
**Petroleum, petrochemical and natural
gas industries — Bulk material for
offshore projects — Pipe support**

*Industries pétrolière, pétrochimique et du gaz naturel — Matériels de
base pour les projets en mer — Supports de tuyauterie*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 24200:2022](https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-24200-2022)

<https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-24200-2022>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 24200:2022

<https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-24200-2022>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2022

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	1
3.1 Terms and definitions.....	1
3.2 Abbreviated terms.....	3
4 General	4
5 Support selection guideline	4
6 Design and material requirements	5
6.1 Clamped shoe.....	5
6.1.1 Key parameters.....	5
6.1.2 Size/Dimension.....	5
6.1.3 Material.....	7
6.1.4 Application.....	7
6.2 Welded shoe.....	8
6.2.1 Key parameters.....	8
6.2.2 Size/Dimension.....	8
6.2.3 Material.....	12
6.2.4 Application.....	12
6.3 U-bolt.....	13
6.3.1 Key parameters.....	13
6.3.2 Size/Dimension.....	13
6.3.3 Application.....	15
6.4 U-strap.....	15
6.4.1 Key parameters.....	15
6.4.2 Size/Dimension.....	16
6.4.3 Application.....	18
6.5 Bracing for branch connection.....	18
6.5.1 Key parameters.....	18
6.5.2 Size/Dimension.....	18
6.5.3 Application.....	21
6.6 Trunnion and stanchion.....	21
6.6.1 Trunnion.....	21
6.6.2 Stanchion.....	25
6.7 Guide, hold-down, guide and hold-down and line-stop support.....	29
6.7.1 Guide.....	29
6.7.2 Guide and hold-down.....	31
6.7.3 Line-stop.....	33
6.8 Guide, guide and hold-down and line-stop support – With hole.....	35
6.8.1 Guide.....	35
6.8.2 Hold-down.....	38
6.8.3 Guide and hold-down.....	41
6.8.4 Line-stop.....	45
Bibliography	49

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12 *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document aims to provide a set of unified specifications for pipe supports for offshore projects, responding to the current lack of recognized specifications for such pipe supports in terms of shape, dimensions, material and application area.

Company specific standards from owners, engineering companies and shipbuilders have therefore been prevailing for specifications related to pipe support types, shapes, sizes and dimensions. There are big variations in specifications from project to project, because of lack of internationally recognized specifications within this area.

Thus, individual pipe support items have often failed to be compatible across different projects. A suggested solution is to apply one unified approach for design, material selection, shape and application, etc. This will also significantly reduce engineering hours and lead times and improve the fabrication efficiency. Other expected benefits are improved practice for design and application of pipe support types related to design life, maintainability and integrity. The ultimate goal is to reduce the overall cost in general offshore projects and lead time while increase the efficiency, interoperability and safety.

In the lack of common industrial specifications for pipe supports, an assessment has been conducted to compare the pipe supports designs and application areas used in past offshore projects. Based on the supports design examples of those projects, a set of unified specifications have been established, which are described in this document.

The main factors considered to arrive at an optimal design of pipe supports are pipe load endurance, weight and material cost. Those three factors have been considered when reviewing pipe supports from past projects and ultimately defining the requirements described in this document.

The requirements including design and dimensions specified in this document are based on the use of H-beam or plate that are commonly used as sections. When an unlisted material or section is used, the designer is responsible for demonstrating the validity of the allowable stress and other limits used in design.

This document can be used as a baseline for suppliers and engineering companies that do not already have a more comprehensive and usable standard for both greenfield and brownfield projects.

Petroleum, petrochemical and natural gas industries — Bulk material for offshore projects — Pipe support

1 Scope

This document specifies the requirements for design including shape and dimensions, material as well as strength for pipe support. Applicable pipe size range varies depending on support types. This document covers topside systems for fixed or floating offshore oil and gas projects. This document is applicable to design temperature of support within the range between -46 °C up to 200 °C .

