TTE TRAINING LIMITED

Phase 1 Fabrication

Carousel 2

PIPEWORK SUPPORT SYSTEMS

PIPEWORK SUPPORT SYSTEMS

INTRODUCTION

Pipe supports are an important part of any piping system and are considered to be an integral part of the piping design. It is true to say that the system will only be good as its supports.

By the consideration of pipe routes at an early stage, structural members and plant items can be arranged in the most convenient positions to give a simple and economical arrangement for supporting the paperwork.

Whenever pipes are installed, some method must be provided to keep them in their proper positions. They could be run along the floor, where they would not need additional support, but the floor is required for the installation of other equipment. Therefore, pipes are often suspended from ceiling, and they must pass through openings in walls and floors. Without adequate support, these pipes would be stressed to the point where they would eventually break or leak. Several other factors must also be considered when pipes are installed. These include possible damage from:

- Expansion and contraction of pipes as they heat up and cool down.
- Vibration transmitted to pipes from operating equipment.
- Rapid changes in flow through pipes.

Not all these problems exist in every pipe. In some cases, pipes do not heat up and cool down, and movement may not be a problem. Exactly what stresses the pipe suffers determines the type of support needed. Supports are available in many different designs, but they are usually divided into two categories: (1) pipe supports (Figure 1-1), which support pipes from underneath and (2) pipe hangers (Figure 1-2), which secure pipes from above. The choice of which is used depends on the requirements of the particular system.

1. AVAILABLE STANDARDS

The piping design standards, e.g. ANSI B31.3 Chemical Plant and Petrochem Refinery Piping gives little other than some general guidance and do not concern themselves with component details.

The only national standards available are the American MSS SP58 – Design Guide and British Standards BS 3974 Pipe Supports.

The American Standard is basically a design guide while the British Standards is a component standard with design guidance and is published in three parts with a fourth for supports for plastic pipes in draft form.

Exactly what stresses the pipe suffers determines the type of support needed. Supports are available in many different designs, but they are usually divided into two categories:

(1) pipe hangers, which secure pipes from above.
(2) pipe supports, which support pipes from underneath.

The choice of which is used depends on the requirements of the particular system.

2.1 Hangers

Hangers consist of a pipe clip round the pipe, a sling rod and a top attachment to the supporting steelwork which is usually a cage type attachment.

The pipe clip is the weakest component and is load rated. The appropriate standard sling rod diameter is selected which gives a load rating in excess of this load. The cage is designed to the load rating of the sling rod.

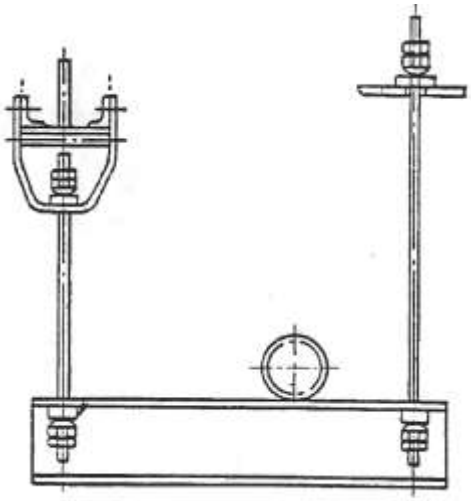
The normal series of clips (up to 16” NB) in the manual are rated to carry the pipe of water with insulation at the maximum recommended spans. Those above 16” NB are rated rather less than this on consideration of normal structural member load carrying capacity. There is also a Heavy series available for pipes above 16” NB.

