

Gasunie Technical Standard

Material Specification Mechanical

MSW-04-E/2

Pipe fittings $15 \leq DN \leq 400$

Version 8 *02-02-2024*

FOREWORD

This specification supersedes the seventh version of MSW-04-E/2.

MSW-04-E is divided in the following parts:

- [MSW-04-E/1](#): "Pipe fittings $450 \leq DN \leq 1200$ ";
- MSW-04-E/2: "Pipe fittings $15 \leq DN \leq 400$ ";
- [MSW-04-E/3](#): "Flanges $450 \leq DN \leq 1200$ ";
- [MSW-04-E/4](#): "Flanges $15 \leq DN \leq 400$ ".

With respect to the former version the following has been changed:

- Clause 1: added Transport medium table.
- Added subclause 3.1 "Definition".
- Clause 1 (NEN-EN 14870-2): added first paragraph; transport media has been changed.
- Added subclause 6.1 (NEN-EN 14870-2) "General".
- Subclause 8.3.5 (NEN-EN 14870-2): preparation grade has been changed to minimal P2.
- Clause 10 (NEN-EN 14870-2): text completely changed.
- Clause 6: added documentation 2.

Note:

The numbering and (sub)clauses in italics in this specification correspond to that in NEN-EN 14870-3.

Alterations are marked with a left margin line.

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1. SCOPE AND APPLICATION

This specification contains the requirements for threaded fittings (clause 4) and seamless butt welding fittings (clause 5) for use in natural gas, hydrogen and nitrogen pipelines and piping systems (see documentation 1) with the following design criteria:

- nominal diameter : $15 \leq DN \leq 400$
- design pressure : $0 \text{ bar (e)} < p_d \leq 80,0 \text{ bar (e)}$
- design temperature : $-20 \text{ }^{\circ}\text{C} < T_d \leq +50 \text{ }^{\circ}\text{C}$

This specification is based on NEN-EN 14870-2:2005 (January 2005) and serves as a supplement to that document. Therefore this specification shall be read in conjunction with NEN-EN 14870-2. Topics referred to as "by agreement" or "if specified" in NEN-EN 14870-2 do not apply when these topics are not specifically addressed in this document.

All seamless fittings specified to be in accordance with this specification shall comply with the requirements of NEN-EN 14870-2, as amended and supplemented herein.

Transport medium ¹	Natural gas	Hydrogen	Carbon dioxide	Nitrogen	(Hot) water	Ammonia
	Applicable	Applicable	Not judged ²	Applicable	Not judged ²	Not judged ²

1 The table is based on 100 % suitability of the transport medium concerned.

The scope and media for which this specification is suitable are not automatically the same as the scope and media of underlying specifications. The scope and suitability for a medium are described for each specification.

2 Suitability shall be determined on the basis of an impact analysis. The requirements that do appear to be applicable shall be observed.

2. REFERENCES

This specification makes prescriptive reference to the documents mentioned in this chapter.

If the documents in this specification are mentioned with a date, this specific edition is applicable.

2.1 Gasunie specification

In this specification reference is made to the following Gasunie specification:

MSA-25-E	Transport, packing and marking.
MSA-32-E	Requirements for inspection certificates of pressure parts.

2.2 Standards

In this specification reference is made to the standards¹ mentioned in this subclause. Any supplements and errata are also applicable.

ASME B1.20.1	Pipe Threads, General Purpose (Inch).
ASME B16.9	Factory-made wrought butt welding fittings.
ASME B16.11	Forged fittings, socket-welding and threaded.
ASME B16.25	Butt welding ends.
ASME B31.3	Process piping.
ASTM A333/A333M	Standard specification for seamless and welded steel pipe for low-temperature service and other applications with required notch toughness.
ASTM A350/A350M	Standard specification for carbon and low-alloy steel forgings, requiring notch toughness testing for piping components.
ASTM A420/A420M	Standard specification for piping fittings of wrought carbon steel and alloy steel for low-temperature service.
BS 3799	Specification for steel pipe fittings, screwed and socket-welding for the petroleum industry.
NEN-EN 10028-2	Flat products made of steels for pressure purposes; Part 2: Non-alloy and alloy steels with specified elevated temperature properties.
NEN-EN 10204	Metallic products - Types of inspection documents.
NEN-EN 13480-3 (August 2017)	Metallic industrial piping - Part 3: Design and calculation
NEN-EN 14870-2 (January 2005)	Petroleum and natural gas industries - Induction bends, fittings and flanges for pipeline transportation systems; Part 2: Fittings.

