PIPEWORK SUPPORT SYSTEMS

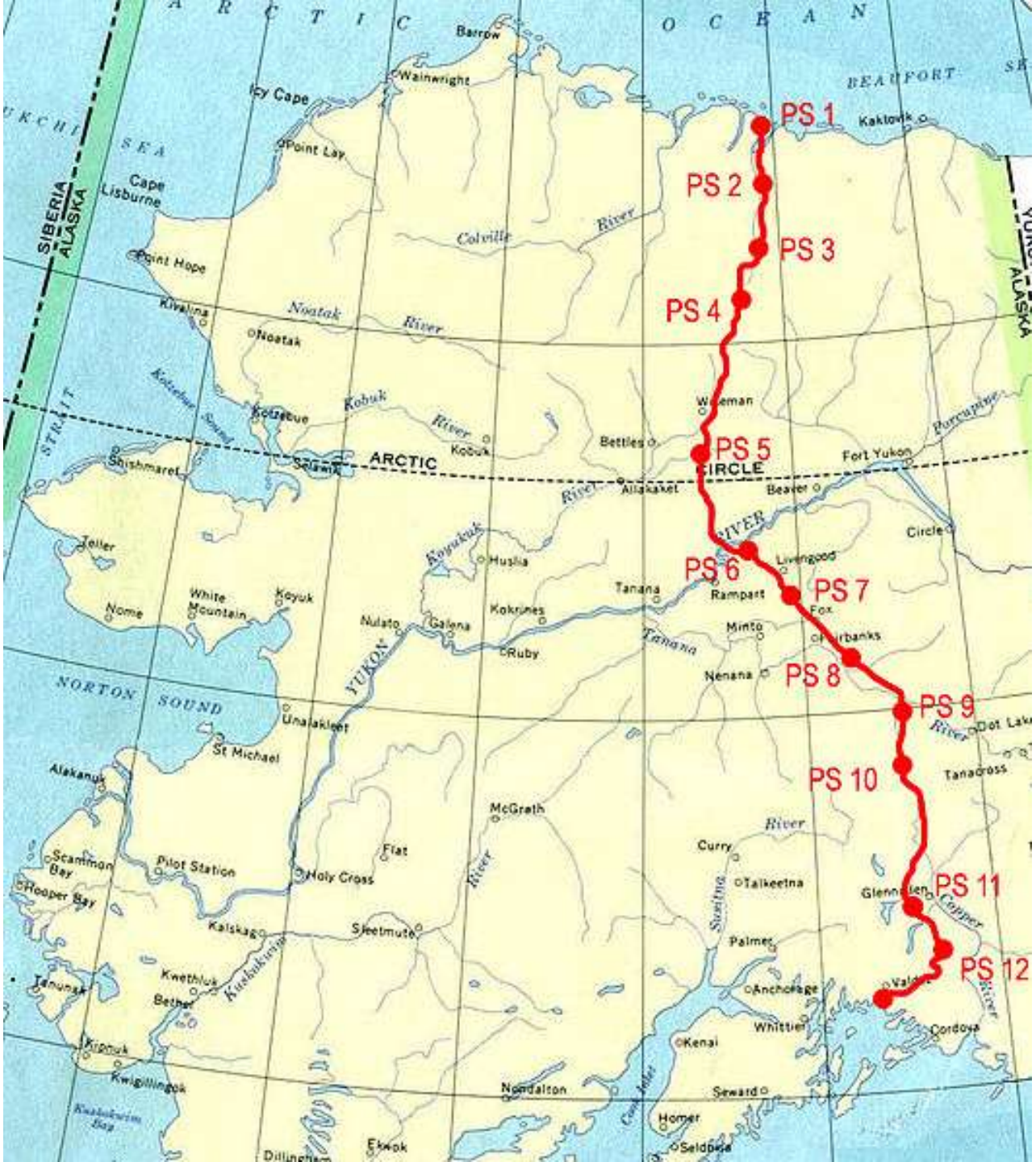
Pipe supports are an important part of any piping system and are considered to be an integral part of the piping design.

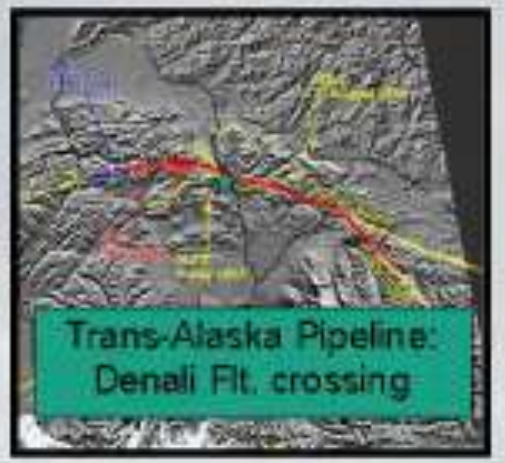
It is true to say that the piping system will only be good as what is holding it in place.


ONLY
BERTS


T 201
COLLECTION
TANK
PV1653


Wear Goggles

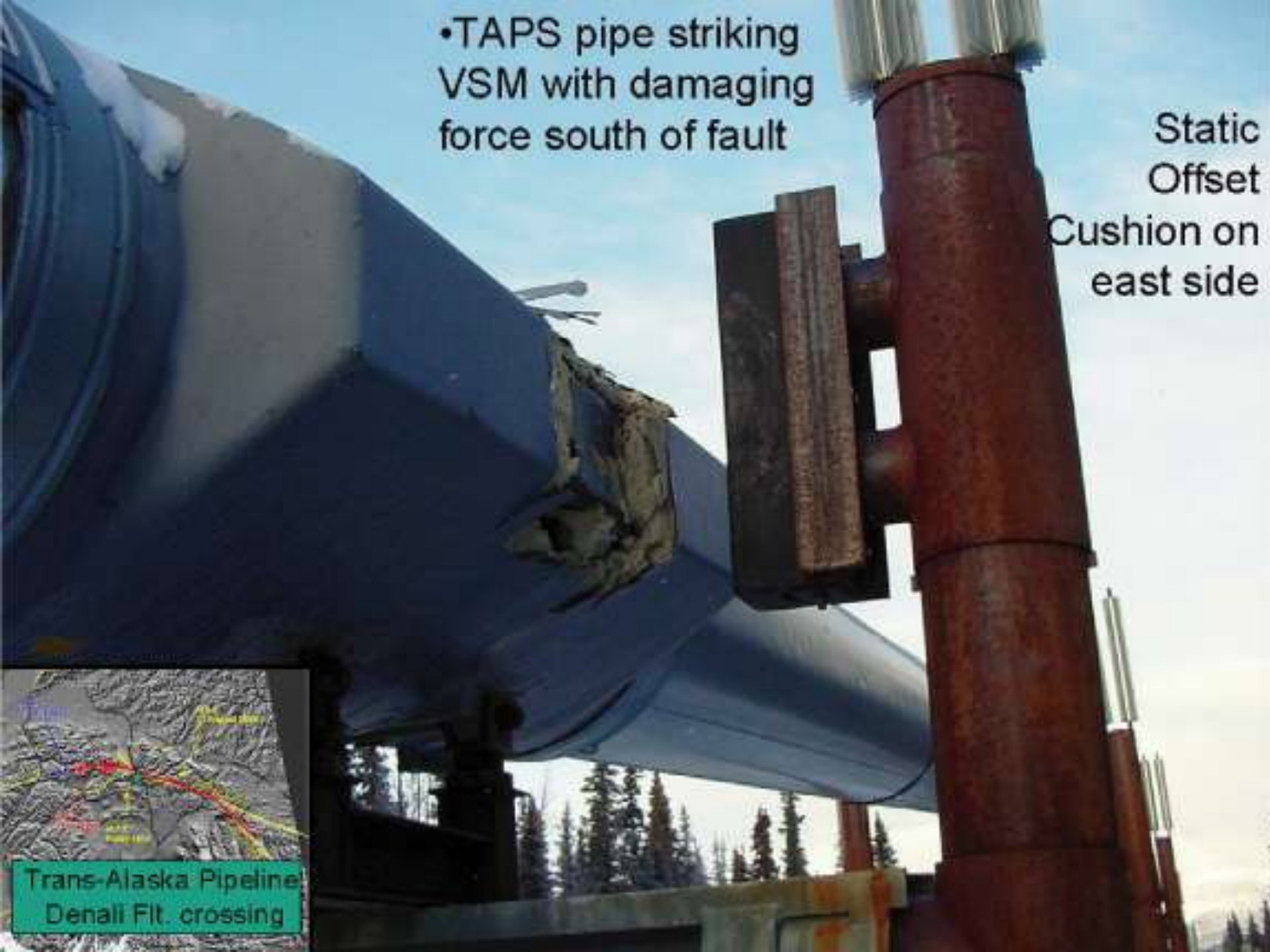

PS 1
PS 2
PS 3
PS 4
PS 5
PS 6
PS 7
PS 8
PS 9
PS 10
PS 11
PS 12
ARCTIC OCEAN
BEAUFORT SEA
CHUKCHI SEA
SIBERIA
ALASKA
Barrow
Wainwright
Icy Cape
Point Lay
Cape Lisburne
Point Hope
Kivalina
Noatak
Noatak River
Kotzebue
Kotzebue Sound
Kobuk River
Shishmaret
Selawik
ARCTIC CIRCLE
Wiseman
Bettles
Allakaket
Alatna River
Koyukuk River
Hughes
Huslia
Tanana
Rampart
Livengood
Fox
Fairbanks
Minto
Nenana
Ruby
Galena
Nulato
Koyuk
White Mountain
Nome
Teller
NORTON SOUND
YUKON
Unalakleet
St Michael
Alakanuk
Scammon Bay
Hooper Bay
Pilot Station
Holy Cross
Flat
McGrath
Kuskokwim River
Kalskag
Sleetmute
Kwethluk
Bethel
Tuntutuliak
Kipnuk
Kwigillingok
Kuskokwim Bay
Nondalton
Iliamna Lake
Ekwok
Dillingham
Homer
Seldovia
Seward
Kenai
Whittier
Anchorage
Palmer
Susitna River
Talkeetna
Curry
Glennallen
Copper River
Cordova
Valdez
Tanacross
Dot Lake
Circle
Beaver
Fort Yukon
Porcupine River



Denali Fault Zone

- 48" pipe transitions from elevated support structure to ground-level skid-beam ("sleeper rail")-teflon shoe assembly

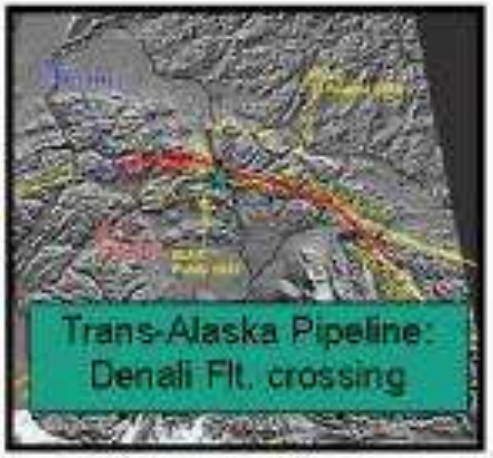

562


•TAPS pipe striking VSM with damaging force south of fault
Static Offset Cushion on east side
Trans-Alaska Pipeline Denali Flt. crossing