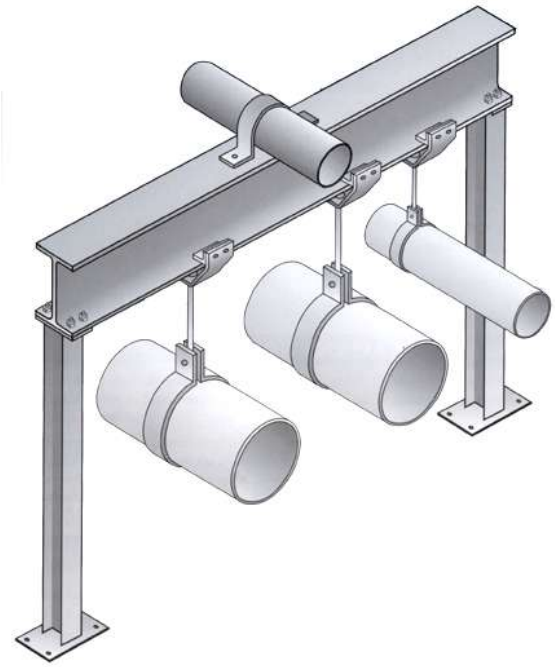
At the full load rating the clips are designed to have yielded onto the pipe up to the horizontal and up to yield above. This is a relatively safe component (if made correctly) as additional load will yield the clip into a safer pear shape. The clips are specified to be 3 mm greater than the pipe outside diameter to prevent excessive inbuilding of stress during erection – however, it is probably that the tolerances on clip manufacture and pipe outside diameter and ovality are at least as great as this clearance.

Particular care has to be given to the strength of the supporting beam . The main problem here is the bending of the bottom flange especially in Universal Beams. Safe loads have been specified in the standards for all beams based on the assumption that the flange is tip loaded with a 5˚ drop rod angulation.

HANGERS

TRAPEZE HANGER FOR LAGGED OR UNLAGGED PIPES FOR ATTACHMENT TO ANY COMBINATION OF UB, RSJ OR HORIZONTAL SURFACE





Hanger support systems consist of three components :

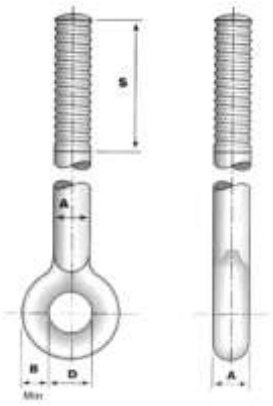
1) Upper component – This is a fixed element such as a bracket or clamping arrangement attached to a beam or solid

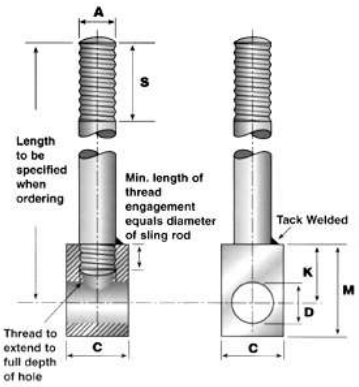
2.2 **Drop Rods**

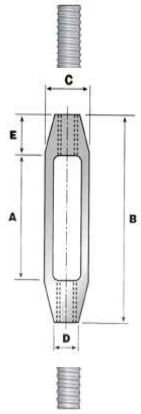
In some areas the sling rod with weldless eye nut is preferred, whilst in others the welded U piece is preferred. A proposed addition is the sling rod with welded plate end.

ALL DIMENSIONS IN MILLIMETRES

NOTE: SHERARDIZE TO BS 4291 CLASS 2,
ALTERNATIVELY ZINC ELECTROPLATE TO BS 3382 pt 2



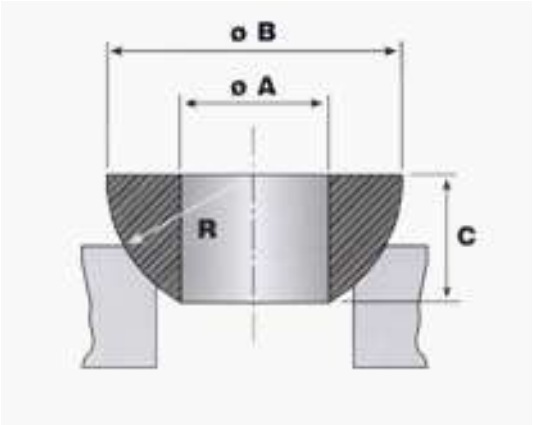




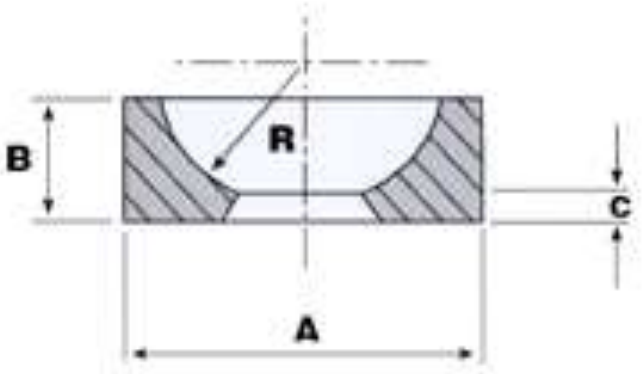
NOTE: RODS 12 mm to 30 mm FULLY THREADED UP TO 500 mm LONG
RODS 36 mm to 42 mm FULLY THREADED UP TO 600 mm LONG