¹ Applicable for all NEN-EN standards: Depending on the country where the standard will be applied, DIN-EN or BS EN, for example, shall be chosen.

NEN-EN-ISO 148-1	Metallic materials - Charpy pendulum impact test; Part 1: Test method.
NEN-EN-ISO 8501-3	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 3: Preparation grades of welds, edges and other areas with surface imperfections.
NEN-EN-ISO 9712	Non-destructive testing - Qualification and certification of NDT personnel.
NEN-EN-ISO 10893-4	Non-destructive testing of steel tubes - Part 4: Liquid penetrant inspection of seamless and welded steel tubes for the detection of surface imperfections.
NEN-EN-ISO 10893-5	Non-destructive testing of steel tubes - Part 5: Magnetic particle inspection of seamless and welded ferromagnetic steel tubes for the detection of surface imperfections.
NEN-EN-ISO 10893-8	Non-destructive testing of steel tubes - Part 8: Automated ultrasonic testing of seamless and welded steel tubes for the detection of laminar imperfections.
NEN-EN-ISO 17640	Non-destructive testing of welds - Ultrasonic testing - Techniques, testing levels, and assessment.
NEN-ISO 2768-1	General tolerances; Part 1: Tolerances for linear and angular dimensions without individual indications.

3. DEFINITION, ABBREVIATIONS AND SYMBOLS

3.1 Definition

In this specification the following definition is applicable:

Transport medium ²	A gaseous or liquefied substance that is transported by and/or stored in a Gasunie transport network; limited to:
	– natural gas;
	– hydrogen;
	– carbon dioxide;
	– nitrogen;
	– (hot) water;
	– ammonia.

3.2 Abbreviations

In this specification the following abbreviations are applicable:

DN	Nominal Diameter
ITP	Inspection and Test Plan
MT	Magnetic Testing
NDT	Non-Destructive Testing
PT	Penetrant Testing
SIF	Stress Intensification Factor
UT	Ultrasonic testing
WPQR	Welding Procedure Qualification Report
WPS	Welding Procedure Specification

3.3 Symbols

In this specification the following symbols are applicable:

<u>Symbol</u>	<u>Description</u>	<u>Unit</u>
A_f	Elongation	%
a	Throat thickness	mm
CE	Carbon equivalent	%
d	Width of specimen	mm
D	Diameter	mm
D_b	Branch diameter	mm
D_i	Internal diameter	mm
h	Height (two scraper-guides)	mm
h_1	Height (three scraper-guides)	mm
h_2	Height (three scraper-guides)	mm
OD	Outer diameter	mm
OD_{pipe}	Outer diameter of the pipe	mm
P_{cm}	Crack measurement parameter	%
p_d	Design pressure	bar (e)
r_x	Crotch radius	mm
R	Radius	1
R_m	Tensile strength	MPa

² Additives and other substances used in the medium or in the processes are therefore expressly outside the scope.

<u>Symbol</u>	<u>Description</u>	<u>Unit</u>
$R_{t0,5}$	Yield strength for 0,5 % total elongation	MPa
T_d	Design temperature	°C
$T_{d,min}$	Minimum design temperature	°C
t	Specified wall thickness at the welding ends for pipe fittings	mm
t_c	Crotch thickness	mm
t_{nom}	Nominal wall thickness	mm
t_p	Nominal wall thickness of matching pipe	mm

4. THREADED FITTINGS ≤ DN 50

Threaded fittings ≤ DN 50 shall be made in accordance with:

Type of fitting	Fitting Standard	Material Standard	Inspection Document
90° Elbow	ASME B16.11	ASTM A350 LF2 Class 1	MSA-32-E + MT report according to paragraph 9.5.7 of this specification (MSW-04-E/2)
45° Elbow	ASME B16.11		
Street Elbow	ASME B16.11		
Tee	ASME B16.11		
Reducing Tee	ASME B16.11		
Coupling	ASME B16.11		
Hexagon Head Plug	ASME B16.11		
Hexagon Head Bushing	ASME B16.11		
Hexagon Nipple	BS 3799		
Hexagon Reducing Nipple	BS 3799		
Union	BS 3799	ASTM A333 Grade 6	
Round Nipple	BS 3799		
Concentric Swage Nipple	BS 3799 / ASME B16.25	ASTM A420 WPL6	

Thread shall be according to ASME B1.20.1.