Impact of pipe against vertical side supports caused the failure of 8 cross-members immediately south of the fault.
Impact mark
Failed cross-member
Collapsed Teflon shoe

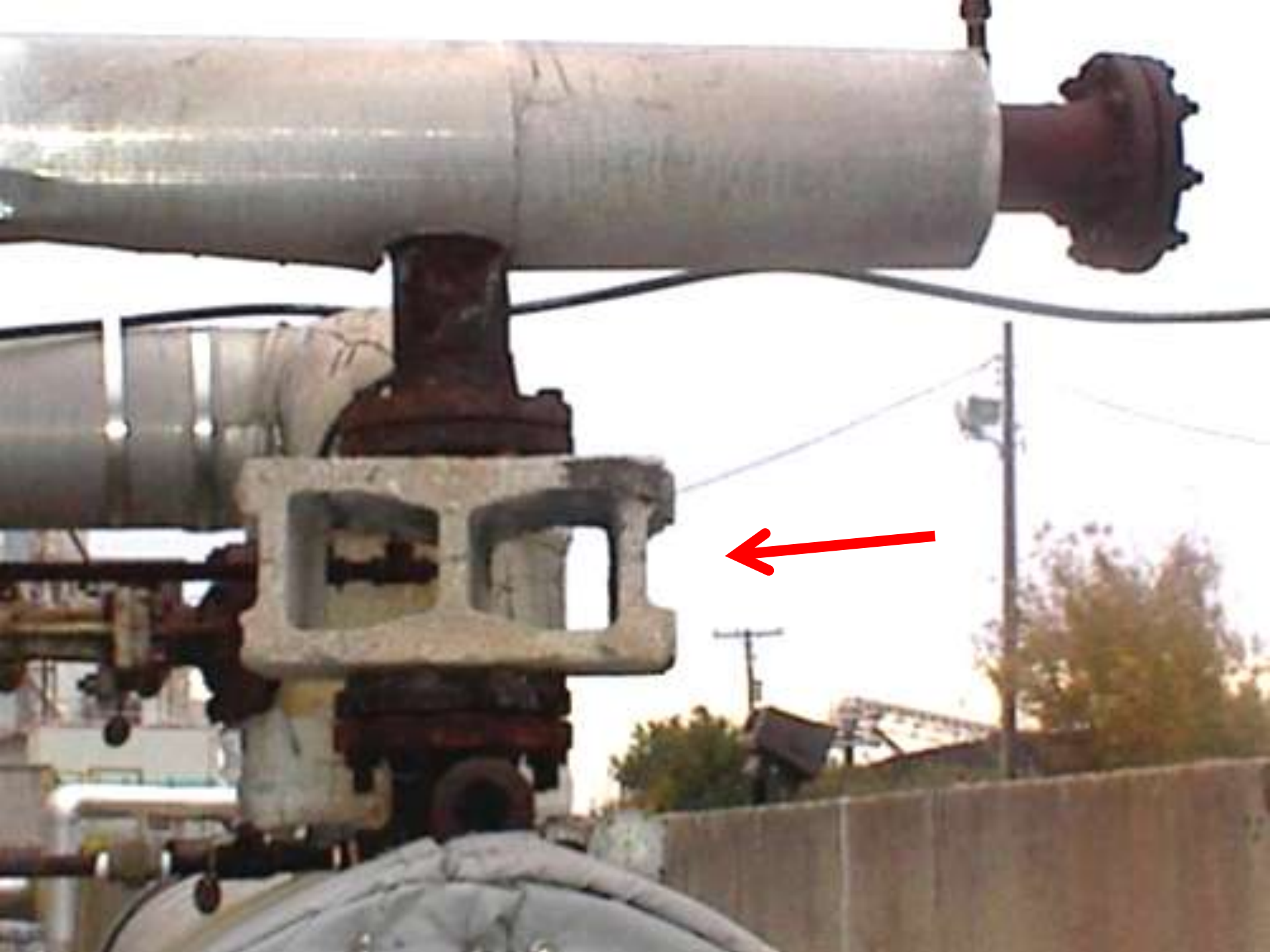
Trans Alaska Pipeline:

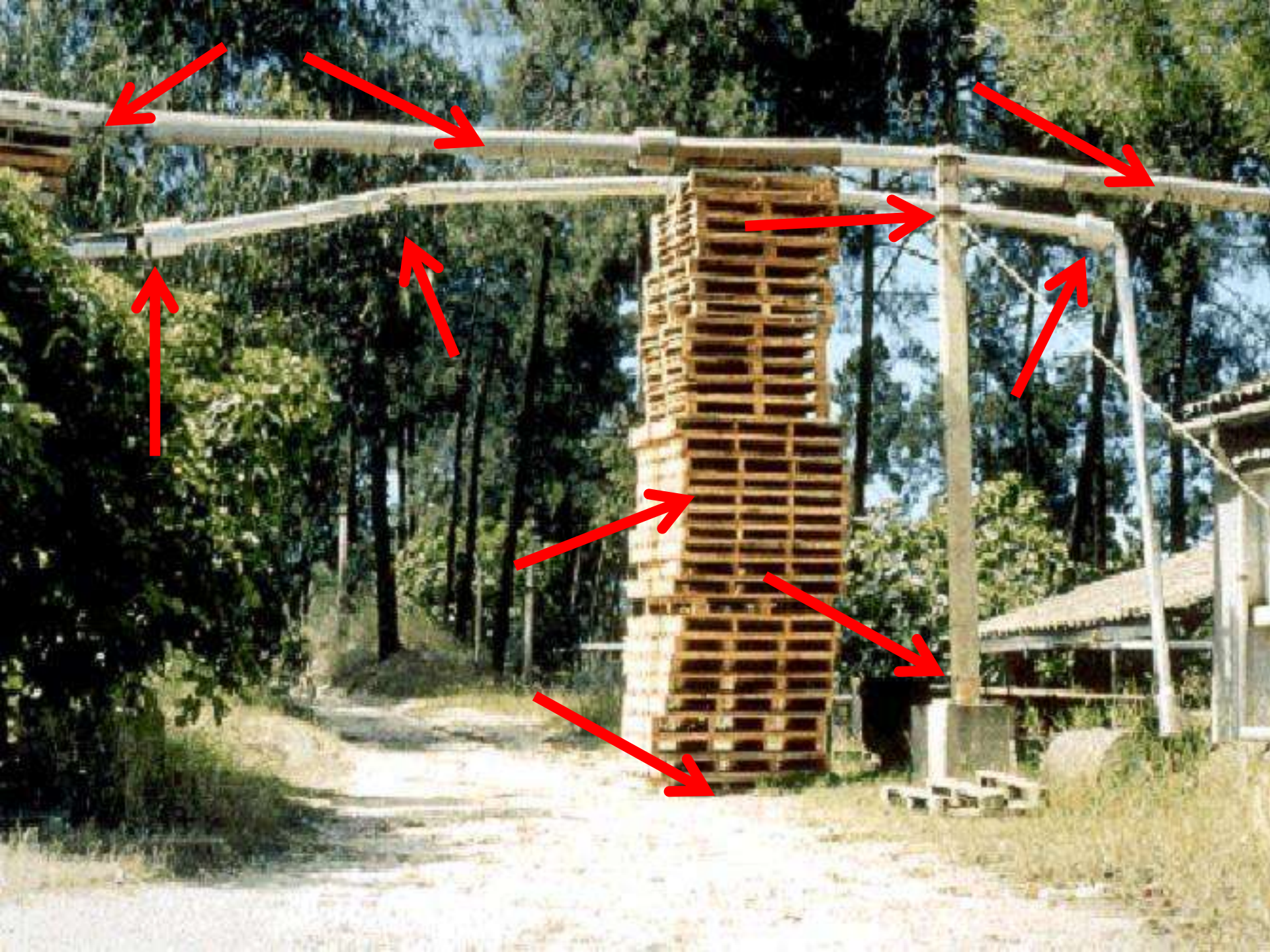
- 48" pipe pushed to limit of VSM
- Teflon shoe off-center



Piping 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 and safe arrangement for supporting the pipework.





Main factors to consider when installing pipe support systems

To allow or control expansion and contraction of pipes as they heat up and cool down.

To absorb or minimise vibration transmitted to pipes from operating equipment.

To counteract pipe movement or shock caused by rapid changes in flow through pipes.

Piping Supports

Piping must be supported in such a way as to prevent its weight from being carried by the equipment to which it is attached.

The supports used must prevent excessive sagging of the pipe and at the same time must allow free movement of the pipe due to expansion or contraction.

Piping Supports

The supporting arrangement must be of minimum design to carry the weight of the pipe, valves, fittings and insulation plus the weight of the fluid contained within the pipe.

Basically the heaviest load that the system may possibly have to carry.

Piping Supports

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**, which support pipes from underneath.

(2) **pipe hangers**, which secure pipes from above.

