DRAFT INTERNATIONAL STANDARD

ISO/DIS 24200

ISO/TC **67**	Secretariat: **NEN**
Voting begins on: **2020-04-27**	Voting terminates on: **2020-07-20**

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

ICS: 75.180.10

Member bodies are requested to consult relevant national interests in ISO/TC 8/SC 8 before casting their ballot to the e-Balloting application.

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 24200:2020(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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*.

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.

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 from NPS 2 up to NPS 36 except for U-bolt and U-strap. This document covers topside systems for fixed or floating offshore oil and gas projects. This document applies for design temperature of support within the range between –23 °C up to 200 °C. This document is limited to metallic pipes only.

This document covers such requirements for following pipe supports:

— clamped shoe;

— welded shoe;

— U-bolt;

— U-strap;

— bracing for branch connection;

— trunnion and stanchion;

— guide support(guide, hold-down, guide/hold-down).

This document addresses design requirements of the listed items above, hence the document does not necessarily cover all other types of pipe supports.

2 Normative references

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 A36, *Standard Specification for Carbon Structural Steel*

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 terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
pipe support
pipe fixture or structural attachment which transfers the load from the pipe or structural attachment to the supporting structure or other piping components

3.1.2
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.

3.1.3
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 and non-grip type.

3.1.4
U-strap
commonly used pipe support designed to absorb mechanical vibration from piping by inserting rubber support material

Note 1 to entry: The U-strap can be divided into type A and type B (see5.4).

3.1.5
bracing for branch connection
reinforcement used to avoid fatigue failure due to the vibration from the parent pipe

3.1.6
guide support
support used to restrict lateral movement of pipe

3.1.7
hold-down
support used to restrict vertical movement of pipe

3.1.8
guide/hold-down
support used to restrict vertical and lateral movement of pipe

3.1.9
line-stop
support used to restrict axial movement of pipe

3.1.10
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

3.1.11
gusset
plates placed between pipe and base plate in lateral direction of pipe to resist any load transferred to piping

3.1.12
rib plate
plate placed between pipe and base plate in axial direction of pipe to resist any load transferred to piping

3.1.13
non-grip type
type of U-bolt that gives some allowance for the inside pipe to move vertically and laterally with a maximum gap of 3 mm

3.1.14
grip type
type of U-bolt without any allowances for the inside pipe to move

3.1.15
teflon pad
pad made of PTFE that is mainly used to reduce friction reactions between different surfaces

3.1.16
spacer
temporary rubber ring to ensure 3 mm gap between pipe and U-bolt during installation of, which is removed after installation

3.1.17
throttle gap
extension of hole for bolts allowing lateral movement

3.1.18
strip
thin plate, typically made of PTFE or other material, under the strap used to prevent fretting due to friction between pipe and strap

3.1.19
isolation pad
pad to absorb mechanical vibration from the pipe

3.1.20
protection pad
pad to prevent damages due to the friction between the bolt and U-strap and galvanic corrosion

3.1.21
bracket
main 'U'-shaped part of U-strap that is in contact with the protection

3.1.22
machine bolt
threaded bolt with a square or hexagonal head

3.1.23
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

3.1.24
trunnion
pipe extended hung on structure or spring

3.1.25
stanchion
extended pipe resting on floor or structure vertically

3.1.26
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.

3.2 Abbreviated terms

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

4 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) pipe movement;

b) forces and loads at point of support;

c) pipe insulation;

d) existing structure.

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/U-bolt(strap) [a,b]
	Uninsulated	Priority	U-bolt(strap) [a,b]
		Alternative	Clamped shoe/Welded shoe
Pipe NPS 8 above	Insulation	Priority	Welded shoe
		Alternative	Clamped shoe [c]
	Uninsulated	Priority	Welded shoe
		Alternative	Clamped shoe [c]

NOTE 1 All support type to be verified not to exceed maximum allowable load.

NOTE 2 Supporting method will be more specified as resting/hold down/guide/stopper as per pipe stress analysis.

NOTE 3 Trunnion type of support are same priority with welded shoe.

[a] Operating temperature shall be lower than maximum allowable temperature of contacted coating material.

[b] U-bolt can be selected if removable insulation or personal protection is applied.

[c] Welded shoe to be a priority when stopper is required.