5. SEAMLESS BUTTWELDING FITTINGS, AMENDMENTS/SUPPLEMENTS TO NEN-EN 14870-2

This chapter is presented in the form of amendments and supplements to NEN-EN 14870-2 and uses the same clause numbering as NEN-EN 14870-2.

If requirements of the mentioned codes and specifications conflict with this specification, this specification shall prevail.

CLAUSE 1 SCOPE

- | | |
|--------------|--|
| Substitution | <i>Substitute in the first paragraph:</i>
"pipeline transportation systems for the petroleum and natural gas industries as defined in EN 14161" with:
"natural gas, hydrogen and nitrogen pipelines and piping systems." |
| Substitution | <i>Substitute the second paragraph with the following:</i>
"This document is applicable to welding-end fittings such as elbows, caps, tees, reducers, transition pieces and olets made from seamless pipe or plate (caps only) of unalloyed or low-alloy steels." |
| Deletion | <i>Delete in this clause the following:</i> <ul style="list-style-type: none"> – the third paragraph; – table 1; – the fourth paragraph; – the sixth paragraph. |

CLAUSE 6 PRESSURE RATING AND DESIGN

6.1 General

- | | |
|--------------|--|
| Substitution | <i>Substitute the second paragraph with:</i>
"Manufacturer is responsible for design for internal pressure within the specifications of ASME B16.9. The design calculations and/or results of proof testing ³ shall be available for review. The manufacturer shall apply the standard values of the starting material in the design." |
|--------------|--|

6.2 Tees and headers

- | | |
|--------------|--|
| Substitution | <i>Substitute the second paragraph with the following:</i>
"The design and welding for the attachment of guide bars of barred tees shall be in accordance with annex A of this specification (MSW-04-E/2)." |
|--------------|--|

CLAUSE 7 INFORMATION TO BE SUPPLIED BY THE PURCHASER

7.1 Principal information

- | | |
|--------------|--|
| Addition | <i>Add to item a the following:</i>
"Fitting designation shall be stated in the purchase order." |
| Substitution | <i>Substitute item b in this subclause with the following:</i>
"Fitting dimensions shall be stated in the purchase order and subclause 9.6 of this specification (MSW-04-E/2)." |

³ See documentation 2.

- Addition *Add to item c the following:*
"End-preparations shall be in accordance with subclause 9.6 of this specification (MSW-04-E/2)."
- Substitution *Substitute item d in this subclause with the following:*
"No fitting shall be manufactured without the approval of the ITP by the purchaser, prior to commencement of manufacturing."
- 7.2 Supplementary information**
- Addition *Add to item l the following:*
"Fittings shall be delivered with an environmental friendly temporary protective anti corrosion layer."
- Addition *Add to item n the following:*
"Fittings shall be packed and shipped in accordance with MSA-25-E."
- Substitution *Substitute in item p the following:*
"ISO 10474" with "NEN-EN 10204".

CLAUSE 8 MANUFACTURING

8.1 Manufacturing procedure specification

- Substitution *Substitute this subclause with the following:*

"8.1 Inspection and Test Plan

The manufacturer shall draw up an Inspection and Test Plan covering all verification activities and indicating all tests/inspections to be witnessed by Gasunie or an authorised inspection agency. In principle, manufacturers may use their own procedure and format for the ITP, provided the minimum requirements are included. All verification activities shall be grouped in a logical sequence in line with the production plan.

The following information shall be provided on each activity:

- activity number;
- description;
- frequency;
- controlling document;
- acceptance criteria;
- type of record or document to be provided;
- verification action (witness, hold-point or review of documents);
- party (manufacturer, Gasunie, Notified Body).

The relevant work instruction/procedures shall be indicated in the controlling document column. The acceptance criteria column shall identify the specific clause/subclause of the applicable documents (codes, standards, requisitions, specifications and the like).

Reference to the following documents shall be included:

- manufacturer's written material specifications;
- welding procedures (WPS/WPQR);
- non-destructive testing (NDT) procedures;
- mechanical testing procedures;
- painting procedures;
- marking procedures;
- shipping procedures.

The welding, NDT and painting procedures shall be submitted to Gasunie for approval.

Note:

The inspectors of Gasunie are authorised to carry out two types of inspection, either in the context of a Gasunie Quality Inspection and/or – if stated in the purchase order – as a User Inspectorate.

An update of the ITP and approval by Gasunie is required either every 3 years or by any change in the manufacturer's production procedures or by a new revision of this specification (MSW-04-E/2)."