This document is limited to metallic pipes, covering the following pipe supports:

- clamped shoe;
- welded shoe;
- U-bolt;
- U-strap;
- bracing for branch connection;
- trunnion and stanchion;
- guide support (guide, hold-down, guide and hold-down, line stop).

2 Normative references

[ISO 24200:2022](https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-24200-2022)

[https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-](https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-24200-2022)

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM A193, *Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications*

ASTM A194, *Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1.1

allowable load

maximum load that each support can withstand under static load conditions

Note 1 to entry: For dynamic loads induced by occasional or extreme conditions, the maximum allowable load can be increased by applying allowable increase factor in accordance with project specification or international code.

3.1.2

bracing for branch connection

reinforcement used to avoid fatigue failure due to the vibration from the parent pipe

3.1.3

bracket

main 'U'-shaped part of *U-strap* (3.1.20) that is in contact with the protection

3.1.4

grip type

type of *U-bolt* (3.1.19) without any allowances for the inside pipe to move

3.1.5

guide support

support used to restrict lateral movement of pipe

3.1.6

guide and hold-down

support used to restrict vertical and lateral movement of pipe

3.1.7

gusset

plates placed between pipe and base plate in lateral direction of pipe to resist any load transferred to piping

3.1.8

hold-down

support used to restrict vertical movement of pipe

3.1.9

line-stop

support used to restrict axial movement of pipe

3.1.10

machine bolt

threaded bolt with a square or hexagonal head

3.1.11

non-grip type

type of *U-bolt* (3.1.19) that gives some allowance for the inside pipe to move vertically and laterally with a maximum gap of 3 mm

3.1.12

pipe shoe

structure consisting of a saddle and integral base that is used to support the pipe by transmitting the load or forces to the adjacent structure

Note 1 to entry: The pipe shoe can be divided into clamped shoe and welded shoe.

3.1.13

protection pad

pad to prevent damages caused from direct contact between pipe and structural support

Note 1 to entry: If anti-vibration function is required, it can be replaced by anti-vibration material.

3.1.14**rib plate**

plate placed between pipe and base plate in axial direction of pipe to resist any load transferred to piping

3.1.15**slotted hole**

extension of hole for bolts allowing lateral movement

3.1.16**stanchion**

extended pipe resting on floor or structure vertically

3.1.17**strip**

thin pad, typically made of non-water retaining material for clamp and anti-mechanical vibration for *U-strap* (3.1.20), under the strap used to prevent fretting and other vibration between pipe and strap

3.1.18**trunnion**

pipe extended hung on structure or spring

3.1.19**U-bolt**

commonly used pipe support type in the shape of the letter “U” with screw threads on both ends

Note 1 to entry: The U-bolt can be divided into *grip type* (3.1.4) and *non-grip type* (3.1.11).

3.1.20**U-strap**

commonly used pipe support designed to absorb mechanical vibration from piping by inserting anti-mechanical vibration material

Note 1 to entry: The U-strap can be divided into type A and type B (see 5.4).

3.1.21**wear pad**

protection plate or pipe fixture or structural attachment attached to pipe to enhance strength of pipe wall and to prevent direct damages from welded attachment or high bearing load

3.1.22**weep hole**

small opening, typically located at the bottom of the object, that allows water or gas to drain from within an assembly and checks pipe leakage within an assembly

3.2 Abbreviated terms

AIV	acoustic induced vibration
CRA	corrosion resistant alloy
CS	carbon steel
LTCS	low temperature carbon steel
NPS	nominal pipe size
PTFE	polytetrafluoroethylene
UV	ultra-violet

4 General

The pipe supports described in this document are applicable to the pipes designed according to the following:

- ASME B16.5 for pipe flanges and flanged fittings;
- ASME B16.9 for factory-made wrought butt welding fittings;
- ASME B16.10 for face-to-face and end-to-end dimensions of valves;
- ASME B16.19 for stainless steel pipe;
- ASME B16.47 for large diameter steel flanges;
- ASME B18.2.4 for metric bolt and nuts;
- ASME B31.3 for process piping;
- ASME B36.10M for welded and seamless wrought steel pipe.