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

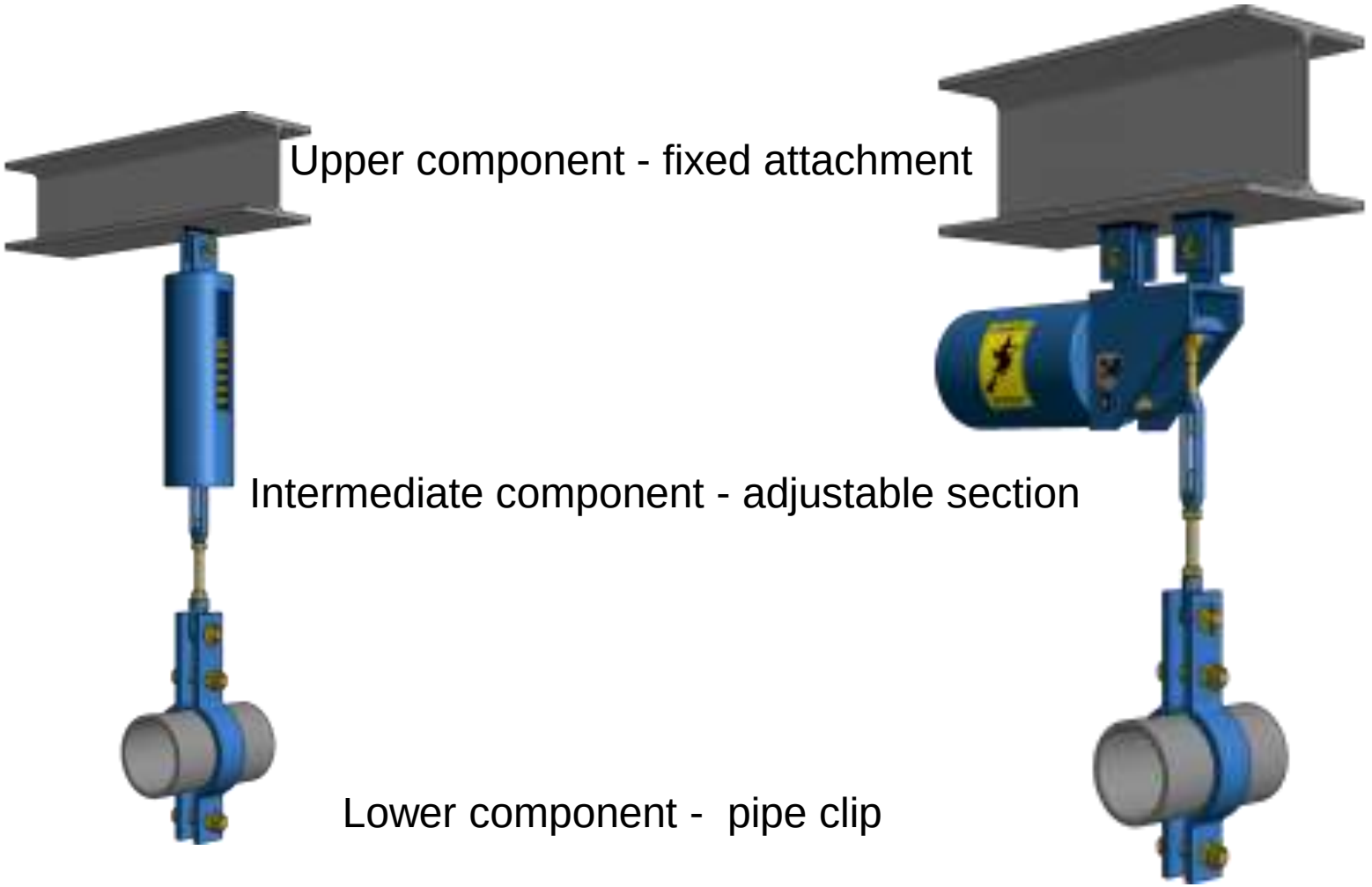
Hangers

Hangers consist of a pipe clip round the pipe, a sling rod and a top attachment to the supporting steelwork.

1 Upper component - fixed attachment

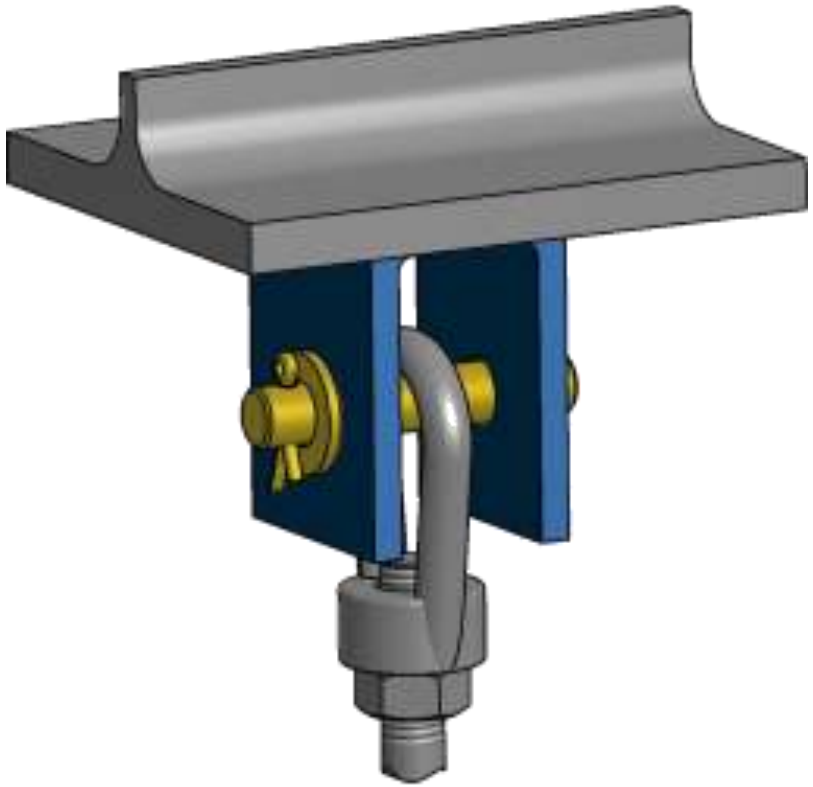
2 Intermediate component - adjustable section

3 Lower component - pipe clip

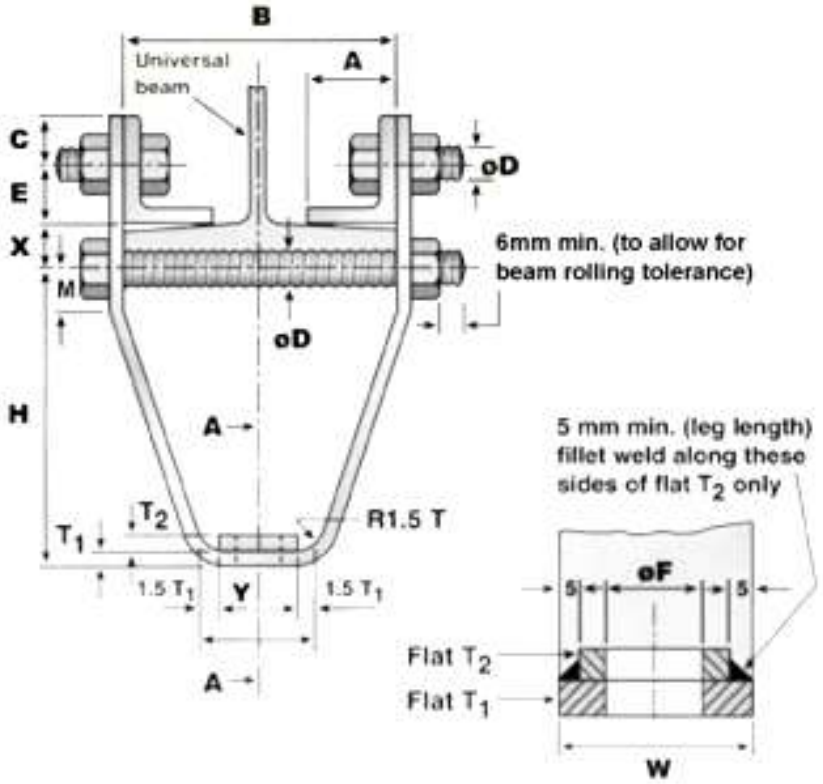

Upper component - fixed attachment
Intermediate component - adjustable section
Lower component - pipe clip

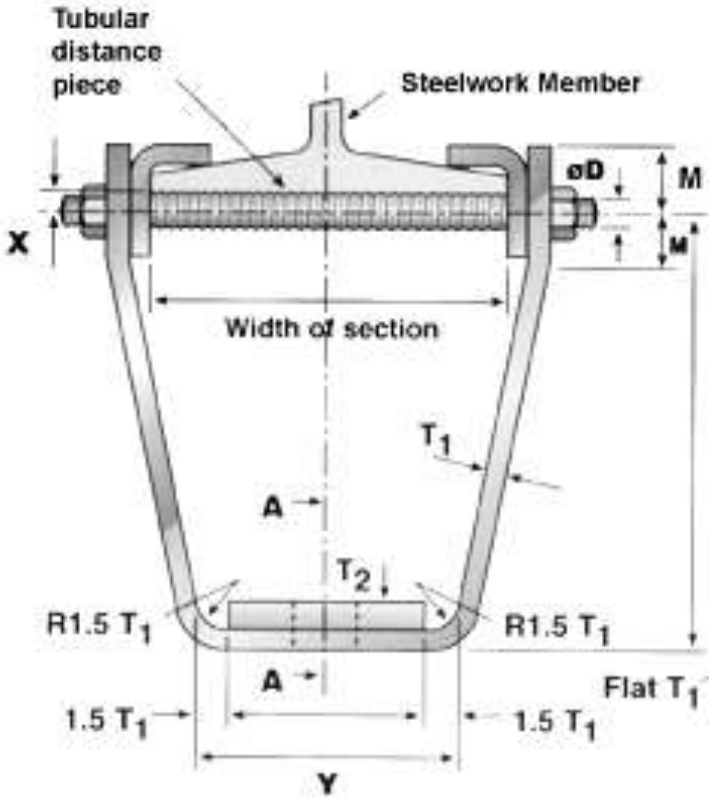

Beam Attachment [1]
[2] Pin
Spring Hanger [3]
Attachment
Spring Coil [9]
Coil Position [10]
[11] Load Column
[6] Threaded Rod
[7] Turnbuckle
[8] Nuts
[5] Weldless Eye nut
[4] Pipe Clamp
Attachment

