintenance of the equipment. Check and confirm that the correct instruction manual is being used by comparing the serial number on the equipment with the documentation.
- 7 Refer to the data plates on the equipment supplied, operation of the equipment outside these specifications will increase the risk to operators and may lead to premature and hazardous pump failure.
- 8 **IMPROPER INSTALLATION, OPERATION OR MAINTENANCE OF THIS SPP PUMPS PRODUCT COULD RESULT IN INJURY OR DEATH.**
- 9 Within the manual, safety instructions are marked with safety symbols.



Hazard

This symbol refers to general mechanical aspects of safety.



Hazard

This symbol refers to electrical safety.

ATTENTION

personal safety.

This symbol gives warning of a hazard to the pump itself, which in turn, could cause a risk to

CONTENTS

	Section	Page
1	Pump Hazards	3
2	Introduction	5
3	Installation	5
4	Connection to Services	9
5	Commissioning	10
6	Grouting	10

1 Pump Hazards

These instructions have been categorised in relation to each Hazard Type that may occur, some hazards listed may not occur on the equipment supplied but are included to cover the potential hazards with equipment of this type.

1.1 Pump Hazards and Safety Instructions

Refer to the isolation instructions for electric motors or diesel engines BEFORE working on the pump.

1.3.1 Crushing

When lifting the pump set, use the lifting points specified on the General Arrangement Drawing. Use lifting equipment having a safe working load rating suitable for the weight specified. Lift the component parts from their lifting points where provided, or use suitable slings for lifting any part not provided with lifting points. Refer to the manual for special lifting instructions where applicable.

1.3.2 Shearing

Do NOT place fingers or hands etc. into the suction or discharge pipe outlets and do NOT touch the impeller, if rotated this may cause severe injury. To prevent ingress of any objects, retain the protection covers or packaging in place until removal is necessary for installation. If the packaging or suction and discharge covers are removed for inspection purposes, replace afterwards to protect the pump and maintain safety.

1.3.3 Abrasion and Entrapment

Do NOT touch any moving or rotating parts. Guards are provided to prevent access to these parts, where they have been removed for maintenance they MUST be replaced before operating the equipment.

1.3.4 Fluid Pressure Jets

Check and ensure that the pump operates at below the Maximum Working Pressure specified in the manual or on the pump nameplate and before maintenance, ensure that the pump is drained down.

1.3.5 Hot Surfaces

Do NOT touch surfaces which during normal running will be sufficiently hot to cause injury. These are marked with the HOT warning symbol. Note that these surfaces will remain hot after the pump has stopped, allow sufficient time for cooling before maintenance. Be cautious and note that other parts of the pump may become hot if a fault is developing.

1.3.6 Cold Conditions

Do NOT operate water pumps in temperatures below freezing point, without first checking that the pumped fluid is not frozen and the pump is free to turn. Pumps in these environments should be drained down during inactivity and re-primed before starting.

1.3.7 Hazardous Noise

In addition to local or site regulations for noise protection, SPP PUMPS recommend the use of Personal Ear Protection equipment in all enclosed pump rooms and particularly those containing diesel engines. Care must be taken to ensure that any audible alarm or warning signal can still be heard with ear defenders worn.

1.3.8 Hazardous Materials

Wear a suitable mask or respirator when working with Packing and Gasket components which contain fibrous material as these can be hazardous when the fibrous dust is inhaled. Components containing hazardous materials will be accompanied by warnings in the manuals. Be cautious, if other supplier's components have been substituted for genuine SPP PUMPS parts, these may then contain hazardous materials.

1.3.9 Gases, Mists, Sprays and Leaks

Be aware of the hazards relating to the pumped fluid, especially the danger from inhalation of noxious and toxic gases, skin and eye contact or penetration. Obtain and understand the hazardous substance (COSHH) data sheets relating to the pumped fluid and note the recommended emergency and first aid procedures.

1.3.10 Access Hazards

Clear and easy access to all controls, gauges and dials etc. MUST be maintained at all times. Hazardous or flammable materials must NOT be stored in pump rooms unless safe areas or racking and suitable containers have been provided.

1.2 Electric Motor Hazards and Safety Instructions

These instructions relate generally to electric motor installations, for specific safety instructions for the electric motor supplied, read the supplier's instruction manual.