Internationally recognized piping codes and standards are applicable for welding of pipe support attachments (including wear pads, trunnions and pipe shoes) with the pipe.

5 Support selection guideline

This clause provides a guideline to select the appropriate type of support depending on different criteria. The actual selection may be different from this guidance, depending on the client's requirements, project specification and pipe material.

Generally proper support should be selected depending on:

- a) required movement restraint;
- b) forces and loads at point of support;
- c) pipe insulation;
- d) structural limitations / restrictions.

Support can be generally selected from [Table 1](#) depending on pipe size and insulation.

Table 1 — Possible support selection

Pipe size	Insulation	Priority level	Type
Pipe NPS 8 and below	Insulated	Priority	Welded shoe
		Alternative	Clamped shoe ^a / U-bolt ^{a,b} / U-strap ^{a,b}
	Uninsulated	Priority	U-bolt ^{a,b} / U-strap ^a / Direct resting on structure
		Alternative	Clamped shoe / Welded shoe
Pipe NPS 10 and above	Insulation	Priority	Welded shoe
		Alternative	Clamped shoe ^c
	Uninsulated	Priority	Welded shoe / Direct resting on structure
		Alternative	Clamped shoe ^c

All support type should be verified not to exceed maximum allowable load.
The type directly resting on structure should include proper isolation between the pipe and the structure.
NOTE 1 Supporting method will be more specified as resting/hold down/guide/line stop as per pipe stress analysis.
NOTE 2 Trunnion type of support are same priority with welded shoe.
^a System operating temperature shall be within the temperature range of contacted coating material.
^b U-bolt can be selected only if partial absence of insulation on U-bolt section is allowed such as personal protection .
^c Welded shoe to be a priority when stopper is required.

6 Design and material requirements

6.1 Clamped shoe

ISO 24200:2022
<https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-24200-2022>

6.1.1 Key parameters

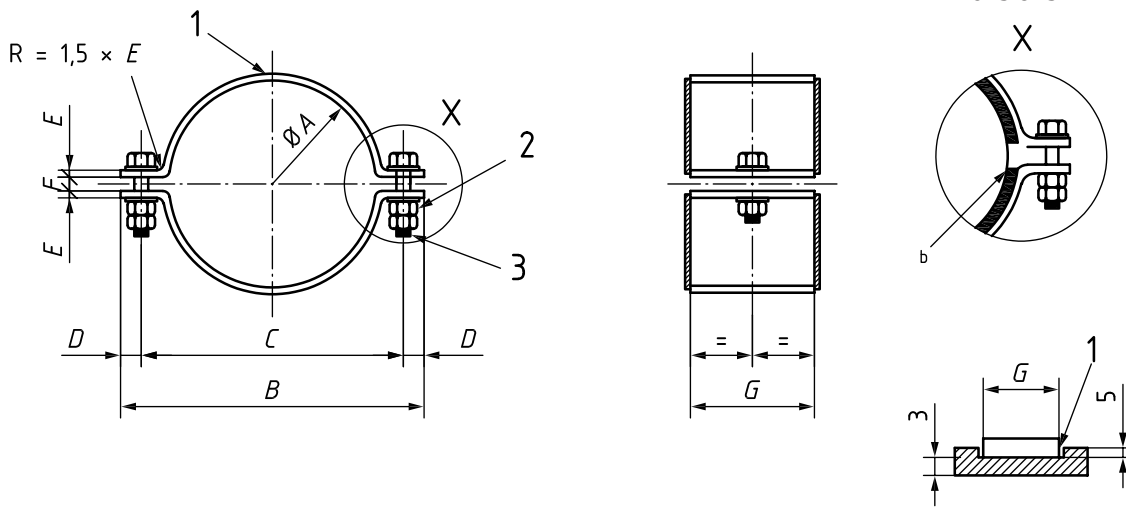
The key parameters of the clamped shoe are:

- shape;
- dimension;
- material;
- application;
- allowable load.