SPHERICAL WASHER

BS 3974: Part 1



SPHERICAL WASHER PLATE



PIPE CLIPS FOR UNLAGGED STEEL PIPES
½ in TO 24 in nom. Size

NOTES: **PIPE CLIPS ARE TO BE HOT FORMED**
CLIPS & DISTANCE PIECES TO BE HOT DIP GALVANIZED TO BS 729
NUTS & BOLTS TO BE SHERARDIZED TO BS 4921 CLASS 2
ALTERNATIVELY ZINC ELECTROPLATED TO BS 3382 Pt 2

LOCK NUTS MAY BE NORMAL OR THIN NUTS

PIPE CLIPS FOR LAGGED STEEL PIPES
½ in TO 24 in nom size

NOTES: **PIPE CLIPS ARE TO BE HOT FORMED**
CLIPS & DISTANCE PIECES TO BE HOT DIP GALVANIZED TO BS 729
NUTS & BOLTS TO BE SHERARDIZED TO BS 4921 CLASS 2
ALTERNATIVELY ZINC ELECTROPLATED TO BS 3382 Pt 2

LOCK NUTS MAY BE NORMAL OR
THIN NUTS

2.3 Section C Skids

These consist of a bolt on or weld on attachment which lifts the pipe above the point of support. They will provide a metal to metal sliding contract or, where desired may incorporate a PTFE to stainless steel surface. Although the movement and therefore necessary slider length will vary at different points on the pipeline it is usual to select a common length. It is important that the correct length is specified and the slider length is selected to ensure that the bearer is completely covered with some safety margin at the point of max movement.

Weld on sliders have the advantage that they can be fabricated easily at site by the erector; however, they are often added at the fabrication stage and are not positioned correctly. Bolt on types are more flexible in that they can be adjusted accurately and may be used advantageously where problems of welding to the pipeline are identified.

PTFE sliding surfaces may be incorporated where there is a requirement to keep friction loads on structures to a minimum or for other pipeline considerations.

SECTION C – SKIDS

BOLT-ON SKIDS WITH INSULATION BLOCKS FOR STEEL PIPES

Recommended for Low Temperature Duties

WELD-ON SKIDS WITH ROUND BAR ANTI-FRICTION DEVICE FOR STEEL PIPES

BOLT-ON SKIDS WITH ROUND BAR ANTI-FRICTION DEVICE FOR STEEL PIPES

Recommended for Lined, Stress Relieved and Stainless Steel Pipe

SECTION C – SKIDS

WELD-ON SKIDS FOR CARBON STEEL PIPES

BOLT-ON SKIDS FOR STEEL PIPES

Recommended for Lined, Stress Relieved and Stainless Steel Pipe

WELD-ON SKIDS WITH PTFE ANTI-FRICTION PADS FOR CARBON STEEL PIPES

BOLT-ON SKIDS WITH PTFE ANTI-FRICTION PADS FOR STEEL PIPES

Recommended for Lined, Stress Relieved and Stainless Steel Pipe

BOLT-ON SUPPORT FOR TRAPEZE ASSEMBLY LAGGED STEEL PIPE ½" TO 6"

BOLT-ON SUPPORT FOR TRAPEZE ASSEMBLY LAGGED STEEL PIPE 8" TO 24"

2.4 Section D Components

Here details of all the components used in the assembly standards are to be found. The spring units which are more complex items are described below.

These are required when there is a requirement for the pipe to be allowed to move during thermal change but for the pipe load still to be carried at this point.

There are two types of spring support, the variable load and constant load varieties.