8.2 Starting material

Substitution *Substitute the first paragraph of this subclause with the following:*

"The starting material for forming into fittings shall be:

- forging quality bar or seamless pipe for weldolets and threadolets;
- seamless pipe for tees, elbows and reducers;
- plate for caps.

The starting material shall be fully killed steel. The chemical composition of the starting material shall be in accordance with column "**Classes B and C**" of table 4. The starting material shall be of European origin."

8.3.2 Welding

Substitution *Substitute this clause with the following:*

"No welding on the starting material is allowed. No welding on the fitting is allowed with the exception of the welding necessary for the guide bars of barred tees."

8.3.3 Heat treatment

Substitution *Substitute the second paragraph of this subclause with the following:*

"A record shall be maintained of each heat treatment batch either by a yearly calibrated oven/furnace or by a sufficient number of thermocouples attached adequately to the material surface. The heat treatment record shall be included in the inspection document."

8.3.5 Surface treatment (additional subclause)

Addition

"The finished parts shall be cleaned to remove all scale and processing compounds prior to the final surface examination. The cleaning process shall not injure the surface finish, material properties, or the metallurgical structure.

Surface preparation shall be minimal P2, according to NEN-EN-ISO 8501-3. Additional weld porosity and welding spatters shall be dressed out.

CLAUSE 9 TESTING AND INSPECTION

9.2 Extent of testing and inspection

Substitution *Substitute in the first paragraph of this subclause the following:*

"for each fitting class." with

". Only requirements of fitting class B shall be used for testing and inspection."

Substitution *Substitute in Table 2 of this subclause the following:*
 Through-thickness hardness "M" with "N"
 Fitting body (UT or MT) "O" with "M"

9.3 Chemical composition

Substitution *Substitute this subclause with the following:*
 "The product analysis shall be taken after final heat treatment and:
 – shall be in accordance with column "**Classes B and C**" of table 4;
 – shall be in accordance with MSA-32-E."

9.4.2.3 Requirements

Substitution *Substitute this paragraph with the following:*
 "The mechanical properties shall meet the requirements stated in table 1 of this specification (MSW-04-E/2)."

Table 1: Mechanical properties

Fitting type	Yield strength		Tensile strength		Ratio	Elongation
	$R_{t0,5}$ MPa		R_m MPa		$R_{t0,5}/R_m$	A_f %
	minimum	maximum	minimum	maximum	maximum	minimum
cap, elbow, reducer, tee, and transition pieces	245	440	415	760	0,85	22
transition pieces, weldolet and threadolet	415	535	550	760	0,85	18

The CE limits apply if $C > 0,12 \%$, and
 the P_{cm} limits apply if $C \leq 0,12 \%$.

9.4.3.1 Test pieces

Substitution *Substitute in the first paragraph of this subclause the following:*
 "ISO 148, ISO 148-2 and ISO 148-3" with "NEN-EN-ISO 148-1".

9.4.3.2 Test method

Substitution *Substitute the second paragraph of this subclause with the following:*
 "Charpy V-notch impact testing shall be in accordance with NEN-EN-ISO 148-1 with a striker radius of 2 mm."

Substitution *Substitute table 5 as follows:*

Table 5 – Maximum Charpy V-notch test temperature

Specified wall thickness at the welding end for pipe fittings (mm)	Test temperature (°C)
$t \leq 22$	$T_{d,min}$
$22 < t \leq 25$	≤ -30
$25 < t \leq 27,5$	≤ -40
$27,5 < t \leq 30$	≤ -50

9.5.1 NDT procedures and personnel

Substitution

Substitute this subclause with the following:

"The manufacturer shall have at least an NDT expert available for the NDT methods employed. This NDT expert shall be certified according to NEN-EN-ISO 9712 level 3 in the method employed by the manufacturer. The personnel performing the examinations shall have at least NEN-EN-ISO 9712 level 2 for the technique they use.

Documentation

For each test method used, a procedure shall be written and approved by the level 3 expert for the relevant method. This NDT procedure shall fulfil the requirements of the relevant EN, ISO or ASME standards. All relevant information for performing the test, interpretation, evaluation of results and reporting shall be included in the procedure as a minimum.

The written procedures for each method employed in production shall be submitted to Gasunie for approval before start manufacturing. A sketch or document showing the location of the NDT and the repairs shall be made for the manufacturing report."

9.5.3.3 Treatment of dressable surface defects

Substitution

Substitute in the first paragraph in this subclause the following:

"9.6" with "the minimal wall thickness as mentioned on the applicable drawings"

9.5.4 Fitting ends

Substitution

Substitute in first paragraph the first sentence with:

"The complete end preparation shall be subjected to MT in accordance with NEN-EN-ISO 10893-5, or PT in accordance with NEN-EN-ISO 10893-4.