UPPER COMPONENTS- FIXTURE

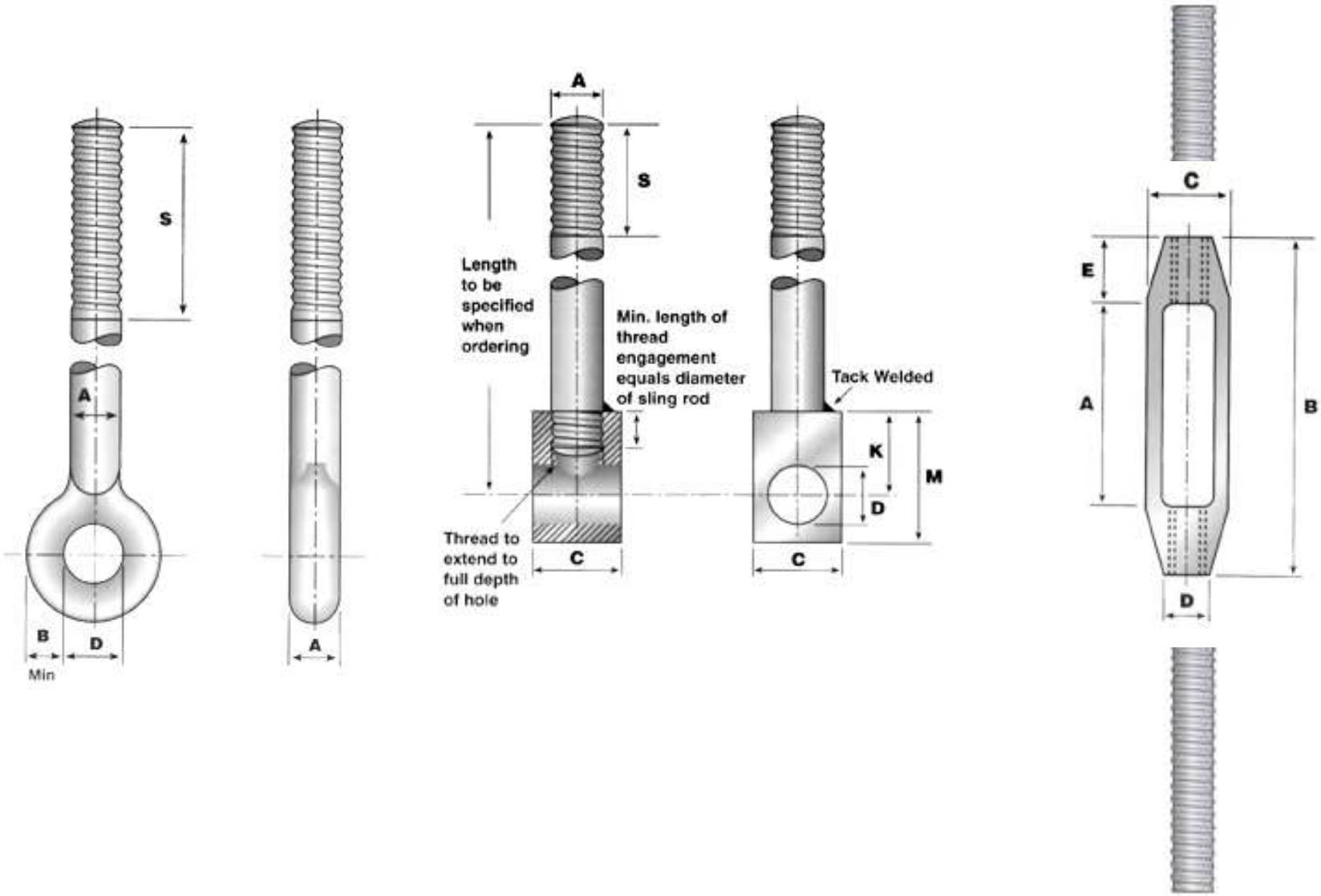


UPPER COMPONENTS - FIXTURE

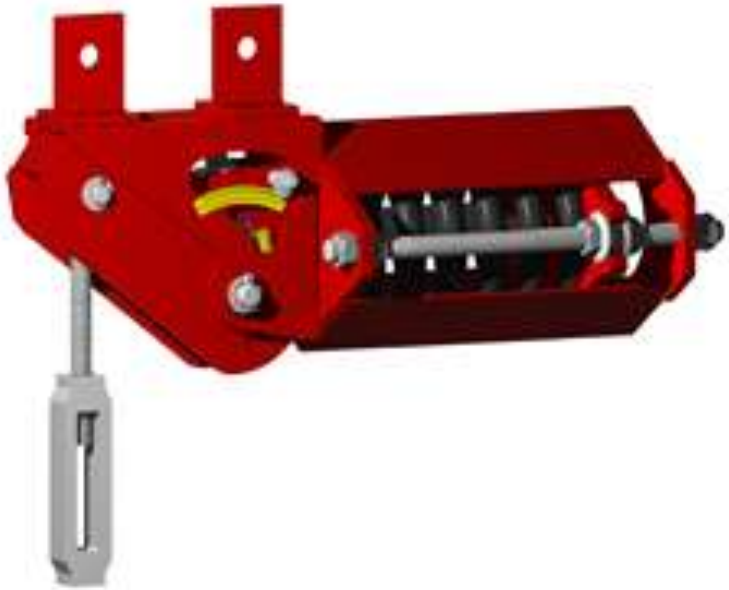




INTERMEDIATE COMPONENTS - ADJUSTABLE

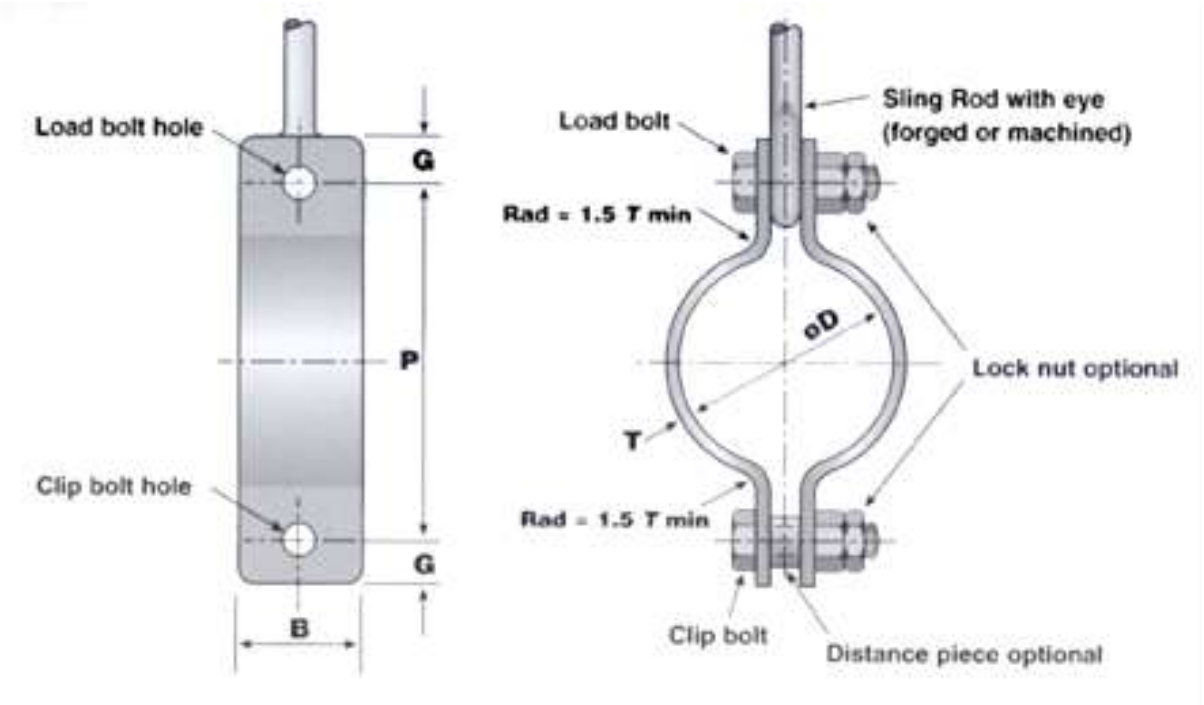


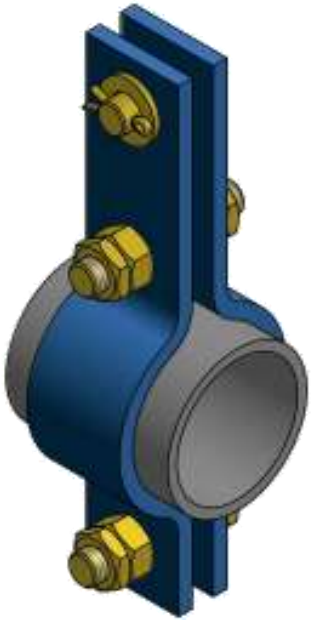
INTERMEDIATE COMPONENTS

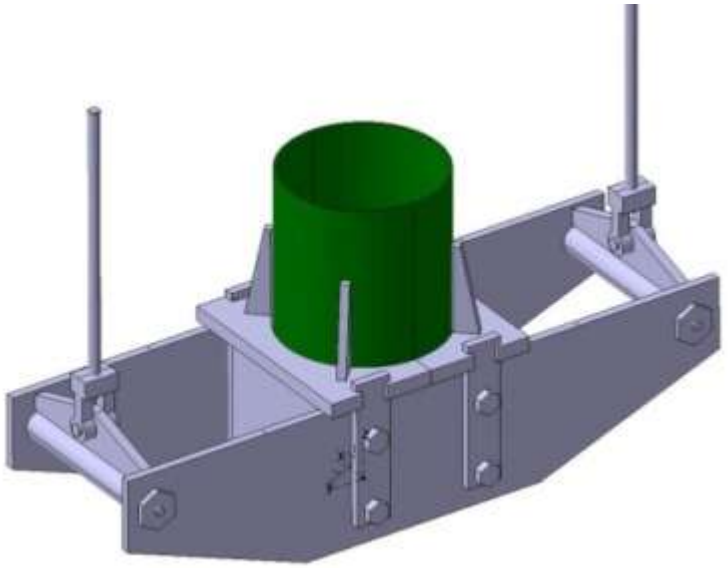


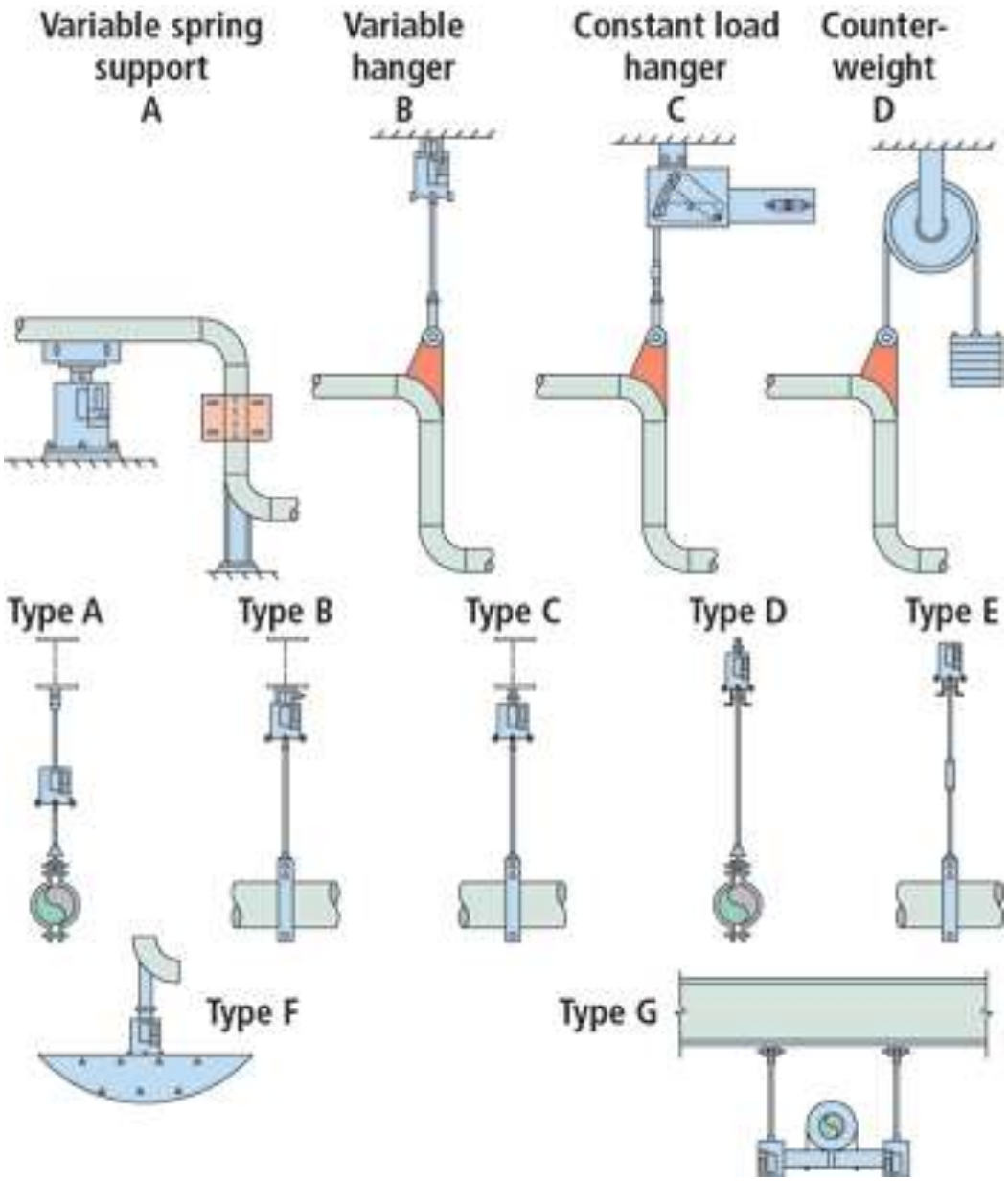