2.4.1 Variable Load Spring Support

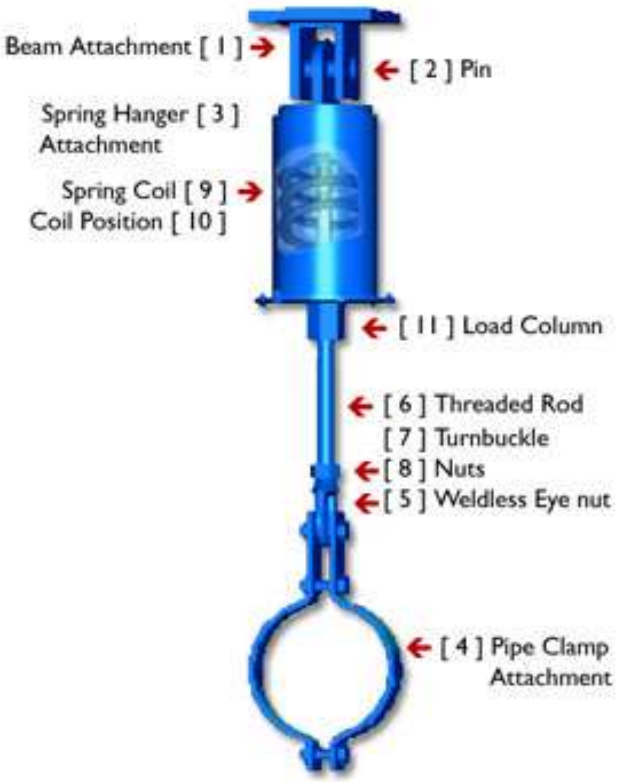
The variable spring support carries the load directly on a spring and therefore changes its load carrying capacity with spring compression.

Normally a spring is shown that will limit the load change to ± 20% over the range of travel required.

It is usually required that the calculated cold load at the support is carried in the operating condition. This means that the spring has to be preset to some other value either more or less depending on the direction of movement and this is obtained by use of a pin or other locking device. After pipe erection is necessary to apply some pre-stress to the pipe system by adjusting the hanger rod length (or other similar adjustment) until the locking pin becomes free, which indicates that the correct load is being carried. It is essential that the locking pin is removed to allow the pipe to move into its correct position in the operating position.

SECTION B – HANGERS

VARIABLE SPRING HANGER ASSEMBLY FOR USE WITH R.S.JOISTS



DROP ROD & CLIP ASSEMBLY WITH VARIABLE SPRING UNIT (SUSPENDED TYPE)

2.4.2 Constant Load Spring Support

The more expensive spring is used on systems where there are large thermal movements or critical stress conditions or a combination of both. Such conditions exist on high pressure steam lines. Constant load supports are spring devices in which the varying force of the spring is compensated through a lever system so that the support load variability is within the range of plus or minus 6%. When specifying this type the support manufacturer or piping section should be consulted.

2.5 Section E U Bolts

Two types are in general use. One is designed to grip the pipe and will be effective as a light type of anchor or restraint on the smaller pipe size. The other type is designed as a loose fit with lock nuts to ensure that this is the case and is used as a simple guide or steady.

It is probable that this type of support is used rather more than is necessary but without detriment to the pipe system. U Bolts should not be used on insulated lines as the lagging will become damaged due to thermal movement and the cladding is difficult to finish satisfactorily at these support points.

SECTION E – U BOLTS/PEDESTALS

2.6 Section F Cantilevers

These usually consist of lengths of channel or angle section steel fixed at one end and carrying the pipe at the other.

Tables of allowable cantilever length for given pipe loads are available but as indicated before the method of attachment and the strength of the member to which the cantilever is attached are usually the areas that give concern and required special attention.

This common form of support needs proper consideration, they should normally be limited to supporting small bore pipes and should be as short as possible.

The ‘Lindaptor’ type of attachment is frequently used often without sufficient consideration. They require proper specification and accurate site erection and only obtain a grip on the very tip of the flange. The load to be carried is of course all in the ‘lindaptor’ nearest to the pipe and will usually be well in excess of the pipe load.

The ‘Spenco’ type cantilever is however much more flexible and provides for adjustment in three dimensions. Its use however on vertical columns has still to be considered.

SECTION F – CANTILEVERS

2.7 Section G Guides

Guides are required to ensure that the pipe moves only in a predetermined direction.

They should be used on straight pipelines to prevent smashing, at frequent intervals on small bore pipes and at wider spacings for larger pipes.