Substitute in third paragraph the first sentence with:

"For class B and C fittings, a 50 mm wide band at each end shall be inspected for laminar imperfections by UT in accordance with NEN-EN-ISO 10893-8".

9.5.6 Guide bar attachment welds

Substitution

Substitute in this subclause the following:

"ASTM E 709" with "NEN-EN-ISO 10893-5"

Addition

Acceptance criteria shall be according NEN-EN-ISO 10893-5, level M2 table 3. By agreement, PT in accordance with NEN-EN-ISO 10893-4. Acceptance criteria in accordance with NEN-EN-ISO 10893-4 level P2 table 3.

9.5.7 Fitting body

Addition

All accessible surfaces shall be MT examined in accordance with NEN-EN-ISO 10893-5. Acceptance criteria in accordance with NEN-EN-ISO 10893-5, level M2 table 2.

Accessible is defined as all outside surfaces, and inside surfaces for a distance of one diameter from the fitting ends.

Irregularities shall not be in the crotch area of a tee.

9.6 Dimensions

Substitution Substitute this subclause with the following:

"Overall dimensions and tolerances shall be in accordance with ASME B16.9.

Additional to the welding end dimensions a minimum bore of the flow path is specified for several diameter tees and elbows $R > 1,5 \cdot D$ in accordance to ASME B16.9. The minimum bore is required for pigging activities.

The inside diameter of each non-reducing fitting with an indicated minimum bore shall permit the passage of a drift mandrel consisting of two parallel circular metal disks of the minimum bore size, each at least 6 mm thick; rigidly connected and separated by a distance of one nominal pipe diameter.

Welding end dimensions and minimum bore requirements shall be in accordance with table 2 and 3.

Table 2: Welding end and bore details, design pressure 19 and 40 [bar (e)]

Nom. Diam.		Welding end			Minimum bore tee	Minimum bore elbow $R > 1,5 \cdot D$
DN	OD (mm)	Schedule	t_{nom} (mm)	$D_i \pm 1,0$ (mm)	$0,85 \cdot OD_{pipe}$ (mm)	$0,95 \cdot D_i$ (mm)
25	33,4	80	$4,6 \pm 0,6$	24,3	-	-
40	48,3	80	$5,1 \pm 0,6$	38,1	-	-
50	60,3	80	$5,5 \pm 0,7$	49,2	-	-
80	88,9	40	$5,5 \pm 0,7$	77,9	-	-
100	114,3	40	$6,0 \pm 0,7$	102,3	-	97,1
150	168,3	40	$7,1 \pm 0,9$	154,1	143,1	146,4
200	219,1	20	$6,4 \pm 0,8$	206,4	186,2	196,1
250	273,0	20	$6,4 \pm 0,8$	260,3	232,1	247,3
300	323,9	30	$8,4 \pm 1,0$	307,1	275,3	291,7
400	406,4	30	$9,5 \pm 1,2$	387,3	345,4	368,0

Table 3: Welding end and bore details, design pressure 66,2 and 80 [bar (e)]

Nom. Diam.		welding end			minimum bore tee	minimum bore elbow $R > 1,5 \cdot D$
DN	OD (mm)	Schedule	t_{nom} (mm)	$D_i \pm 1,0$ (mm)	$0,85 \cdot OD_{pipe}$ (mm)	$0,95 \cdot D_i$ (mm)
25	33,4	80	$4,6 \pm 0,6$	24,3	-	-
40	48,3	80	$5,1 \pm 0,6$	38,1	-	-
50	60,3	80	$5,5 \pm 0,7$	49,2	-	-
80	88,9	40	$5,5 \pm 0,7$	77,9	-	-
100	114,3	40	$6,0 \pm 0,7$	102,3	-	97,1
150	168,3	40	$7,1 \pm 0,9$	154,1	143,1	146,4
200	219,1	40	$8,2 \pm 1,0$	202,7	186,2	192,6
250	273,0	40	$9,3 \pm 1,2$	254,5	232,1	241,7
300	323,9	-	$11,0 \pm 1,4$	301,9	275,3	286,8
400	406,4	-	$14,2 \pm 1,6$	378,0	345,4	359,1