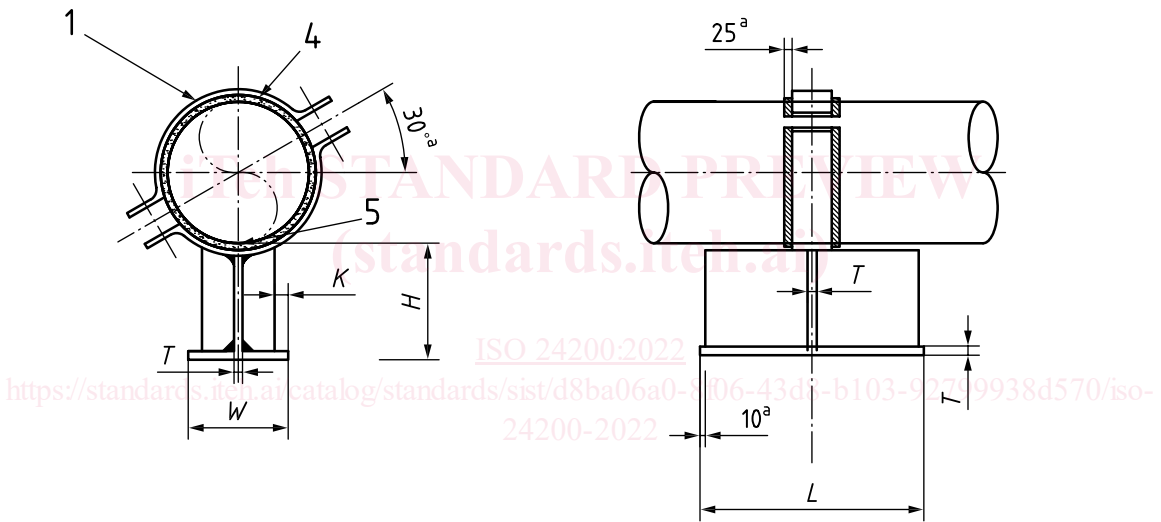
6.1.2 Size/Dimension

[Figure 1](#) shows the design specification of clamped shoe used for steel/non-ferrous NPS 2 to NPS 36. [Table 2](#) presents the dimensions, as also shown in [Figure 1](#), including standard length and height of clamped shoe for different pipe sizes.

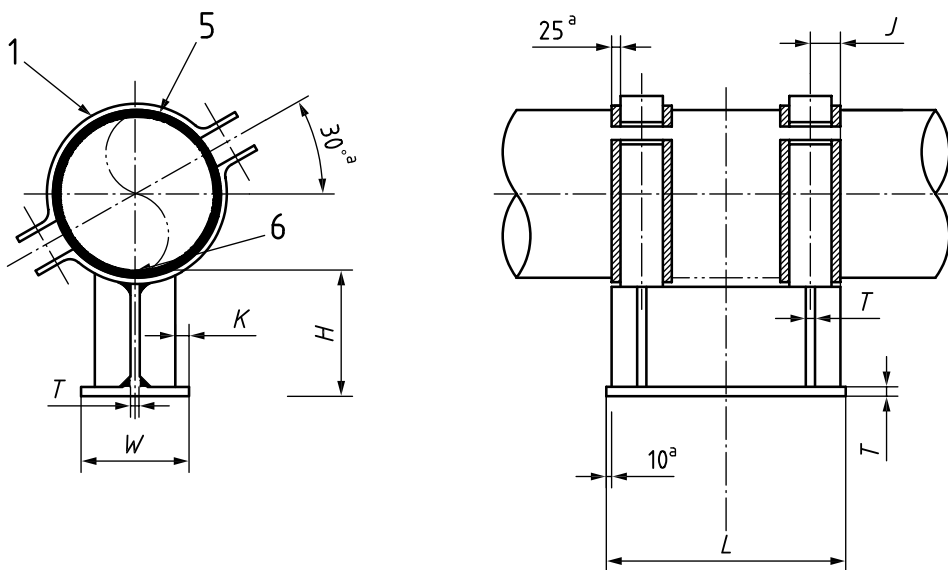
Dimensions in millimetres



a) Clamp detail (typical)