Guides are installed either size of expansion bellows to prevent bellows failures (as Flixborough) and provide two directional restraint.

2.8 Section H Anchors

Anchors are usually purpose designed to take calculated loads. They are a means of fixing the pipe at a point and have to be capable of sustaining all the forces which may be imposed such as expansion, pressure bellow, pumping effects, etc.

Both the attachment to the pipe, the supporting structure and the interface have to be capable of carrying these loads. In general the attachment to the pipe will be via a pad or saddle welded to the pipe.

Often forces are balanced (or nearly so) at an anchor and the use of a standard weld on slipper bolted to the structure will be sufficient. However, transient conditions such as start up or shutdown have to be considered and it is therefore safer to design the anchor to sustain the calculated forces acting on one side only.

TYPICAL CANTILEVER SUPPORTS SHOWING MOMENT ARM ⌊

3. POSITIONING OF PIPE

The position of the pipe will determine type of support to be used or perhaps more often the converse is true, i.e. pipe routing usually has to be made with the supports required in mind.

Support locations are dependant on pipe size, pipe configurations, the location of heavy valves and fittings and the structure that is available for the support of the piping. Judgement is therefore necessary in each case to determine the appropriate support location.

(a) Pipes should be grouped so as to minimise the number of structural members needed solely for the supporting of pipes.

(b) Supports should be located so as to reduce the necessity for temporary supports where regular maintenance requires removal of equipment, vessel covers, control valves etc, and where the pipes have to be dismantled for cleaning.

(c) Where practical, a support should be located immediately adjacent to any change in direction of the pipes.

(d) Where changes of direction in the pipes of any system occur between supports the total length of piping between supports should not exceed 0.75 of the full span listed in the manual.

(e) Supports should not be located on sharp radius bends or weld elbows which are already subjected to high localised stresses but should be located at points of low stress in pipes.

(f) Screwed or flanged joints should not be sited at mid span or close to a support (i.e. at high points of high bending moment).

(g) Pipes from upper connections on tall free standing vertical vessels (e.g. distillation columns) are advantageously supported from the vessel to minimise relative movement between support and the pipes. Such pipes should be routed next to the vessel and supported close to the connection.

(h) Pipes in structures should be routed beneath platforms near major structural members and supported at points favourable for added loading.

(i) Pipes prone to vibration, such as compressor suction or discharge lines should be routed for support independent from other pipes and lightly braced structures and buildings. Supports offering resistance and providing some damping capacity should be used rather than hanger supports.

(j) Pipes should be sufficiently close to point of support or restraint so that the structural connection can have adequate rigidity and details can be simple and economical.

(k) To avoid lagging in the bearer and to ensure that the outer cladding makes a satisfactory weather seal insulated pipework should not rest directly on supporting steelwork. This is of particular importance where insulated, cold or sub-zero pipes require a perfect vapour seal. In addition lagged pipes will need to be guided at intervals and this cannot be achieved satisfactorily from the lagging but is usually from the slider support.

(l) Where pipe supports protrude through lagging the seal between the support and the lagging should be to the relevant specification.

(m) Horizontal pipes which turn at right angles, for example coming off a pipe bridge, can be supported by providing a dummy branch which can then be supported from adjacent steel work, thus obviating the necessity of providing additional steelwork. This method of support should only be used where stresses induced in the bend are acceptable.

4 Spans may need, indeed often need to be reduced below the maximum allowable because the load to be carried exceeds the capacity of the supporting structure.

5 SPACING

The spacing of pipes will depend on a number of factors such as space for welding, insulation and flange clearance. Thermal movement has also to be considered. A particular problem which is often ignored can be at changes of direction where longitudinal movements can cause interference between adjacent pipes and this is particularly so on long ambient lines where daily ambient changes in temperature can be quite significant (perhaps 20mm/30mm).

6 FLEXIBILITY

Supports should be designed to meet all static and operational conditions to which the pipes and equipment may be subjected. The design necessitates a knowledge of the complete cyclic behaviour of each section of the pipe.

The complexity of the support design can be reduced by allowing a pipe to ‘float’. However, in many instances the thermal movement of the pipe has to be controlled both in magnitude and direction. This is achieved by the careful selection and location of supports.

Anchors and Guides should be located as follows:-

(a) In pipes incorporating expansion loops or expansion joints as required to control flexibility and pressure effects.