1.2.1 Electric Shock

ISOLATE the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent re-connection.

1.2.2 Magnetic Fields

Note the existence of magnetic fields where shown by the MAGNETIC FIELD warning symbol.

1.3 Diesel Engine Hazards and Safety Instructions

These instructions relate generally to diesel engine installations, for specific safety instructions for the diesel engine supplied, read the supplier's instruction manual.

1.3.1 Electrical Hazards

DISCONNECT the Batteries by removal of the NEGATIVE terminal connector.

ISOLATE the equipment before any maintenance work is done. Switch off the mains supply, remove fuses, apply lock-outs where applicable and affix suitable isolation warning signs to prevent inadvertent re-connection.

Do NOT place tools on or near the Batteries such that a short circuit may be caused.

INSPECT all cables for damage or signs of failure and replace immediately.

1.3.2 Hot Surfaces

Do NOT touch any part of the engine, its cooling system or exhaust system when it is running or afterwards until it has cooled.

1.3.3 Unexpected Noise Hazard

Wear Ear Defenders when working near the engine even if it is not running, as it may start unexpectedly when fitted with an automatic start control system.

1.3.4 Fluids, Gases and Fumes

Fuel fumes are highly flammable. Do NOT refuel the engine when it is running or is still hot from recent running.

When refuelling, avoid breathing the fuel fumes, particularly if the pump is installed in an enclosed pump room. Maintain maximum ventilation to clear the fumes quickly.

Do NOT start the engine whilst fuel fumes remain evident or may be present..

Exhaust gases are hazardous, the exhaust system MUST be maintained free from leaks and be directed to discharge in a safe area.

Battery gases are hazardous and flammable. The battery area MUST be well ventilated to clear these gases quickly.

Do NOT store lubricants or other volatile substances near the engine. These should be placed in a designated area having a suitable storage enclosure.

ISOLATE the fuel supply to the engine BEFORE working on any part of the fuel supply and control system.

1.3.5 Stored Energy

Where Mechanical, Hydraulic, or Pneumatic systems are fitted, refer to the supplier's manual for instructions to ISOLATE or DE-ENERGISE the system BEFORE maintenance on the engine and to DE-ENERGISE the equipment BEFORE maintenance on this equipment.

2 Introduction

This manual specifies SPP Pumps Limited requirements for the installation of SPP horizontal and vertical split case and end suction pumpsets.

SPP Pumps Limited requires that this document is given to all contractors with responsibility for site preparation, electrical supply and connection, pump installation and pipework etc.

On completion of all stages that apply, a signature should be obtained from the contractor's representative confirming compliance with SPP requirements.

If SPP Pumps Limited Service Department have been requested to perform initial testing, these documents **MUST** be submitted signed before commissioning can be undertaken.

This guide covers the installation, connection and initial testing of a SPP Pumps pumpset, comprising baseplate with electric motor, flexible coupling and centrifugal pump or close coupled pump unit.

All other items required for the installation must be provided by the customer or the contractors responsible for the installation.

2.1 Review of Equipment Received

On receipt of the pumpset it is important to check for any damage or loss that may have occurred in transit. Any damage or missing items should be referred in the first instance to the haulage contractor responsible.

3 Installation

3.1 Pump Location

The pump should be installed as near to the liquid source as possible, with the shortest and most direct suction pipe practical.

Allow sufficient access for inspection and maintenance with enough headroom for an overhead crane or hoist of sufficient capacity to lift the heaviest item of equipment.

Adequate ventilation is required for cooling purposes, inlet and outlet apertures, suitably sized and positioned to prevent air

re-circulation, must be provided in the pump house structure.

3.2 Foundations

A foundation plinth should be constructed to support each pumpset on a floor area free from expansion joints. These foundation plinths should be sufficiently substantial to absorb vibrations and rigid enough to avoid any twisting or misalignment.

As a rough guide, they should be at least 300mm wider than the pumpset on all sides and weigh between 1 and 1.5 times the weight of the pumpset. Plinths for pumps are recommended to have a minimum height of 300mm but height should be sufficient to achieve the necessary weight and to accommodate the pockets for fixing bolts.