5 Design and material requirements

5.1 Clamped shoe

5.1.1 Key parameters

The key parameters of the clamped shoe are:

— shape;

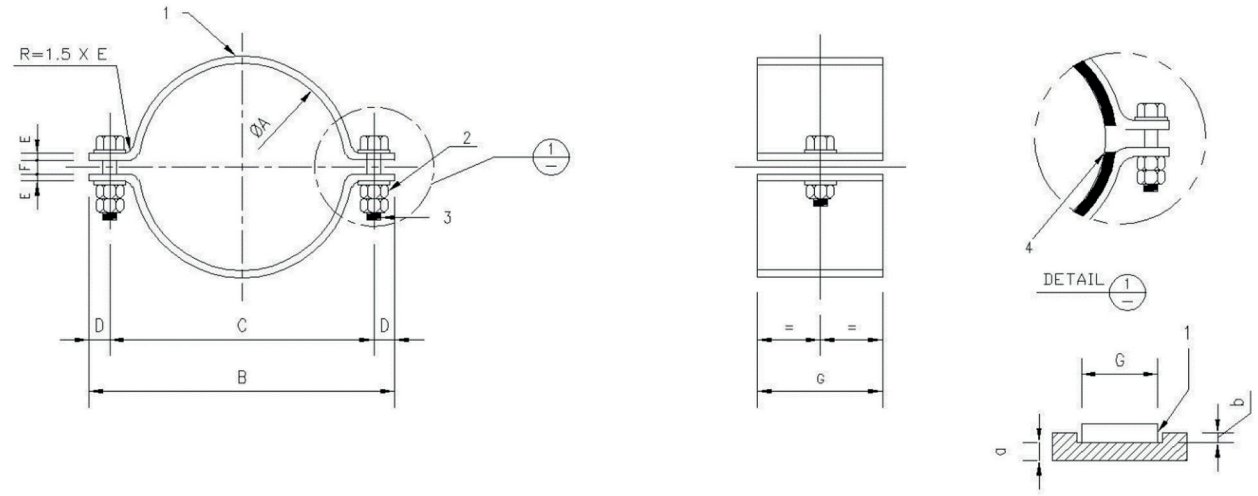
— dimension;

— material;

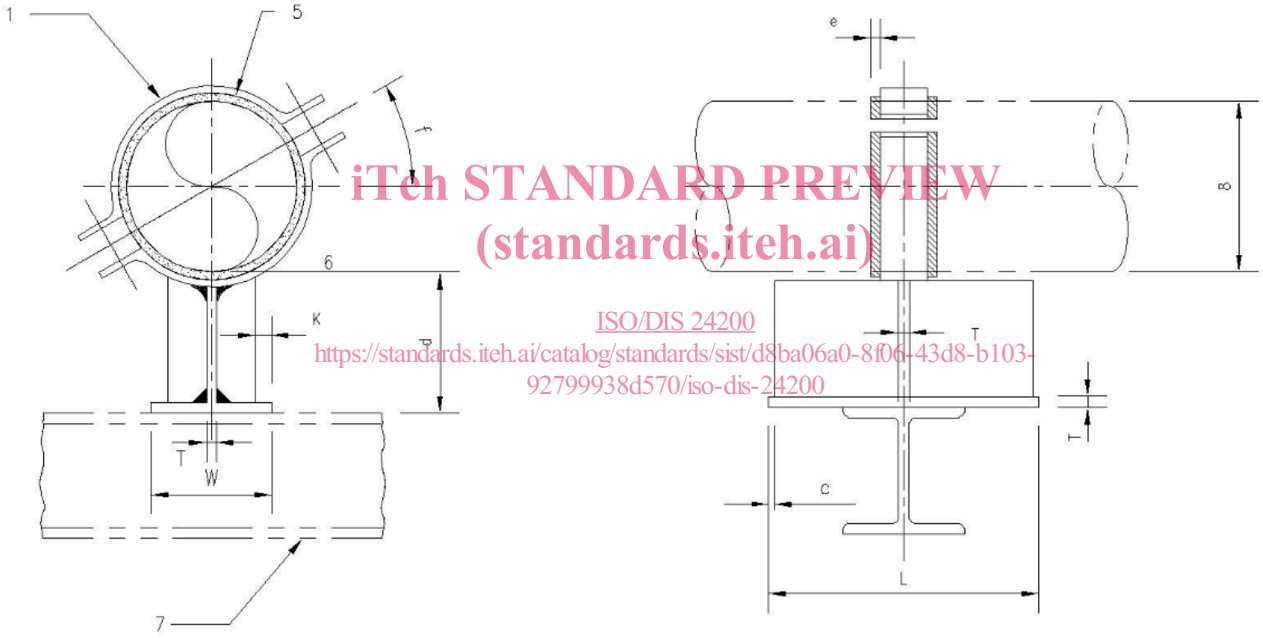
— application.