(b) In order to control the magnitude of moments and forces on connections to equipment with load sensitive nozzles (Pumps, Turbines, Vessels etc).

6.1 Anchors

The Requirements for anchors are specified as part of the piping design and the loads to be carried obtained from pipe flexibility analysis. Often the loads will be quite low due to the balancing effects either side of the anchor and the anchor is required as a restraint point on the pipeline so that movement and stress are predetermined. The introduction of an anchor usually implies guides and thermal expansion controlled into bends or loops. It is considered that ambient lines of any length should generally be also treated this way, unless pipe snaking is acceptable. Where there are any pumping effects then they should certainly be treated this way. Pipe failures have been known where long fabricated anchors have been welded to 'hot' pipelines and the pipe has been torn due to differential thermal conditions between anchor and pipe – don't make them too long.

6.2 Guides

Guides should not be placed too near to bends which are being allowed to accommodate thermal expansion effects.

Loads on guides are usually small and can consist from small angles or bars welded to the structure up to a more complicated frame type support erected round the pipe to prevent two directional movement.

6.3 Pipe Movement

6.3.1 The movement of the pipe at each support point dictates the basic type of support required. Each type of support selected should be capable of accommodating movements calculated for the pipeline. The first choice should always be the simplest support capable of meeting these requirements.

6.3.2 With negligible vertical and definite horizontal movement a simple drop rod with a spherical washer will suffice, provided the overall length is sufficient to keep the angular swing of the rod within the limits stated in the standards.

6.3.3 For pipes supported from below, some form of slide should be incorporated to provide for horizontal movement where this is certain. Roller supports should not be used.

6.3.4 Spring supports are used where the deflection of a pipe is excessive.

6.3.5 Excessive flexibility may make additional supports and restraints necessary to avoid movement and vibration. This can occur on vertical lines where only one point of support is need to carry the weight.

6.3.6 On pipes which need to be self draining by nature of fluid content the deflection of a pipe spanning two supports should not prohibit the self draining requirements.

7 CONSIDERATIONS FOR PIPE SUPPORT SELECTION

The support system will be provided to permit and control pipe movement in a predetermined way and it should be appreciated that all pipes are subject to thermal movement so that long ambient lines can suffer the same or greater movements than short hot lines.

The following considerations have to be made in selecting the pipe supports.

7.1 Sufficient space should be allocated so that the total support assembly can be accommodated.

7.2 Supports should in general be attached to the pipe and not to pipe components such as valves, fittings and expansion joints. However, the position of the support should be carefully considered, for example:-

(a) With copper pipes the support should be close to the valve or hose point.

(b) With unreinforced plastic pipes, valves should be supported independently.

(c) With reinforced plastic pipes, supports should be close to the valve or the valve supported independently if the valve is large.

7.3 Axial loads can be transmitted to a foundation or other fixture by attaching a ‘duck foot’ to the lower end of a vertical pipe, e.g. generally at the bend. This method of support can induce additional stresses into the bend due to the bending moment created by thermal movement. This can be reduced by allowing the ‘duck foot’ to slide, but allowances should be made for the residual bending moment induced by sliding friction.

7.4 On pipe bridges, pipe racks and other horizontal supports which are part of the structure, the pipe supports should be designed to avoid the drilling of supporting members. Double 'Z' sections or back to back angles allow pipes to be adjusted to accommodate any mis-alignment.

7.5 Site drilling of structural steel is acceptable if agreed with the Structural Design Section, but should be avoided if possible. Flame cutting of holes is not permitted.

7.6 Where possible bolted clamps should be used for attaching brackets to steelwork but supports may be welded to structural steel if called for in the design. Special techniques are required when welding brackets to high tensile steel work, and this shall only be done with the approval of the Structural Design Section.

The use of friction grip bolts is not permitted.

7.7 Unistrut should not be used.

8 LOADING

Supports, with the exception of springs and counterweights, should be of ample strength to carry the load caused by the most severe combination of the following:-

(a) Weight of pipe, fittings, valves etc.
(b) Weight of operating fluid or test fluid – whichever is the greater.
(c) Weight of insulation.
(d) Weight of pipe support components.
(e) Expansion of contraction loads.
(f) Reaction from line discharging to atmosphere.
(g) Wind loads.
(h) Snow and ice loads.
(i) Any other forces.
(j) The effect of 'Water' hammer.