Foundation height may be calculated thus:

$$\text{Height (m)} = \frac{W}{2400 \times B \times L}$$

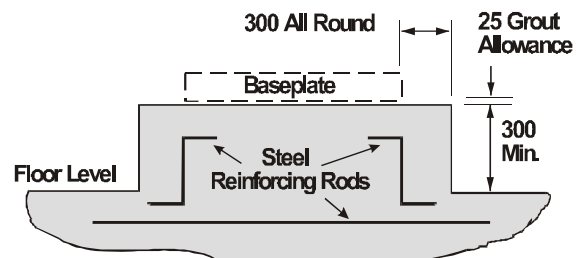
where:

W (kg)	= total weight of pumpset
2400 (kg/m ³)	= concrete density
B (m)	= foundation width
L (m)	= foundation length

Use a suitable concrete mixture by volume is 1:2:3 (Cement : Sand : Aggregate) with a maximum 100mm slump, and a 28 day compressive strength of 27,000 N/mm².

Foundation concrete should be poured without interruption to within 25mm of the finished height.

The foundation should be reinforced with layers of 150mm square No.8 gauge steel wire fabric, or equivalent, horizontally placed 150mm apart.

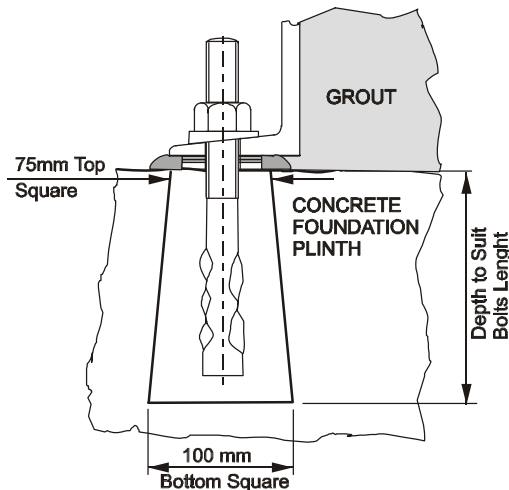


The top surface should be well scored and grooved before the concrete sets to provide a bonding surface for the grout. The foundation should be allowed to cure for several days before installation of the baseplate.

Plinth Sized and Made to Specifications.	Signed	Date
---	--------	------

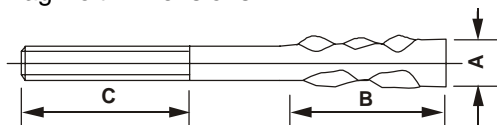
3.3 Foundation Bolts

Two types of foundation bolts are normally used; either rag bolts set into pre cast pockets in the plinth or, chemical anchor bolts for which pockets are drilled into the plinth after casting.



3.3.1 Rag Bolts

Rag Bolt Dimensions



Bolt size		Clearance hole size	Bolt dimensions (see Figure 1)		
Dia.	Length	Dia.	A	B	C
16	160/240	19	32	80	40
20	300/350	24	40	100	50
24	350	28	48	120	60