5.1.2 Size/Dimension

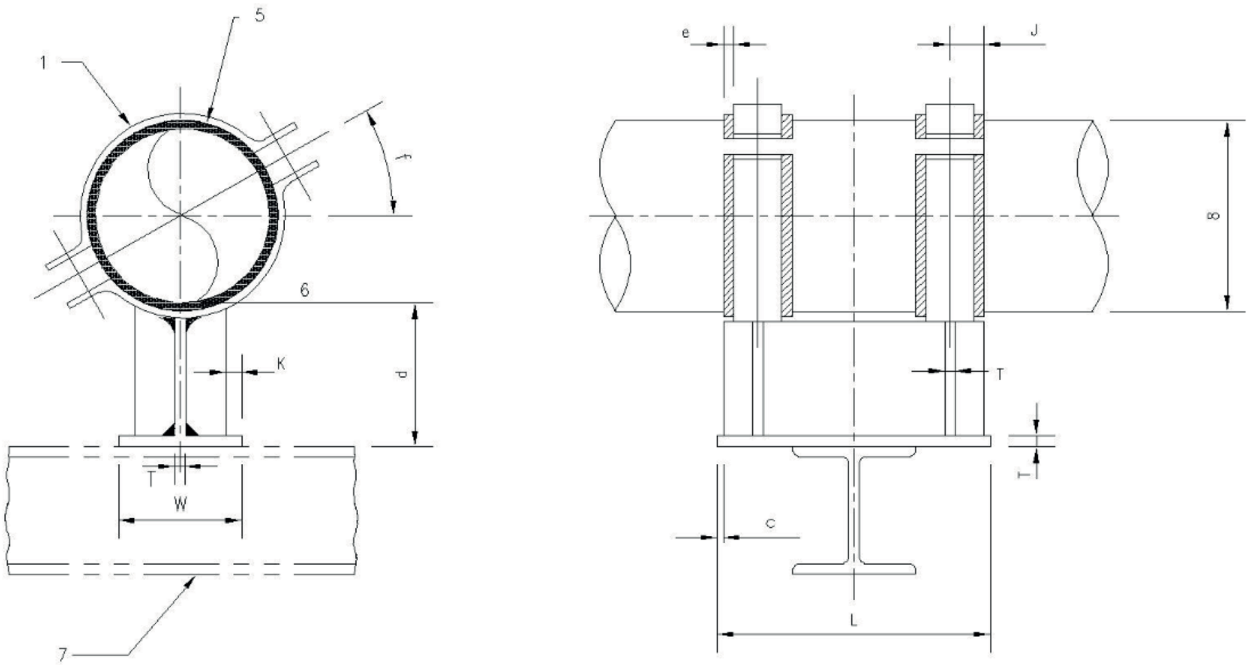
Figure 1 shows the design specification of clamped shoe used for steel/non-ferrous NPS 2 to NPS 36. Table 2 presents the dimensions, as also shown in Figure 1, including standard length and height of clamped shoe for different pipe sizes.



a) Clamp detail (typical)



b) For pipe NPS 2



c) For pipe NPS 3 to NPS 36

Key

1	clamp	a	3 mm
2	Nut	b	5 mm
3	machine bolt (see also NOTE 7)	c	10 mm (typical)
4	lining to be fabricated as 2 pieces with cut end at this corner	H	= 100 (maximum 175, see NOTE 3)
5	3 mm thickness insulator strip wrapper	e	25 mm (typical)
6	bottom of pipe	f	30°
7	structural steel		
8	nominal diameter		

NOTE 1 All dimensions are in millimetres, unless specified otherwise.

NOTE 2 Length 'L' can be increased or decreased, if required when indicated on isometric drawing.

NOTE 3 Height 'H' shall be indicated on isometric drawing, if greater than 100 mm.

NOTE 4 All welds shall be 6 mm of welding leg continuous fillet, unless specified otherwise.

NOTE 5 Clamp material shall be in accordance with ASTM A36 or equivalent material (e.g. JIS SS400 per JIS G3101).

NOTE 6 The clamped shoe shall not be used for anchor or axial stops without lugs on pipe.

NOTE 7 At least two threads of bolt shall be protruded at the end of nut.

NOTE 8 Dimensions shown in Table 2 are based on 3 mm thickness of insulator. It shall be recalculated upon on an insulator material and thickness