LOWER COMPONENTS - HOLDING

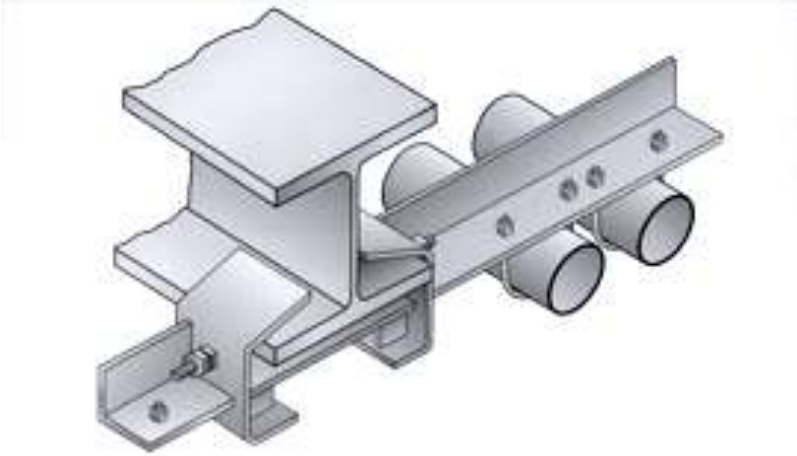
LOWER COMPONENTS - HOLDING

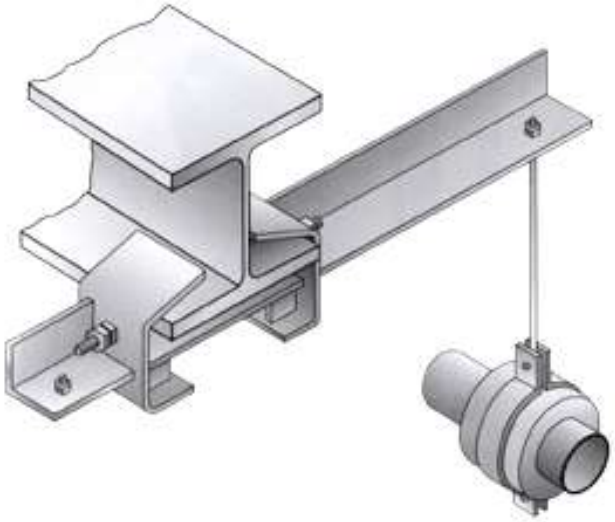


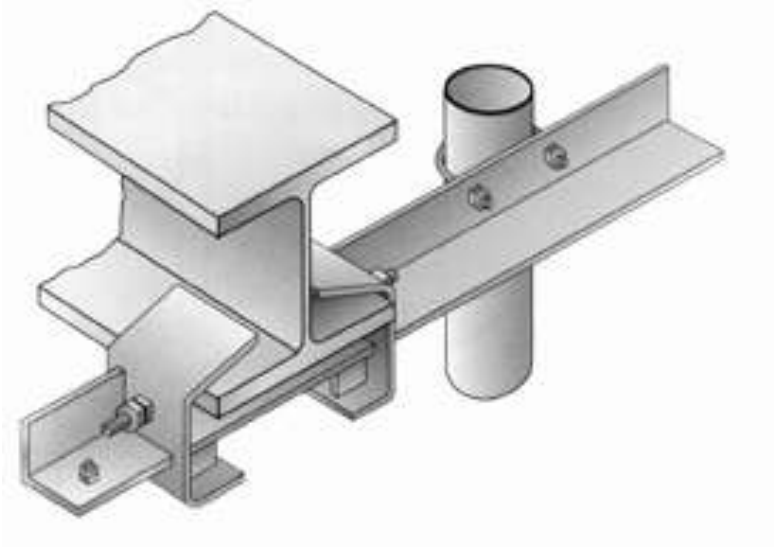


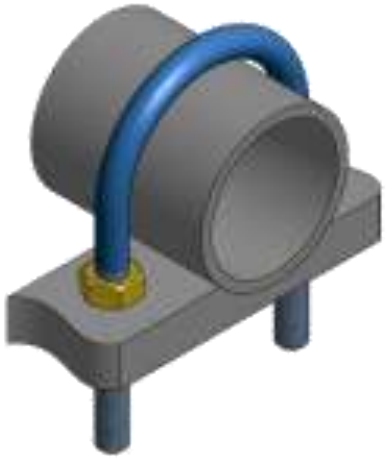


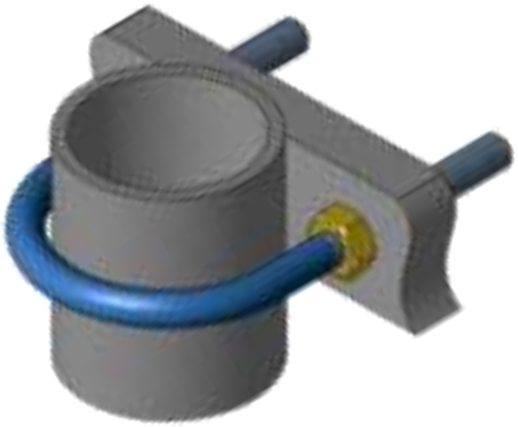

Variable spring support A
Variable hanger B
Constant load hanger C
Counter-weight D
Type A
Type B
Type C
Type D
Type E
Type F
Type G