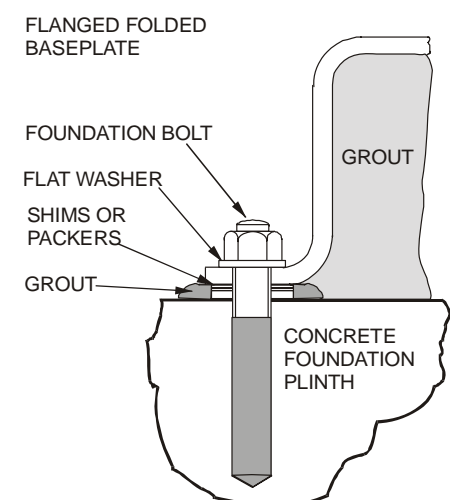
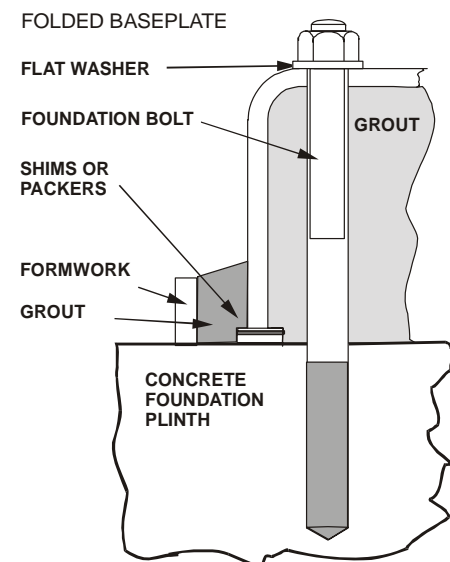
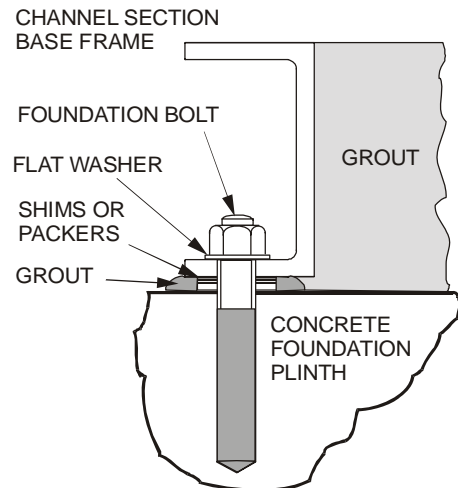
Tapered pockets are recommended for all pump installations.

3.3.2 Chemical Anchor Bolts

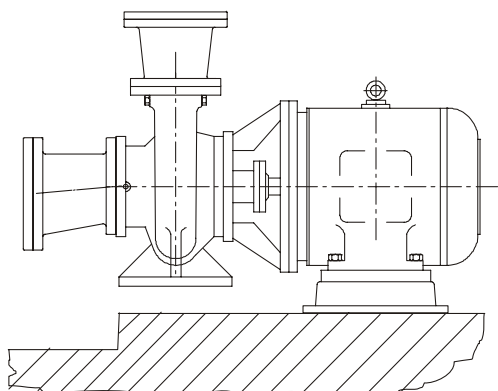
For Chemical Anchor Bolts, refer to the manufacturers installation instructions.

3.4 Horizontal Pump Baseplate Types

There are three main types of baseplate as illustrated below. Note that these figures show chemical type anchor bolts.



3.5 Slide Rail Mounting



Close coupled pumpsets are supplied with the pump mounted directly on the motor. These motors may also be fitted with slide rails under the motor feet to permit withdrawal of the impeller from the casing without disconnecting the pipework.

The motor, with or without slide rails, requires foundation support but where supplied, feet cast onto the pump housing **must NOT be bolted down**. It is, however recommended that the plinth extends under the pump to prevent accidental damage.

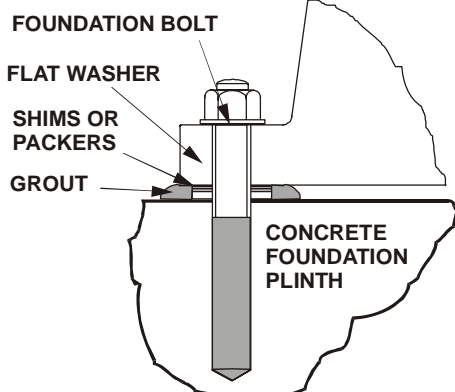
Installation follows the same procedure as for pumpsets except for the alignment checks. Pump/driver alignment is maintained by the spigot/recess construction of the pumpset and cannot be adjusted.

3.6 Vertical Pump Mountings

Vertical pump are supplied with cast or fabricated motor stools. Mountings for fabricated pump stools are as shown for the channel section base frame, above.

Cast pump stools are mounted typically thus

CAST PUMP STOOL

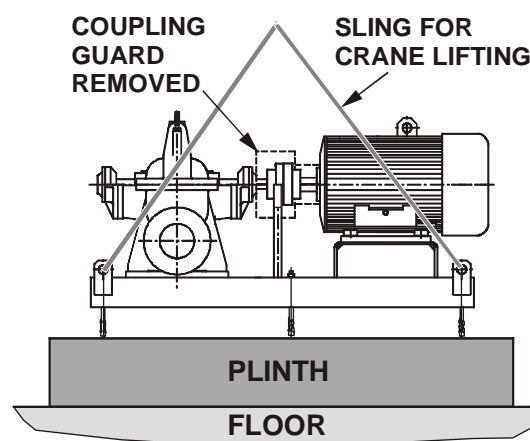


3.7 Installing the Pumpset

ATTENTION

It is important to install pumpsets **BEFORE** installing the main suction and delivery pipework. This is to ensure that the pipes are positioned to match the pump location and do not transmit load and induce strain in the pump casing.