b) For pipe NPS 2



c) For pipe NPS 3 to NPS 36

Key

- 1 clamp
- 2 nut
- 3 machine bolt
- 4 3 mm thickness strip (non-water retaining and anti-mechanical vibration material)
- 5 bottom of pipe
- a Typical.
- b Strip to be fabricated as 2 pieces with cut ring at this corner.

Height, *H*, shall be indicated on isometric drawing, if greater than 100 mm with a maximum of 175 mm.

All welds shall be 6 mm of welding leg continuous fillet, unless specified otherwise.

Clamp material should be in accordance with ASTM A36 or equivalent material (e.g. JIS SS400 per JIS G3101).

For machine bolt, at least two threads of bolt shall be protruded at the end of nut.

Dimensions shown in [Table 2](#) are based on 3 mm thickness of strip. It shall be recalculated upon on the material and thickness.

NOTE Length, *L*, can be increased or decreased, if required when indicated on isometric drawing.

Figure 1 — Design specification of clamped shoe used for steel/non-ferrous NPS 2 to NPS 36

Table 2 — Dimensions of clamped shoe for different pipe sizes

Pipe	Length <i>L</i> mm		ΦA	Dimension												Bolt	Allowable load kN
	Standard	Long		B	C	D	E	F	G	H	J	K	T	W	inch		
2	200	300	66	152	120	16	5	12	30	100	40	25	10	80	M12	1/2	5,5
3	200	300	95	192	160	16	8	16	30	100	40	25	10	100	M12	1/2	19
4	250	300	120	236	196	20	8	16	40	100	45	25	10	120	M16	5/8	24
6	250	350	174	310	264	23	10	20	40	100	45	25	10	140	M20	3/4	25
8	300	400	225	360	316	22	10	20	40	100	45	25	10	180	M20	3/4	25
10	300	400	279	448	390	29	12	24	50	100	50	25	10	220	M24	1	32
12	300	400	330	560	470	45	15	34	50	100	50	25	10	260	M24	1	41
14	300	400	362	618	510	54	15	40	65	100	58	35	15	300	M24	1	84
16	300	400	412	668	560	54	15	40	65	100	58	35	15	370	M24	1	90
18	350	400	463	718	610	54	15	40	65	100	58	35	15	370	M24	1	91
20	350	450	514	788	680	54	20	40	65	100	58	35	15	420	M36	1 1/2	106
24	400	450	616	898	790	54	20	40	80	100	65	35	15	470	M36	1 1/2	122
26	400	450	666	988	880	54	25	40	80	100	65	45	15	540	M36	1 1/2	147
28	450	550	717	1038	930	54	25	40	80	100	65	45	15	560	M36	1 1/2	150
30	450	550	768	1092	984	54	25	40	80	100	65	45	15	610	M36	1 1/2	158
32	450	550	819	1140	1030	55	25	40	110	100	80	55	15	620	M36	1 1/2	175
34	500	600	870	1180	1070	55	25	40	110	100	80	55	15	640	M36	1 1/2	188
36	500	600	920	1220	1110	55	25	40	110	100	80	55	15	660	M36	1 1/2	193

6.1.3 Material

Material for all the associated parts, including clamp, base plate, gusset and rib plate, shall be of carbon steel for all pipes. Other material may be used instead of carbon steel in case of specific requirements.

6.1.4 Application

Lines sizes listed in [Figure 1](#) can be applicable with clamped shoe.