When calculating the load on the supports, the piping system should be considered to be full of water even though the system may carry only gas or vapour and be pneumatically tested. This may be waived by agreement but this should be fully documented.

Ducting for dust extraction systems should be considered to be full of powder.

When several new pipelines are to be supported by common steelwork (e.g. a pipebridge) it may be wrong to assume that all of the pipelines would be filled with water at the same time. Such an assumption may lead to a costly

structural design for the pipebridge. The actual design loading should be agreed with the Structural Design Section.

The piping drawings should clearly indicate which of the lines are or are assumed to be full of water as the basis of the structural design.

A further consideration is process maloperation or just plainly the unexpected, e.g. gas lines filling up with water or dust/silt. Consideration should also be given to:

(1) Any forces arising from two-phase flow.
(2) Need to control the magnitude of forces and moments on equipment.
(3) Vibrations.
(4) Settlement of large storage tanks.
(5) Removal of pipework and/or equipment for maintenance.
(6) Access to equipment.
(7) Differential settlement of the building.
(8) Expansion joints in the structure (to allow for expansion of the structure).
(9) Avoiding damage to any pipe insulation.
(10) Avoiding stress concentration at the point of attachments to the pipe.

9 STRENGTH OF SUPPORTING STRUCTURE

Having established the load which the support will carry it is necessary (where applicable) to check the strength of the attachment to the supporting beam and the supporting beam itself. Finally the strength of the supporting structure should be checked. Because this is often a complicated question and may not involve just pipes it is usual and often essential that the problem is referred to the Structural Design Section. However some guidance is given in the manual as to the permitted loads on simply supported beams and joists and the allowable bottom flange trip loading via 08 0898, 0899.

A problem arises when cantilevers are fixed to the underside of beams and joists in that the beam web may bend. This is a complex problem depending on pipe weight cantilever length beam strength and end fixing. Cantilevers should be kept as short as possible and limited for use on small pipes (6” – 8” max).

The undesirable effects of pipe reactions on foundations, structures, buildings and vessels can be minimised by the careful location of supports, restraints, anchors etc.
For example:-

(a) Applying loads to columns and beams near main member intersections minimises bending effects.

(b) Avoiding the introduction of unnecessary torsion or lateral bending effects.

(c) Avoiding the introduction of moments or transverse loading into slender structural members such as wind bracing.

10 PLINTHS

The preferred method for the design of a pedestal support is to sit the support on the floor, erect the pipe and then to locate the pedestal by firing ‘red-head’ bolts into the concrete floor. The support can then be protected by casting a concrete box round the base of the pedestal.

In areas where the floor is tiled, a membrane is inserted or, in gravelled areas, pre-cast plinths should be provided prior to the erection of the support.

11 SUB ZERO SUPPORTS

When supporting piping operating at sub-zero temperatures, the pipe should be insulated from its support by a load bearing material such as preformed hardwood blocks of a suitable type; eg IROKO (oak and beech should not be used because of acid corrosion). Where piping is insulated the insulation itself may be used for this purpose providing it has sufficient mechanical strength.

When hardwood blocks are used, care should be taken to ensure sound application of the vapour seal between the block and the insulation.

12 CORROSION/PROTECTION

Corrosion of pipe supports is often a problem which does not receive sufficient thought. It is possible that the requirements are different say between plants which have a relatively short life and service pipes which may be in operation over many years.

In all events the environment in which the supports will operate has to be considered and a minimum of a good paint treatment should be required. Often supports are delivered ‘bare metal’ and proceed to corrode while they lie around on site before erection. Experience suggests that after erection because they are relatively inaccessible (or because they are erected after structural pointing) they often never received a paint treatment. This also often applies to welded attachments to structural members where the welding burns off the paint which = h does not get repaired.

It should be recognised that hot dip galvanising gives an extended delivery period.

Before pipes are supported directly from the bearer careful thought should be given.

This point of support is known to be a source of high corrosion as painting is not possible and failures have occurred here on long life lines. In addition this is also a point of wear as even ambient lines are usually subject to movement. The addition of wearing plates and possibly corrosion allowance to the pipe should be considered. If wearing plates are used they should be fully seal welded to prevent corrosion between the pipe and the plate.