For long coupled pumpsets, remove the coupling guard to provide access to the shaft and coupling.



When using rag bolt fixing, suspend the pumpset over the plinth and hang the foundation bolts from their holes using tapered washers for channel base frames and plain washers for other types, with the nuts showing at least one full thread through.

Place sufficient metal packing pieces on both sides of each foundation bolt hole to support the base frame at about 25mm above the plinth surface. Lower the pumpset and insert the rag bolts into their pockets. Continue lowering until the pumpset is supported by the packing.

Adjust the height of the packing with shims in each position until the **shaft** is horizontal and the pump suction **flange face** is vertical, do not level from the baseplate as this may not be true to the shaft and flanges.

Ensure that the foundation bolts are vertical to permit easy lifting of the pumpset, then grout in with non-shrinking grout. Allow sufficient time for the grout to harden, usually 24 hours or as recommended in the grout manufacturer's instructions.

For chemical anchor fixing with channel section base frames it will be necessary to

mount the pumpset, mark the foundation bolt positions and lift off the pumpset to give access for drilling. Hang the anchor bolts in their holes and lower the pumpset in position having inserted the anchors into their fixing holes.

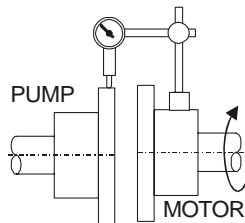
When the pump is resting evenly on all packers, check the coupling alignment and record the initial dial indicator readings

Initial Alignment Readings Taken	Signed	Date
Lateral TIR.	Angular TIR.	

To check coupling alignment, refer to the pump and coupling instruction manuals for details of shaft alignment procedures and tolerances, or proceed generally thus:

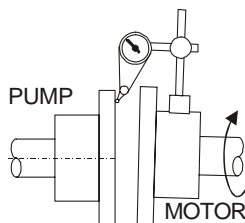
1 Lateral Alignment

Mount a dial gauge on the motor shaft or coupling with the gauge running on the outer-machined surface of the pump coupling. Turn the motor shaft and note the total indicator reading.



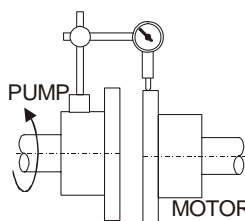
2 Angular Alignment

Mount a dial gauge on the motor shaft or coupling to run on a face of the pump coupling as near the outside edge as possible. Turn the motor shaft and note the total indicator reading.



3 Confirm Lateral Alignment

Mount the dial gauge on the pump shaft or coupling with gauge running on the outer-machined surface of the motor coupling. Turn the pump shaft in the direction of pump rotation, and note the total indicator reading.



4 Adjustment

The motor must be shimmed and re-positioned to align the shafts to well within the coupling manufacturer's specifications.

Note Poor alignment is a major factor contributing to shortening of pump bearing and seal life. It is recommended that alignment is checked frequently and maintained at below 10% of the manufacturer's specified figure.

As the pump and motor feet are accurately machined, any discrepancy may be due to foreign matter between any of the mating faces. These should be checked for cleanliness before assembly and before resorting to using shims under the motor flange.

ATTENTION

Shaft alignment must be checked again after the final positioning of the pump unit and connection to pipework as this may have disturbed the pump or motor mounting positions.

After allowing sufficient time for the bond to cure, tighten the chemical anchor bolts to the torque setting recommended in the manufacturer's instructions, or for rag bolts, tighten the nuts to the torque figures below.

Bolt Size	16	20	24
Torque Nm	95	185	320

ATTENTION

After tightening the fixing bolts check and measure the coupling alignment and if the figures have changed significantly, the baseplate will have been distorted. Release the anchor bolts and adjust the packers to maintain the shaft level and the coupling alignment within acceptable figures.