The clamped shoe may be used as guide, but torque should be calculated and defined depending on project. The clamped shoe shall not be used for anchor or axial stops without lugs on pipe.

6.2 Welded shoe

6.2.1 Key parameters

The key parameters of the welded shoe are:

- shape;
- dimension;
- material;
- application;
- allowable load.

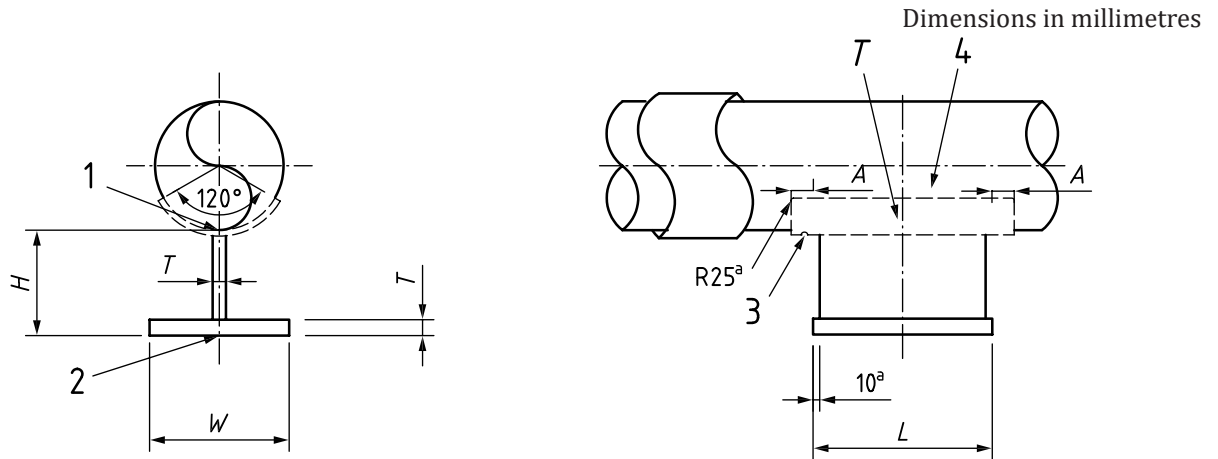
6.2.2 Size/Dimension

[Figure 2](#) shows the design specification of welded shoe used for pipes of up to NPS 2. [Table 3](#) presents the dimensions, as also shown in [Figure 2](#), including standard length and height of welded shoe for different pipe sizes.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 24200:2022](#)

<https://standards.iteh.ai/catalog/standards/sist/d8ba06a0-8f06-43d8-b103-92799938d570/iso-24200-2022>



Key

- 1 bottom of pipe
- 2 top of steel
- 3 6 mm weep hole
- 4 wear pad
- ^a Typical.

For NPS 2 and below, wear pad shall be applied for thin wall pipe (SCH. 10S and below for CRA material, and SCH. 30 and below for CS material).

For wear pad thickness for pipe thickness less than 10 mm, the same thickness as parent pipe shall be used; otherwise 10 mm or higher thickness should be used.

Height, *H*, shall be noted on isometric drawing, if greater than 100 mm.

All welds shall be 6 mm of welding leg continuous fillet, unless specified otherwise.

All weep holes shall be sealed with mastic (resin) after hydro test. The mastic shall be watertight, UV resistant and also able to endure pipe operating temperature as a minimum requirement.

For pipes of NPS 2, gussets are not required. If the shoe length is more than 500 mm, an additional gusset shall be added.

NOTE Length, *L*, can be increased or decreased, if required when indicated on isometric drawing.

Figure 2 — Design specification of welded shoe used for pipes of NPS 2

Figure 3 shows the design specification of welded shoe used for pipes of from NPS 3 to NPS 30. Table 3 presents the dimensions, as also shown in Figure 3, including standard length and height of welded shoe for different pipe sizes.