Note: Dimensions in mm

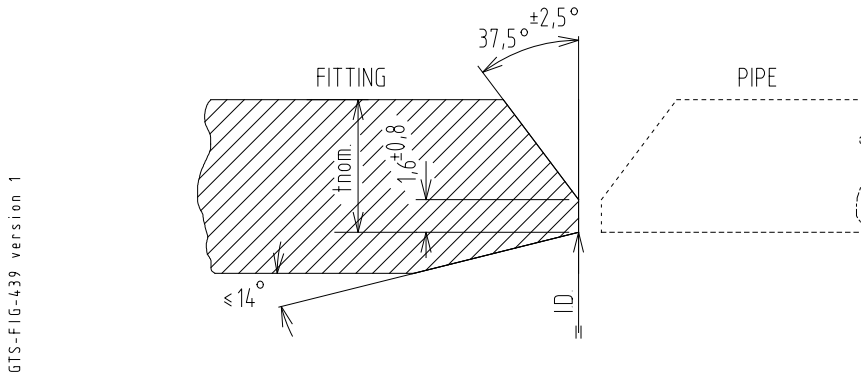


Figure 1: Welding end detail for fittings

Guide bars for barred tees shall be in accordance with annex A of this specification (MSW-04-E/2)."

CLAUSE 10 INSPECTION DOCUMENT

Substitution Substitute this clause with the following:

"The fitting shall be certified in accordance with MSA-32-E. The required inspection certificate shall be in accordance with MSA-32-E route 6 or 9, or by agreement route 5 or 7.

The following documents shall be supplied:

- burst test or design calculation;
- applicable drawings as mentioned in the purchase order;
- concession requests if applicable;
- calculations;
- finished product inspection certificates including results of:
 - dimensional check;
 - destructive tests;
 - non destructive tests;
 - heat treatment time;
 - temperature."

CLAUSE 11 MARKING

Addition Add to the sixth enumeration item in this clause the following:

"The manufacturer's name or trademark shall be a specific stamp and not a combination of standard characters."

Substitution Substitute the seventh enumeration item in this clause with the following:

- "purchaser's article number."
- "purchaser's PO number and position number"
- Depending on the applicable heat treatment, fittings shall be marked with:
 - "N" in case of normalised or normalised and tempered heat treatment;
 - "QT" in case of quenched and tempered heat treatment.

In case of QT, the fittings shall be marked with paint on each cutback in the 12, 4 and 8 o'clock position with the text "QT steel".

Deletion Delete in the clause the following:

- the second paragraph;
- the third paragraph;

Substitution *Substitute in the fourth paragraph in this clause the following:*
"19 mm" with "4 mm"

Substitution *Substitute the last paragraph in this clause with the following:*
"The fitting shall be identified by stamping on the external surface with low stress die stamps or interrupted dot stamps.

The marking position shall be located with a distance of minimal 5 mm from the weld bevel. Marking on the weld bevel not is allowed."

Addition *Add to this clause the following paragraph:*
"Where the size of the fitting does not permit complete marking, the following minimum information and order of precedence is applicable:

- manufacturer's name or trademark;
- heat number or manufacturer's heat identification;
- purchase order and item number."

ANNEX A.4 TEES (FULL OUTLET AND REDUCING)

Substitution *Substitute this clause with the following:*

Outlets of tees shall be integral with the bodies. Tees with separately welded outlets shall not be supplied.

The crotch radius and crotch thickness shall satisfy the following criteria (according table ASME B31.3, D300), such that the use of the SIF of forged tees according NEN-EN 13480-3 table H.3 is ensured for pipe stress calculations:

- $r_x \geq 1/8 D_b$;
- $t_c \geq 1,3 \cdot t_p$ at 45° plane.

Machining shall not be employed in order to meet above mentioned requirements.

6. DOCUMENTATION

In this specification the following informational documentation applies:

- 1 N.V. Nederlandse Gasunie, memorandum [OTW-L 22.0610](#),
"GTS_MSW-04-E/1 en -E/2 Pipe fittings voor de toepassing voor
waterstof en stikstof en voor overgangsstukken", d.d. 24-03-2022.
- 2 N.V. Nederlandse Gasunie, memorandum [OTWP 23.0843](#),
"Fittingen $15 \leq DN \leq 400$ volgens ASME en NEN-EN 14870-2",
d.d. 7 december 2023.

ANNEX**A DESIGN AND WELDING OF GUIDE BARS****Materials**

Material of guide bars shall be: NEN-EN 10028-2, P 265 GH, certified in accordance with MSA-32-E.

Tolerances

General tolerances shall be in accordance with NEN-ISO 2768-1.

Non Destructive Testing

Weld preparation of items marked with ① shall be examined for laminations by PT or MT.