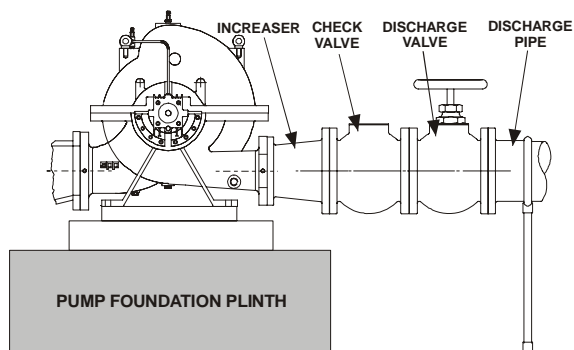
Bolted Down and Alignment Confirmed.	Signed	Date
Lateral TIR.	Angular TIR.	

3.7 Suction & Delivery Piping

Ensure that bolt grouting or chemical anchors have been allowed to cure or dry thoroughly before connecting any pipework.

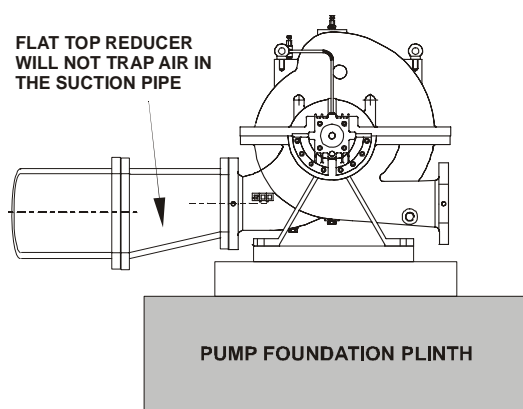
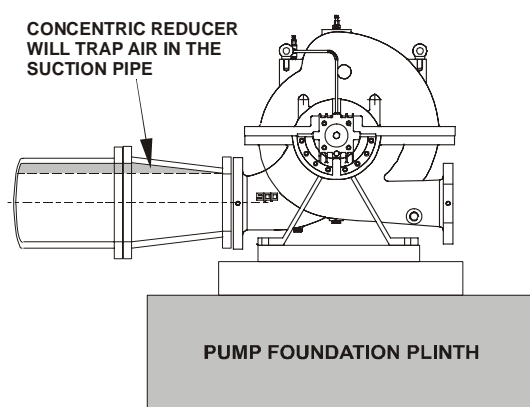
Both suction and discharge piping should be supported independently and close to the pump so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe hangers or other supports at intervals necessary to provide support. When expansion joints are used in the piping system, they must be installed

beyond the piping supports closest to the pump.



Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use 45° or long sweep 90° fitting to decrease friction losses.

Where reducers are used, eccentric or 'flat top' reducers are to be fitted in suction lines and concentric or straight taper reducers in discharge lines. Undulations in the pipe runs are also to be avoided. Failure to comply with this may cause the formation of air pockets in the pipework and thus prevent the correct operation of the pump. Make sure that all piping joints are air tight.



The use of butterfly valves in suction lines is

not recommended, however if unavoidable there should be a distance of at least 5 pipe diameters between the valve and the pump inlet flange.

The suction pipe should be as short and direct as possible, and should be flushed clean before connecting to the pump. Where suction lift is not very high, it is advisable to use a foot valve. Horizontal suction lines must have a gradual rise to the pump. If the pumped fluid is likely to contain foreign matter then a filter or coarse strainer should be fitted to prevent ingress to the pump.

The discharge pipe is usually preceded by a non-return valve or check valve and a discharge gate valve. The check valve is to protect the pump from excessive back pressure and reverse rotation of the unit and to prevent back flow into the pump in case of stoppage or failure of the driver. The discharge valve is used in priming, starting and when shutting down the pump.

Refer to the operating manual for the pump for instructions on the use of the control valves

ATTENTION

Shaft alignment must be checked again after the final positioning of the pump unit and connection to pipework as this may have disturbed the pump or motor mounting positions. To restore alignment shims between the pump or motor feet and the baseplate should be varied to suit.

Pipework Connected and Alignment Confirmed.	Signed	Date
Lateral TIR.	Angular TIR.	