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 (L)		ØA	B	C	D	E	F	G	J	K	T	W	Bolt		Allowable load kN
NPS	Standard	Long		mm											inch	Vertical
2	200	300	66	152	120	16	5	12	30	40	25	10	80	M12	1/2	5.5
3	200	300	95	192	160	16	8	16	30	40	25	10	100	M12	1/2	19
4	250	300	120	236	196	20	8	16	40	45	25	10	120	M16	5/8	24
6	250	350	174	310	264	23	10	20	40	45	25	10	140	M20	3/4	25
8	300	400	225	360	316	22	10	20	40	45	25	10	180	M20	3/4	25
10	300	400	279	448	390	29	12	24	50	50	25	10	220	M24	1	32
12	300	400	330	560	470	45	15	34	50	50	25	10	260	M24	1	41
14	300	400	362	618	510	54	15	40	65	58	35	15	300	M24	1	84
16	300	400	412	668	560	54	15	40	65	58	35	15	370	M24	1	90
18	350	400	463	718	610	54	15	40	65	58	35	15	370	M24	1	91
20	350	450	514	788	680	54	20	40	65	58	35	15	420	M36	1 1/2	106
24	400	450	616	898	790	54	20	40	80	65	35	15	470	M36	1 1/2	122
26	400	450	666	988	880	54	25	40	80	65	45	15	540	M36	1 1/2	147
28	450	550	717	1038	930	54	25	40	80	65	45	15	560	M36	1 1/2	150
30	450	550	768	1092	984	54	25	40	80	65	45	15	610	M36	1 1/2	158
32	450	550	819	1140	1030	55	25	40	110	80	55	15	620	M36	1 1/2	175
34	500	600	870	1180	1070	55	25	40	110	80	55	15	640	M36	1 1/2	188
36	500	600	920	1220	1110	55	25	40	110	80	55	15	660	M36	1 1/2	193

5.1.3 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.

5.1.4 Application

Lines sizes listed in Figure 1 can be applicable with clamped shoe.

5.2 Welded shoe

5.2.1 Key parameters

The key parameters of the welded shoe are:

— shape;

— dimension;

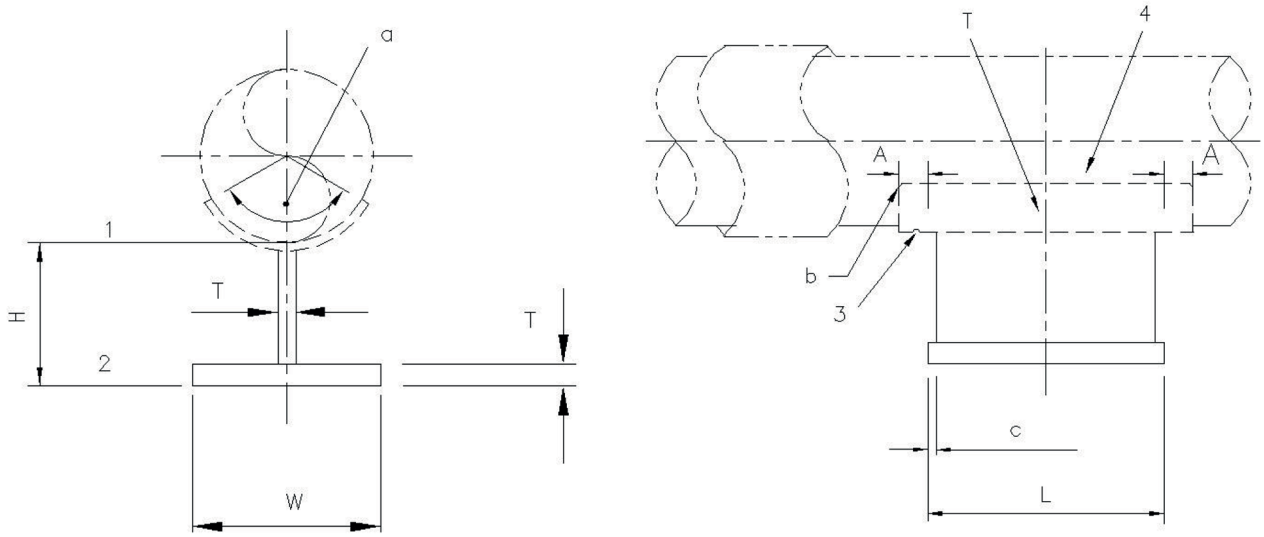
— material;

— application;

— inspection and testing.

5.2.2 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.



Key

1	bottom of pipe	a	120°
2	top of steel	b	R25 (typical)
3	6 mm vent hole (see NOTE 7)	c	10 mm (typical)
4	pad thickness 'P' (see NOTES 3 and 4)		

NOTE 1 All dimensions are in millimetres, unless specified otherwise.

NOTE 2 Length 'L' may be increased or decreased if required when indicated on isometric drawing.

NOTE 3 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).

NOTE 4 For wear pad thickness for pipe thickness less than 10 mm, the same thickness as parent pipe shall be used; otherwise 10 mm thickness shall be used.

NOTE 5 Height 'H' shall be noted on isometric drawing, if greater than 100 mm.

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

NOTE 7 All vent 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.

NOTE 8 For pipes of NPS 2, gussets are not required. If the shoe length is more than 500 mm, a center gusset shall be added.

Figure 2 — Design specification of welded shoe used for pipes of up to 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.