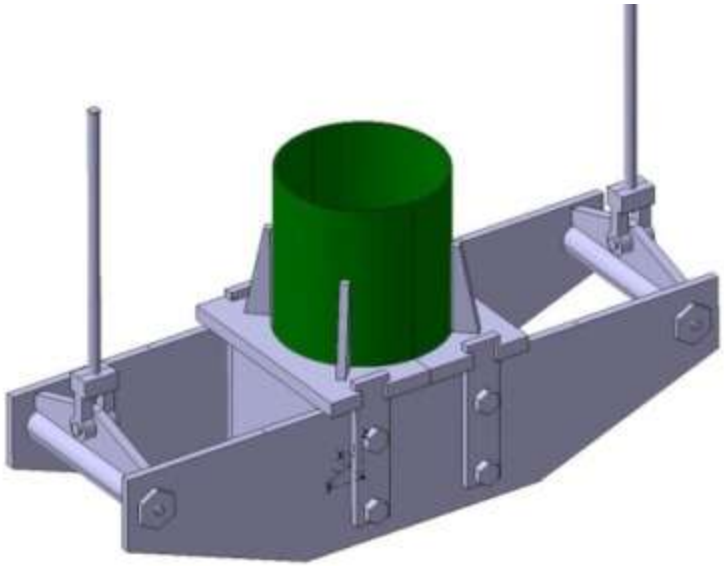




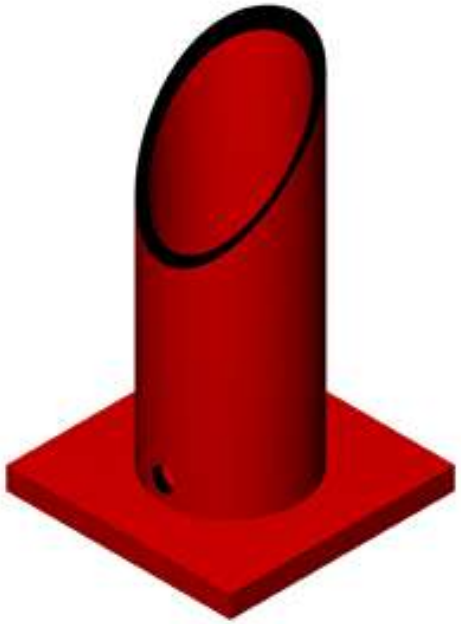




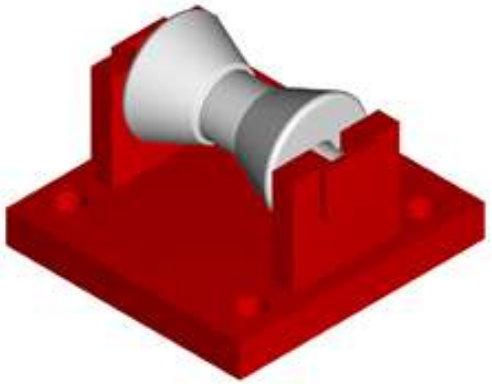




SUPPORTS – HOLD FROM BENEATH

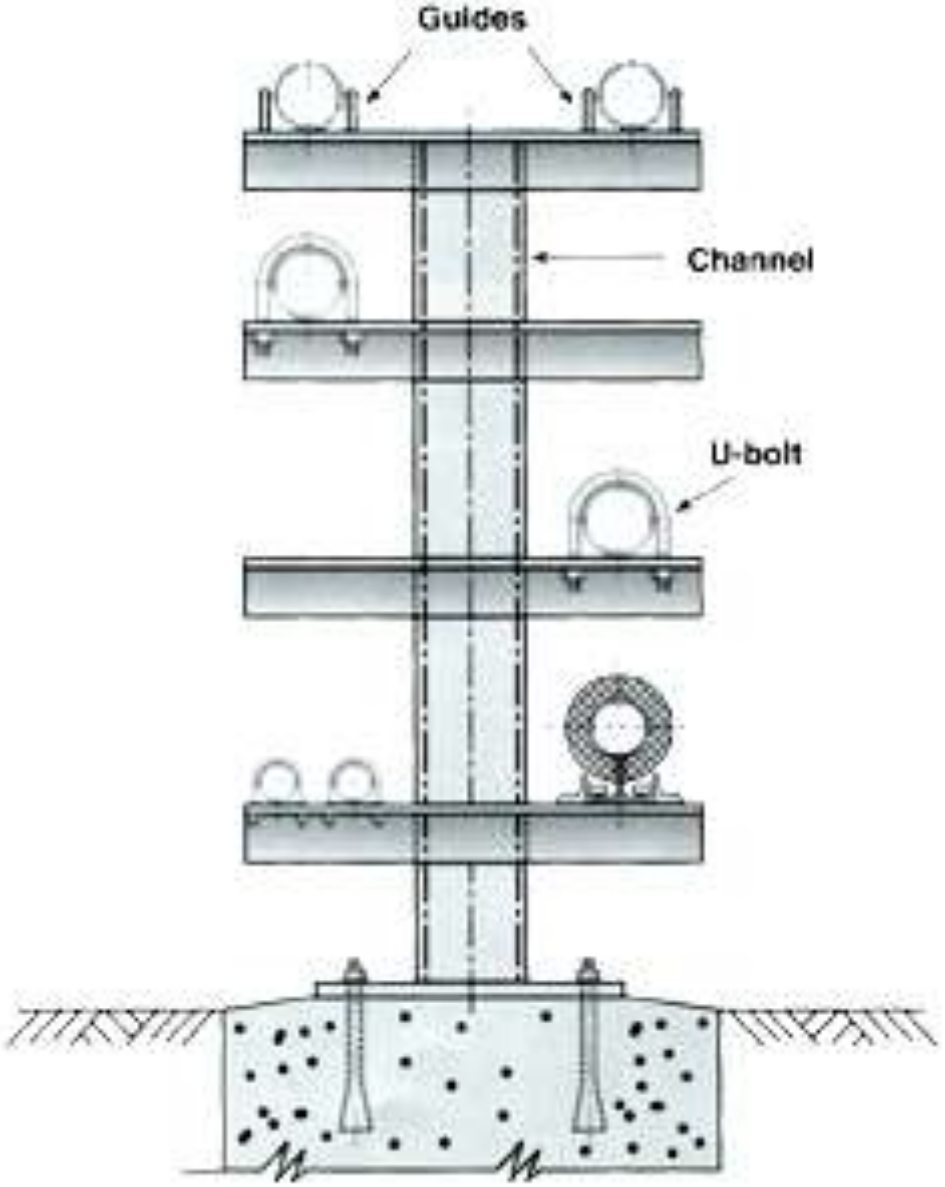


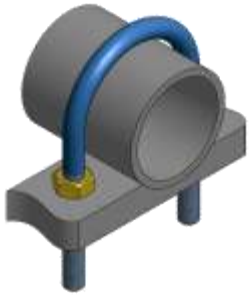
Support rollers and chairs



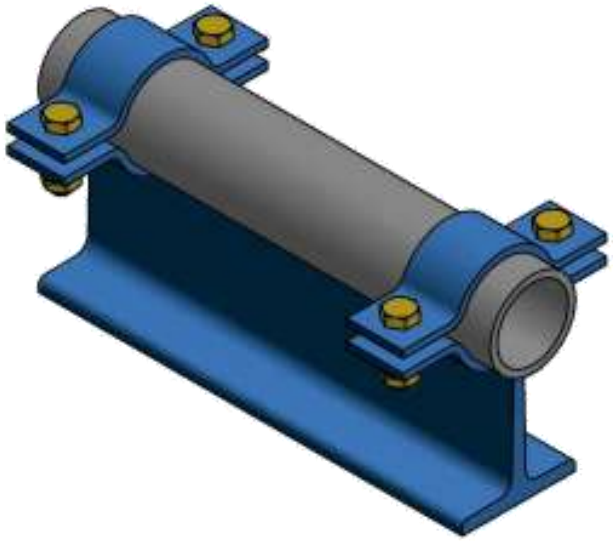
Anchor Chair

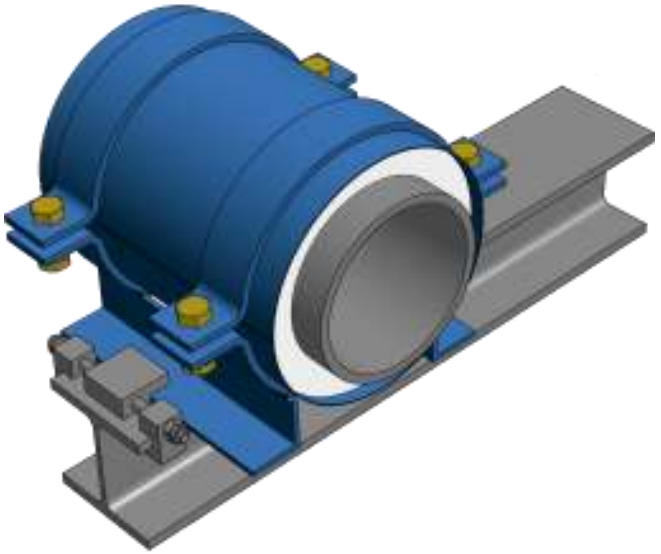
SUPPORT FRAME



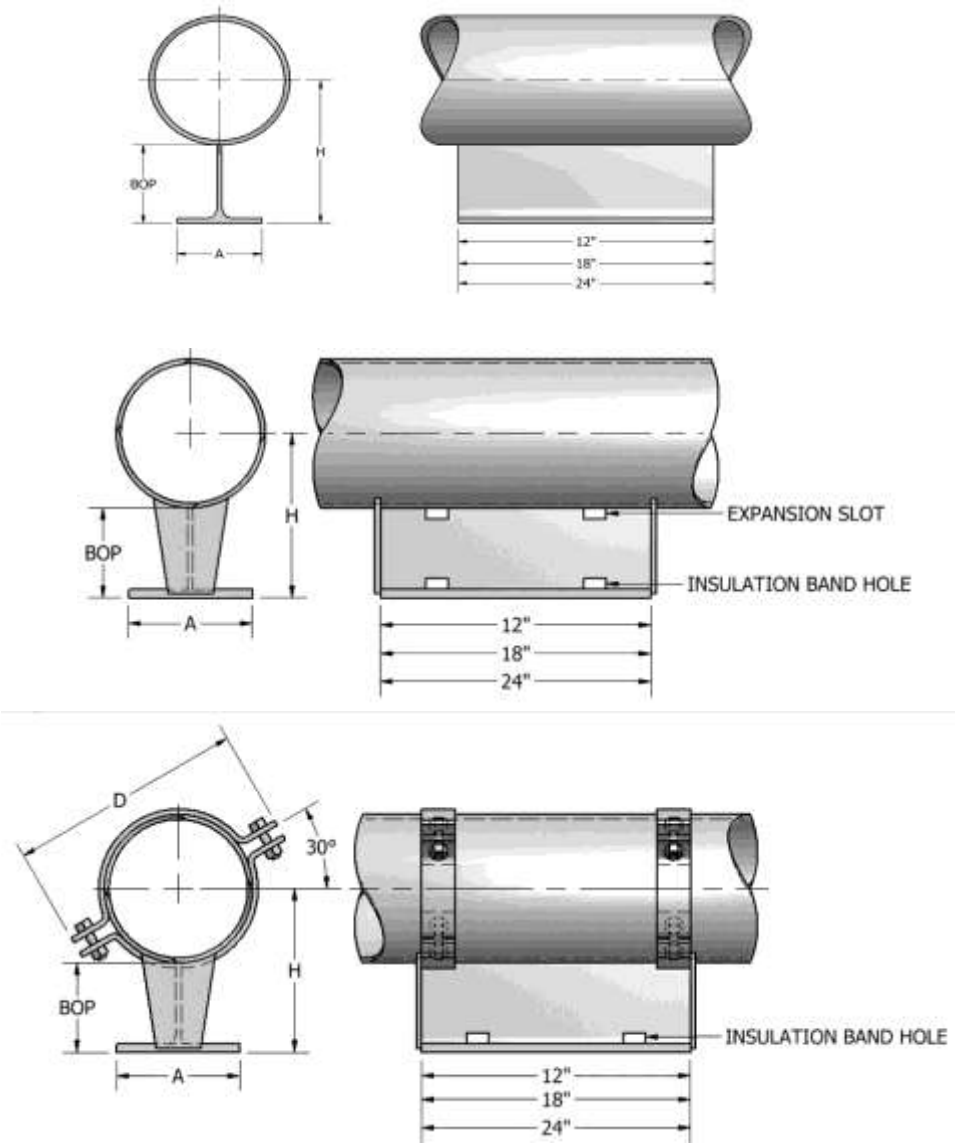


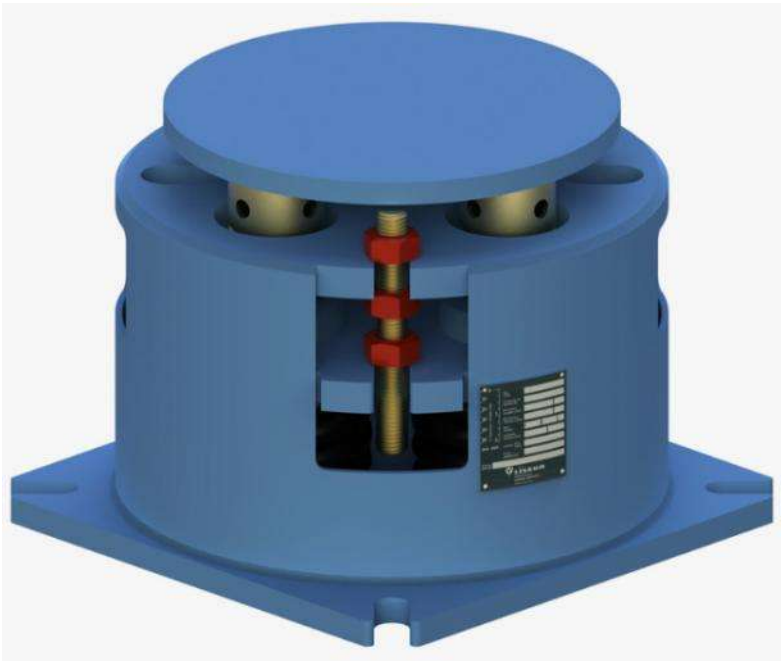
Pipe Skids

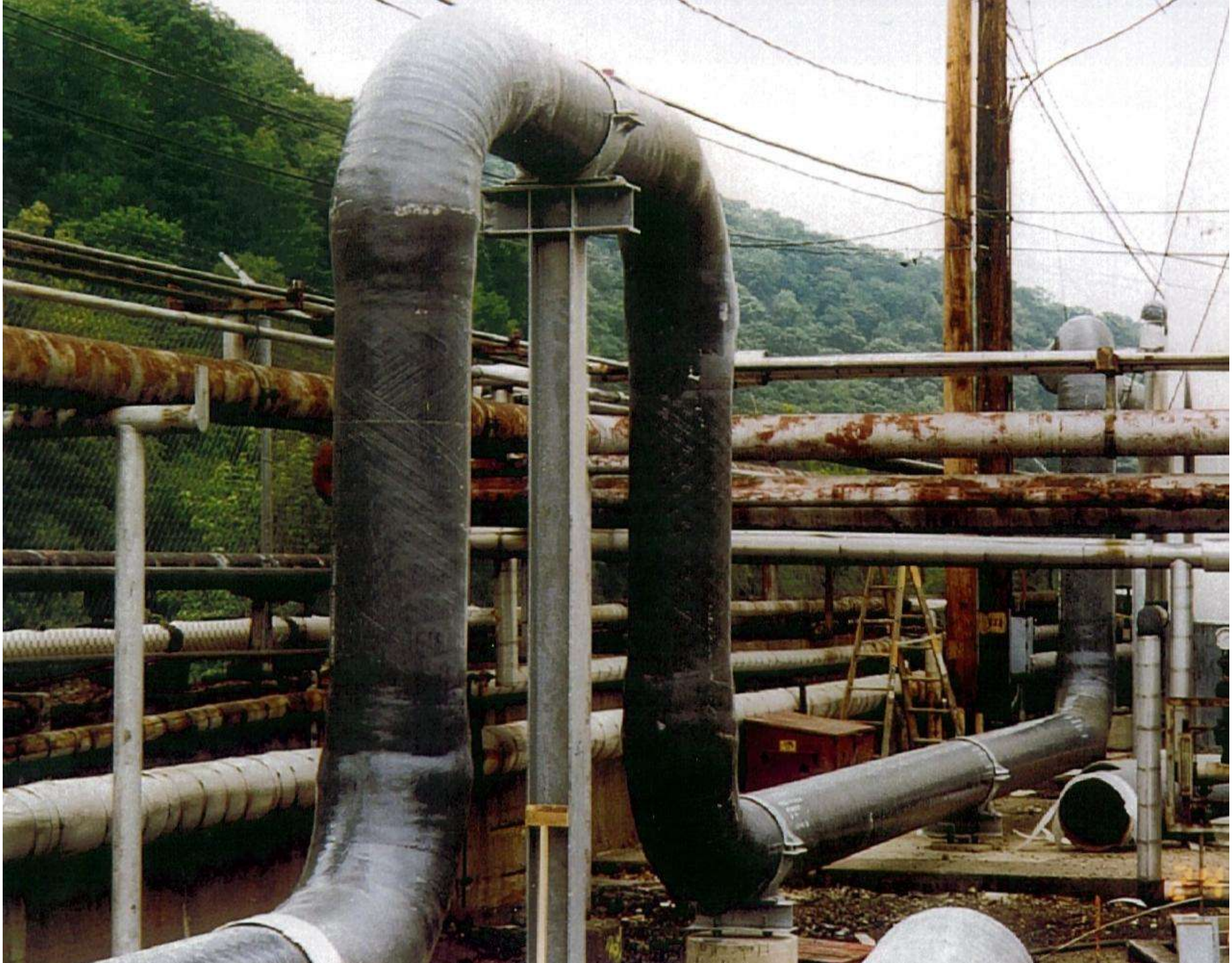




Pipe Skids


H
BOP
A
12"
18"
24"
EXPANSION SLOT
INSULATION BAND HOLE
D
30°
INSULATION BAND HOLE

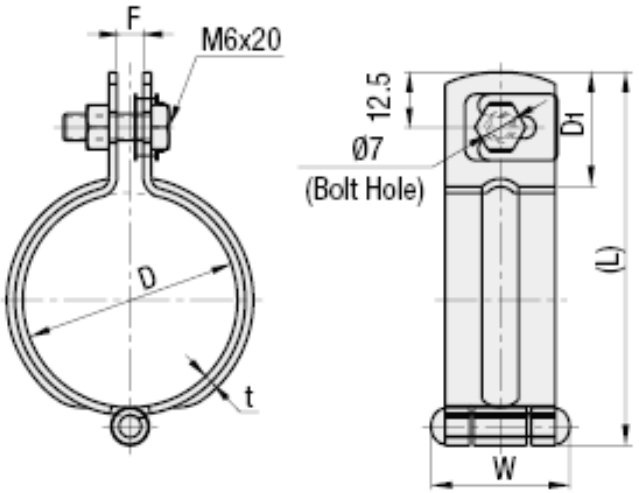


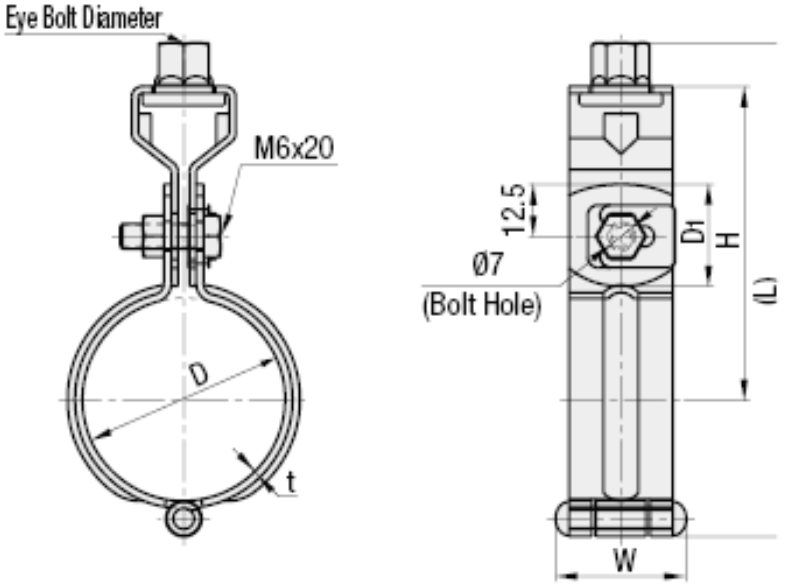


Design specifications

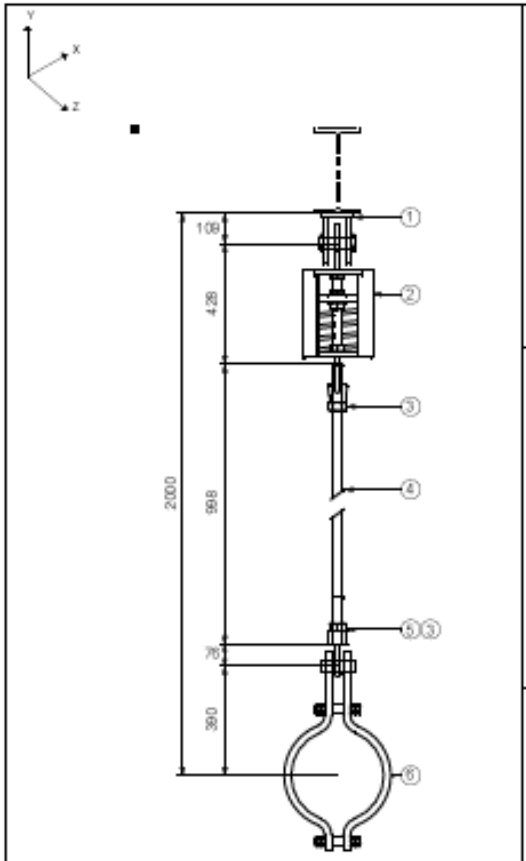
With eye bolt hole

Standard

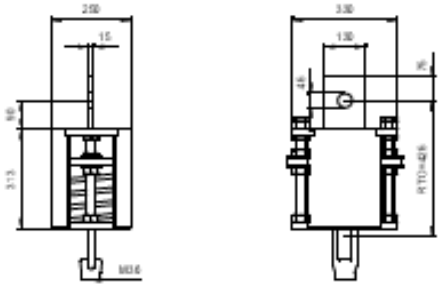


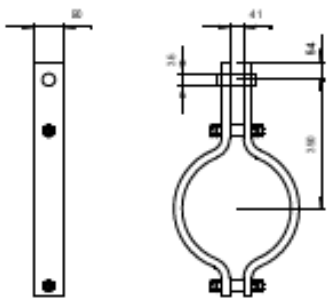


Mass of Support Assembly=100.2kg



View Looking North (Direction -Z)





Item No.	No. Req'd	Fig. No.	Description	Material
1	1	F125-M42	Inverted Beam Welding Attachment	BS EN 10025: S275JR
2	1	V1-23-TS2	Variable Effort Support	Per BS3974
3	2	F278-M36	Full Nut	BS 4190 DIN 931 GR.4
4	1	F226-M36 L=600	Hanger Rod RH/RH	BS EN 10025: S275JR
5	1	F236-M36	Welded Eye Nut	BS 970 080A 27
6	1	PC3-3004-560	Pipe Clamp 3 Bolt	BS EN 10028-2: 16Mo3-10

Spring Details
V1-23 TS2 Preset Load=3537.1kg Operating Load=3000.0kg
Spring Rate=53.7kg/mm. RTO=426mm. Pin=M42 Rod = M36 Thermal Movement 10.0mm. Up Variability=17.66%
Serial No
Rod Angulation = 0.0 Deg

Pipe NB : 300mm | Temperature : 560C | Pipe Insulation : 120mm

Loads : -	Movement : -	X mm	Y mm	Z mm
Pipe Load : 3000.0kg	Preset to operating :	0	10 Up	0
Test Load : 0.0kg				

REVISIONS

LOCATION PLAN

BERGEN PIPE SUPPORTS

PIPESUPPORTS LIMITED
DROITWICH UNITED KINGDOM
www.pipesupports.com

CUSTOMER	Smith
PROJECT	Plant
PIPE SYSTEM	Steam
CUSTOMER ORDER NO.	
CONTRACT No.	ABC123