The type of protection required for each project should be agreed to suit the environmental conditions.

13 SUPPORT ERECTION

Special care should be taken when supporting fragile pipework such as glass, PVC or glass lines carbon steel pipes to ensure that damage is not caused by overstressing the pipe by permitting excessive deflection during erection.

During pipe erection temporary supports may be required, for example, if mechanical ‘mousing’ is required or blast cleaning is called for. It is important, if t he supports are to operate in service as designed that all such temporary supports are removed before commissioning.

14 INSPECTION OF PIPE HANGERS AND PIPING SUPPORTS

Even though pipe hangers and piping supports are very reliable, they should be inspected routinely to make sure that they are keeping pipes in place and providing adequate support. Any parts that have become loose should be retightened or replaced. Leaking joints and bent or sagging pipes could be indications of improper pipe support. However, these conditions may also be caused by abuse, such as someone standing on a pipe. The cause should be determined, and the necessary corrective action should be taken.

In most cases, the pipe hanger lower component attaches directly to the pipe. However, in situations where vibration or movement is severe, a canvas or rubber protective material may be placed between the support or hanger and the pipe. Where applicable, this protective material should be checked as part of routine inspections. If it is worn out, it should be replaced.

Some typical problems and failures are as follows:-

(a) Cold formed pipe straps have been known to crack in service and straps with the ears welded on have failed.

(b) The zip fastener type of failure which takes place when one hanger collapses throwing excessive load onto adjacent hangers which then fail and so on.

Such failures may occur because of faulty manufacture, corrosion or faulty specification. The latter is usually when the pipeline conditions change from the design conditions, for example, when a usually empty pipeline becomes full of water or chokes with dust.

(c) The use of incorrect slider length (i.e. too short) is not an uncommon type of failure. The pipe falls off the bearer due to excessive movement perhaps at start up of or because of dynamic effects and is unable to return to its intended position. This has been known to have disastrous results in steam mains, for example, where the pipe wall has been torn or perhaps less seriously the steelwork on which the pipe was sitting becomes bent.

(d) Corrosion is a problem and it is often the case that supports do not get painted after erection probably because access is so difficult.

Variable Spring support ‘cans’ corrode and collapse, sling rods waste away, pipes lying directly on bearers corrode in the area where painting is impossible. Tubular duckfoot supports used incorrectly to hang pipes allowed water to reach the pipe wall and corrode it through because they were not sealed.

(e) Lock nuts have been found which do not lock, for example, the weldless eye nut sling rod employing a lock nut instead of tack weld has been known to turn out of the eye nut when adjustment is being made at the top end of the assembly.

RECOMMENDED MAXIMUM SPANS FOR STRAIGHT RUNS EXCLUDING FITTINGS

NOM. SIZE 80 mm TO 150 mm INCLUSIVE
RECOMMENDED MAXIMUM SPAN = 4 m

NOM. SIZE 200 mm TO 600 mm INCLUSIVE
RECOMMENDED MAXIMUM SPAN = 8 m

THESE MAXIMUM RECOMMENDED SPANS TAKE ACCOUNT OF:

1 THE PIPE BEING FILLED WITH WATER AND WITHOUT LAGGING

2 THE FLANGED JOINT BEING POSITIONED AT MID-SPAN

FOR STRAIGHT RUNS OF FLANGED DUCTILE IRON PIPES TO BS 4772 THE FOLLOWING DIAGRAMS ILLUSTRATE THE PREFERRED POSITIONS FOR SUPPORTS AND FLANGED JOINTS IN ORDER TO MINIMISE THE BENDING MOVEMENT ON THE FLANGED JOING.

NOM. SIZE 80 mm TO 150 mm INCLUSIVE WITH A SUPPORT FOR EACH LENGTH POSITIONED L/4 AWAY FROM FLANGES

NOM. SIZE 200 mm TO 600 mm INCLUSIVE WITH A SUPPORT POSITIONED APPROXIMATELY L/2 AWAY FROM THE FLANGES ON ALTERNATIVE LENGTHS

NB
STANDARD LENGTHS OF FLANGED PIPE SHOULD NORMALLY BE 4 METRES TO MINIMISE THE BENDING MOMENT ON THE FLANGED JOINTS AS ILLUSTRATED ABOVE.