4 Connection to Services

The requirements for each installation will vary depending upon the equipment supplied.

Ensure that site electrical power supply characteristics match the data on the equipment data plates.

If the control panels were manufactured or supplied by Sterling, wiring diagrams will be included with the instruction manual. If the panels have been supplied by others, refer to their literature for electrical details and wiring instructions.

4.1 Electrical Supply Connection

Install the electric motor starter panel in a convenient position for use and wire up to mains supply and to the electric motor. Earth bonding connections are provided on all base frames and must be connected to a suitable earth point.

4.2 Seal Flush and Cooling Systems

Where applicable, if a separate supply for the pump seal is to be used, connect the feed pipes.

4.3 Waste and Drain Lines

Waste water lines should be run from all ancillary connections such as gland drains or tundish etc. Where applicable, these are shown on the General Arrangement Drawing provided.

When installed under positive suction head conditions, pumps should be provided with an air release valve on the top of the pump casing to provide a means of exhausting trapped air.

Services connected to specification.	Signed	Date
--------------------------------------	--------	------

5 Commissioning

5.1 Pre-commissioning Checks

1	Installation:	Θ
a	Mounting plinths comply with instructions for size, construction and location.	
b	Steel packers position the base frame 25 mm above the top surface of the plinth.	
c	The pump shaft is horizontal (or vertical).	
d	The fixing bolts are grouted as instructed and tightened to the required torque.	
e	The shaft alignment has been checked and set to within the stated tolerances.	
f	Suction and delivery pipework is adequately supported and NEGLIGIBLE forces are transmitted to the pump casing.	
2	Where applicable, all drain, minimum flow, and test pipe lines are fitted, together with valves gauges and flow meters.	
3	Sufficient water supply is available for the commissioning proof run.	

Pre - Commissioning Check List Completed	Signed	Date
--	--------	------

If SPP Pumps Limited Service Department is contracted to carry out the initial test run, the check-list shows items to be completed

before the engineer arrives. It is SPP Pumps Limited policy that service engineers will give as much assistance as possible to the customer in solving site problems. However, if due to incomplete installation or failure of equipment not supplied by SPP Pumps Limited, further visits are required to complete commissioning then, additional charge will be made.

5.2 Initial Test Run

It is recommended that the initial test run is done by an SPP Pumps Limited commissioning engineer.

ATTENTION Refer to the pump instruction manual for instructions for commissioning pumpsets.

6 Grouting

After successful testing, grouting is required to compensate for uneven foundations, distribute the weight of the pumpset, prevent movement and reduce vibration. Use only an approved high-strength grout, prepared and poured in accordance with the manufacturer's instructions.

Build any formwork required to contain the grout. If an epoxy grout is to be utilised then the foundation surface should remain dry. For other types of grout, soak the top of the concrete foundation thoroughly with water until absorption stops then, remove any excess.

Fit temporary formwork (shuttering) to the preferred height around the baseplate to prevent grout running out when poured. Fill the space inside the baseframe level with top of the channels or to the level of the top plate with grout ensuring that there are no air pockets. **DO NOT use vibration techniques to aid this procedure.** Dress to a smooth finish and allow the grout to harden.

After the grout has thoroughly hardened remove the temporary shuttering, check the foundation bolts and re-tighten if necessary.

Re-check the shaft alignment and adjust if necessary. The pump is now ready for normal use.

Approximately 14 days after the grout has been poured or when it has thoroughly dried, apply an oil based paint to the exposed faces of the grout to prevent air and moisture from coming into contact.

SPP Pumps Limited operate a comprehensive Spares and Service support network throughout the world, and can be contacted as follows:

SPARES & SERVICE Telephone: +44 (0)118 932 3123

For spare parts, supply only.

ask for - **Spares Dept.**

For breakdowns, spare parts and,
on-site fitting, pump installation and,
commissioning, and service contracts.

ask for - **Service Dept.**

For breakdowns outside office hours. Telephone :

+44 (0)118 932 3353

Spares & Service Office

SPP Pumps Limited

Theale Cross

Reading

Berkshire

RG31 7SP

ENGLAND

General Fax line:

+44 (0)118 932 3302

Direct Fax line:

+44 (0)118 930 3259