FINISH	SEE FINISH PROCEDURE
THREAD FORM	ISO METRIC COARSE
SCALE	NTS

TITLE	SUPPORT ASSEMBLY	DRAWN Martin	DATE 13-04-12
SUPPORT MARK No PS01		CHECKED	DATE
No ASSEMBLIES 1	DRAWING No ABC123-01		REV 0

Supports 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.(wet)
(d) Weight of pipe support components.
(e) Expansion and contraction loads.
(f) Reaction from line discharging to atmosphere.
(g) Wind loads.
(h) Snow and ice loads.
(i) The effect of 'Water' hammer.
(j) Any other forces. (people climbing)

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 or equipment for maintenance.
(6) Access to equipment.
(7) Differential settlement of the building.
(8) Expansion joints in the building structure.
(9) Avoiding damage to any pipe insulation.
(10) Avoiding stress concentration at the point of attachments to the pipe.
(11) Process mal-operation or just plainly the unexpected, e.g. Gas lines filling up with water or dust/silt.

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.

POSITIONING OF PIPE

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.

POSITIONING OF PIPE

(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.

(c) Where regular maintenance requires removal of equipment, vessel covers, control valves etc.

(d) Where the pipes have to be dismantled for cleaning.

POSITIONING OF PIPE

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

(d) 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.

POSITIONING OF PIPE

(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 connections.

POSITIONING OF PIPE

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

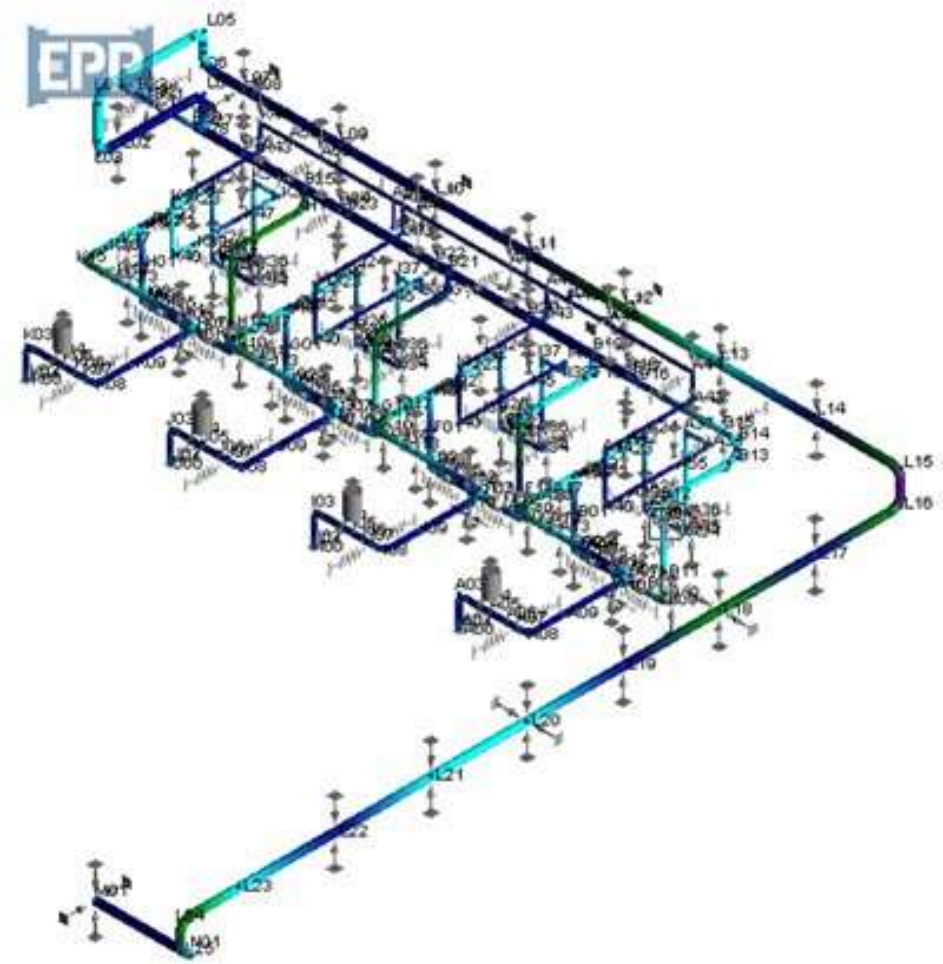
(i) Pipes prone to vibration, such as compressor suction or discharge lines should be routed for support independent from other pipes and lightly braced structures and buildings.
Supports offering resistance and providing some damping capacity should be used rather than hanger supports.