Welds marked with ◇ shall be examined by MT or a combination of PT and visually. Welds marked with ◇₂ shall be examined visually.

Selection

The selection of guide bar type shall be in accordance with table A.4.

Table A.4: Selection table of guide bar type

DN		branch						
		80	100	150	200	250	300	400
run	100	A	A					
	150	A	A	A				
	200		A	A	B			
	250			A	B	B		
	300			A	A	B	B	
	400			A	A	A	B	B

Details of type A and B are given on the following two pages.

Type A – Two guide bars system

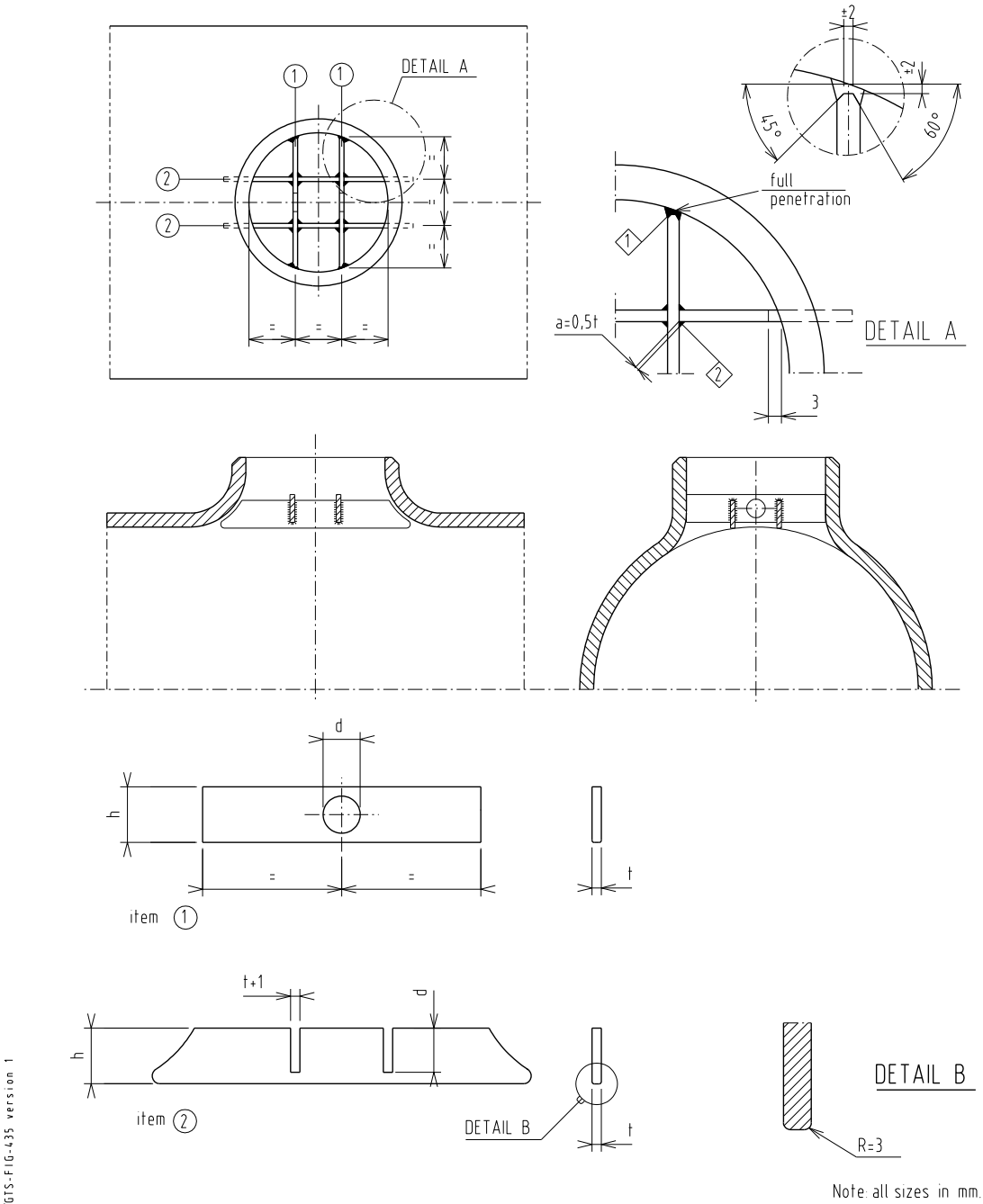


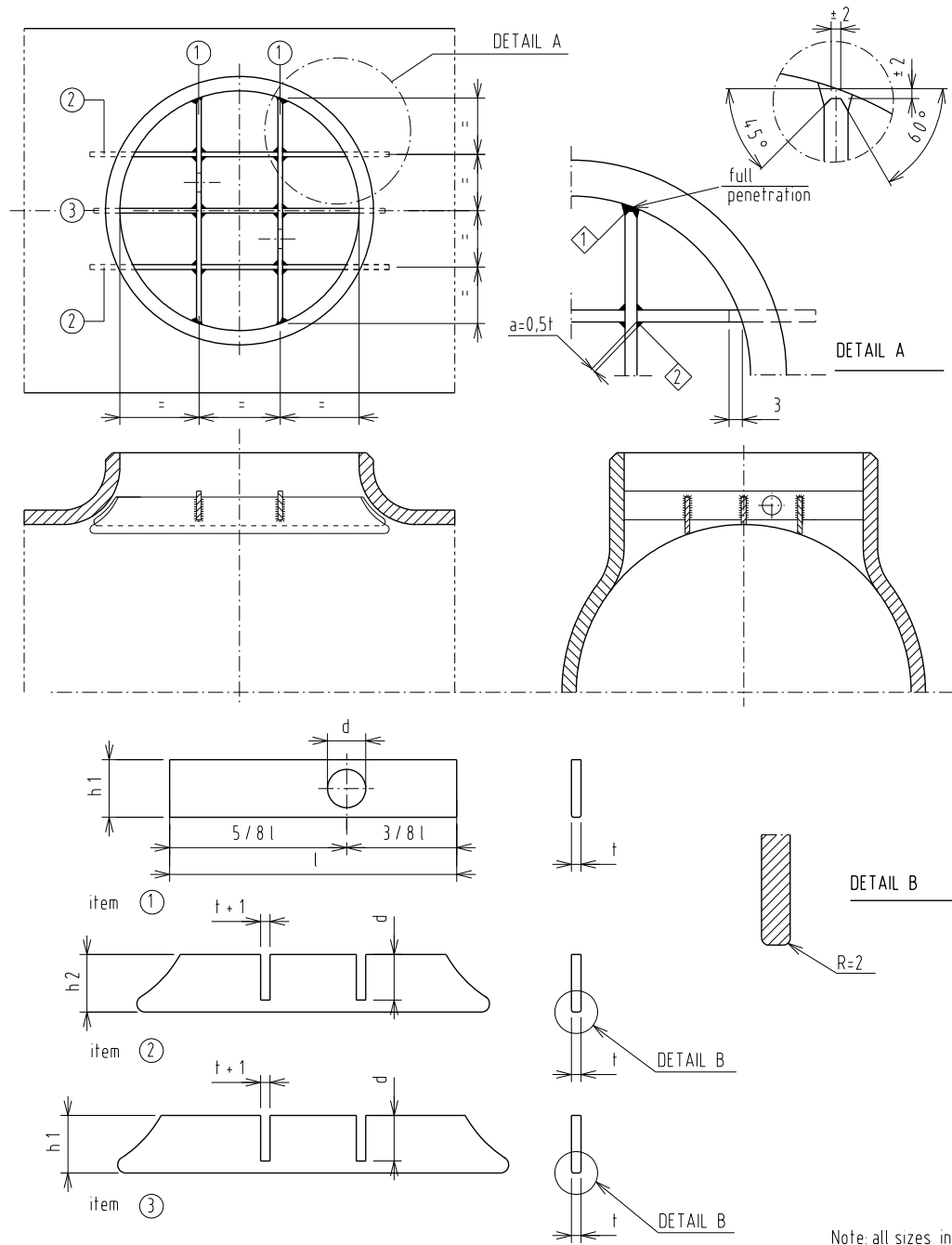
Figure A.2: Two guide bars system

Dimensions shall be in accordance with table A.5.

Table A.5: Dimensions type A

symbol	branch diameter in DN				
	80	100	150	200	250
d	16	18	20	28	30
h	24	27	30	38	45
t	5	5	6	8	8

Type B – Three guide bars system



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Figure A.3: Three guide bars system

Dimensions shall be in accordance with table A.6.

Table A.6: Dimensions type B

		branch diameter in DN			
		200	250	300	400
symbol	d	25	30	32	40
	h_1	37,5	45	48	60
	t	8	8	10	10

h_2		branch			
		200	250	300	400
run	200	47			
	250	45	58		
	300		55	63	
	400			60	79