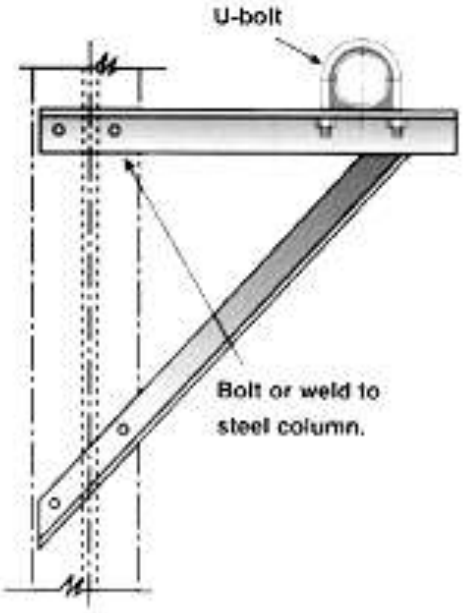
POSITIONING OF PIPE

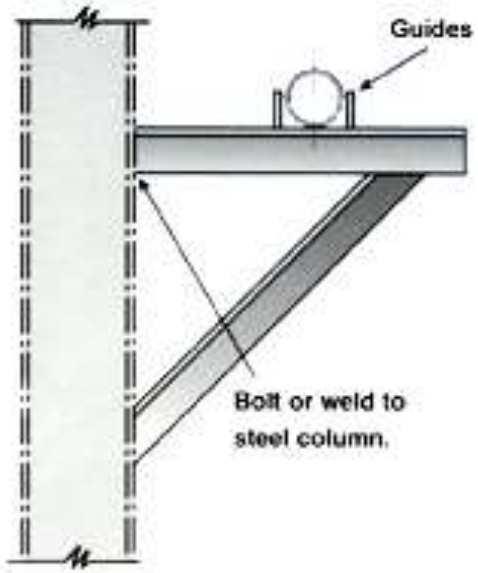
(j) Pipes should be sufficiently close to point of support or restraint so that the structural connection can have adequate rigidity and details can be simple and economical.

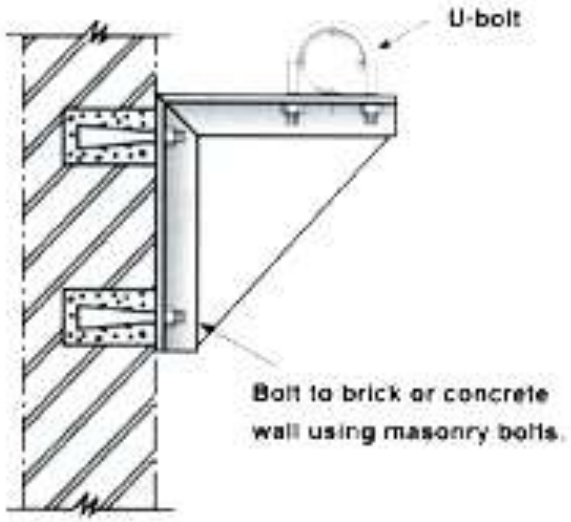
(k) To avoid lagging in the bearer and to ensure that the outer cladding makes a satisfactory weather seal insulated pipework should not rest directly on supporting steelwork.
This is of particular importance where insulated, cold or sub-zero pipes require a perfect vapour seal.

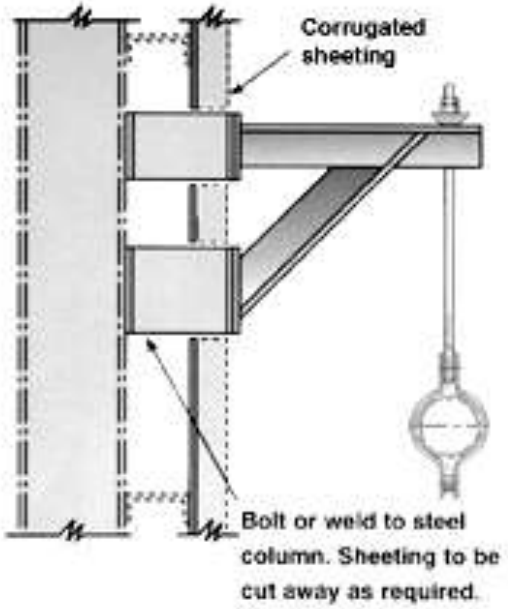
Pipe stress analysis

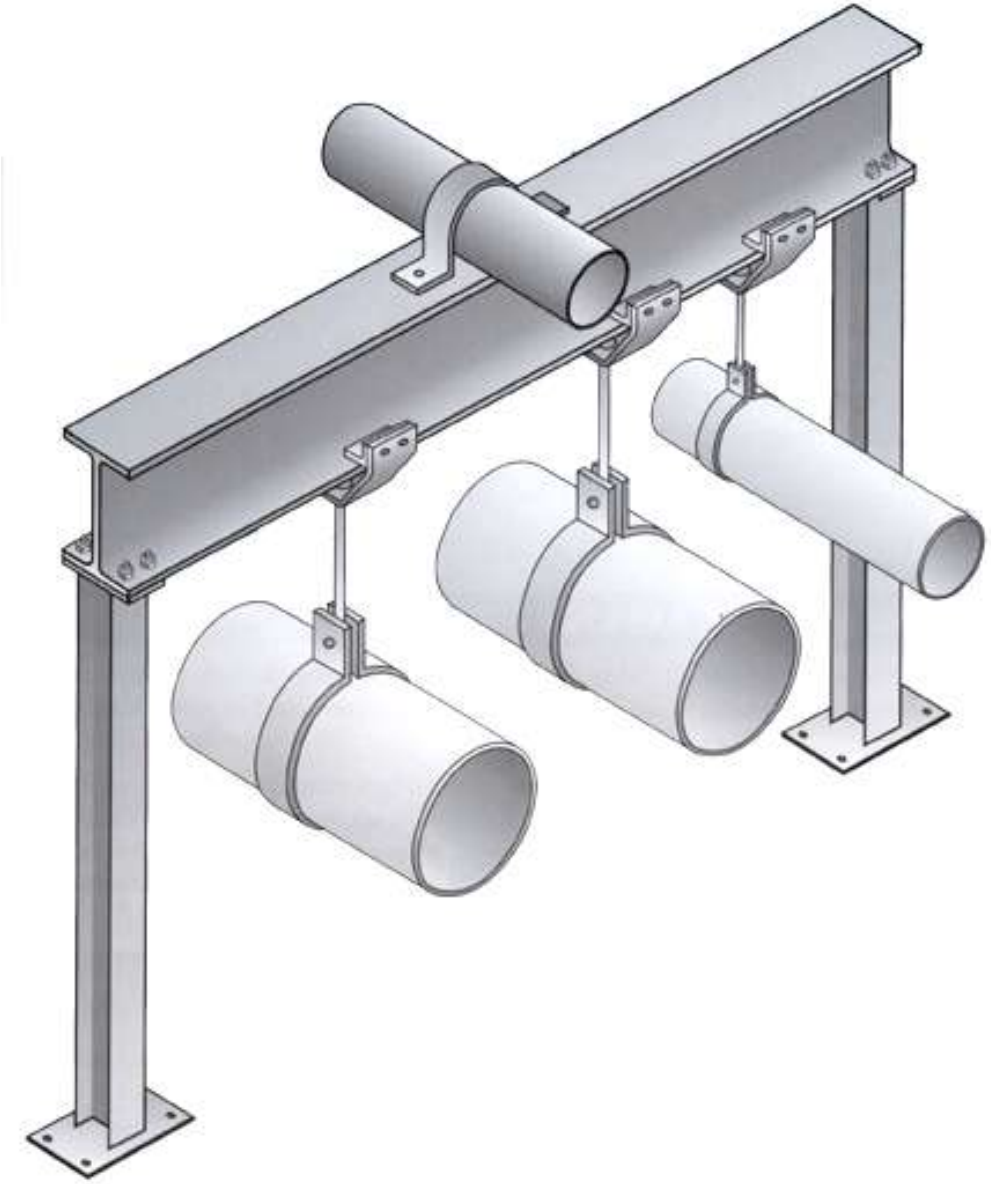



U-bolt
Bolt or weld to
steel column.


Guides
Bolt or weld to
steel column.


U-bolt
Bolt to brick or concrete
wall using masonry bolts.


Corrugated
sheeting
Bolt or weld to steel
column. Sheeting to be
cut away as required.



Support Inspection

Corrosion at pipe supports is one of the leading causes of process piping failures.

It is the beam supports and saddle clamps that have historically caused the majority of problems.


ONLY
BERTS

Checklist for Inspection of Hanger Assembly

Check the *beam attachment (1), pin (2)* and the *spring hanger attachment (3)* for any cracks, fractures, or signs of corrosion.

Check the *pipe clamp attachment (4), the weldless eye (5)* and *threaded rod (6)* for integrity.

Test the *turnbuckle (7), locknuts (8)*, and other threaded items to be sure they will turn.

Check the *spring coil (9)* for any sign of corrosion.

Mark the *position of the coil (10)* and compare it to design position.

These have the following undesirable features in common:

Crevices – the formation of a crevice at the pipe surface.

Water Entrapment – water is trapped and held in contact with the pipe surface.

Poor Inspectability and Maintainability – virtually impossible to paint or otherwise maintain; visual and/or NDT inspection are often difficult.

Galvanic Couples – even when both the pipe and support are steel, the metallurgical differences can still provide enough potential difference to drive a corrosion cell.

PIPE SUPPORT FAILURE

Pipe Hangers

and

Pipe Supports