MANUAL

COMPILATION OF BILL OF MATERIAL FOR PIPING ISOMETRICS

DEP 31.38.01.13-Gen.

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DESIGN AND ENGINEERING PRACTICE

PREFACE

DEP (Design and Engineering Practice) publications reflect the views, at the time of publication, of:

Shell International Oil Products B.V. (SIOP)
and
Shell International Exploration and Production B.V. (SIEP)
and
Shell International Chemicals B.V. (SIC)

The Hague, The Netherlands,

and other Service Companies.

They are based on the experience acquired during their involvement with the design, construction, operation and maintenance of processing units and facilities, and they are supplemented with the experience of Group Operating companies. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good design and engineering practice applied by Group companies operating an oil refinery, gas handling installation, chemical plant, oil and gas production facility, or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual operating companies to adapt the information set forth in DEPs to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use DEPs they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will expect them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal or its technical advisor.

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1) Operating companies having a Service Agreement with SIOP, SIEP, SIC or other Service Company. The use of DEPs by these Operating companies is subject in all respects to the terms and conditions of the relevant Service Agreement.

2) Other parties who are authorized to use DEPs subject to appropriate contractual arrangements.

3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) or 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

Subject to any particular terms and conditions as may be set forth in specific agreements with users, SIOP, SIEP and SIC disclaim any liability of whatsoever nature for any damage (including injury or death) suffered by any company or person whomsoever as a result of or in connection with the use, application or implementation of any DEP, combination of DEPs or any part thereof. The benefit of this disclaimer shall inure in all respects to SIOP, SIEP, SIC and/or any company affiliated to these companies that may issue DEPs or require the use of DEPs.

Without prejudice to any specific terms in respect of confidentiality under relevant contractual arrangements, DEPs shall not, without the prior written consent of SIOP and SIEP, be disclosed by users to any company or person whomsoever and the DEPs shall be used exclusively for the purpose for which they have been provided to the user. They shall be returned after use, including any copies which shall only be made by users with the express prior written consent of SIOP and SIEP. The copyright of DEPs vests in SIOP and SIEP. Users shall arrange for DEPs to be held in safe custody and SIOP or SIEP may at any time require information satisfactory to them in order to ascertain how users implement this requirement.

All administrative queries should be directed to the DEP Administrator in SIOP.

NOTE: In addition to DEP publications there are Standard Specifications and Draft DEPs for Development (DDDs). DDDs generally introduce new procedures or techniques that will probably need updating as further experience develops during their use. The above requirements for distribution and use of DEPs are also applicable to Standard Specifications and DDDs. Standard Specifications and DDDs will gradually be replaced by DEPs.

TABLE OF CONTENTS

APPENDICES

1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the compilation of a bill of material (BOM) on the basis of piping isometrics, and gives detailed instructions for the preparation and completion of the various documents forming part of such a BOM.

This is a revision of the DEP of the same number dated April 1992; a summary of the main changes is given in (1.5).

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by SIOP and SIEP, the distribution of this DEP is confined to companies forming part of the Royal Dutch/Shell Group or managed by a Group company, and to Contractors nominated by them (i.e. the distribution code is "C" as defined in DEP 00.00.05.05-Gen.).

This DEP is intended for use in oil refineries, chemical plants, gas plants and exploration and production installations.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.4 CROSS-REFERENCES

Where cross references to other parts of this DEP are made, the referenced section number is shown in brackets. Other documents referenced in this DEP are listed in (5).

1.5 SUMMARY OF MAIN CHANGES

This is a revision of the DEP of the same number dated April 1992. Other than editorial changes, the main changes are as follows:

New DEP Section	Old DEP Section	
2.6		Requirements added for documents in electronic form
3.5		For symbols, now refers to Standard Drawing S 02.001
	Appendix 2	Appendix replaced by Standard Drawing S 02.001
	Appendix 3	Appendix deleted (typical key plans)
	Appendix 5	Appendix deleted (Specimen Standard Forms)

2. GENERAL

2.1 BOM DESCRIPTION

The BOM is a set of engineering documents containing information for identification, fabrication and construction of piping and piping components for a project or part of a project.

Index sheets, piping isometrics and material lists may be generated either by hand or by means of a computer system.

2.1 BOM CONTENTS

A BOM shall at least consist of the following documents:

- Cover sheet (3.2)
- Index sheet(s) (3.3)
- Issue sheet(s) (3.4)
- Isometric drawings and material lists (3.5)
- Key plan (if applicable) (4.)

Instructions and requirements for the piping may necessitate the inclusion of additional sheets, e.g. detail drawings.

2.2 STANDARD FORMS

In order to compile a BOM, the following forms should be used:

General-purpose sheet	DEP 31.38.01.44-Gen.
Cover sheet	DEP 31.38.01.80-Gen.
Index sheet	DEP 31.38.01.81-Gen.
Issue sheet	DEP 31.38.01.82-Gen.
Isometric drawing sheet	DEP 31.38.01.86-Gen.

2.3 NUMBER OF BOMS

Separate BOMs shall be issued for different types of material, e.g. carbon steel, low temperature carbon steel, low alloy steel, austenitic stainless steel, ferritic-austenitic stainless steel. Moreover, for lined piping, separate BOMs shall be made for each type of lining material, e.g. plastic, rubber, cement. There should be no more than about 300 isometrics for each BOM otherwise it becomes unmanageable. If there are more isometrics, more than one BOM shall be made, showing the applicability of each BOM on a keyplan (4).

2.4 DRAWING NUMBER, SHEET NUMBER AND FIRST ISSUE

All sheets forming part of one BOM shall be identified by one drawing number (taken from the list of drawing numbers allocated to the relevant project) and a sequential sheet number.

2.5 FINAL ISSUE

All final isometrics of a BOM shall be issued as transparencies or white prints.

Independent of the final issue of the completed BOMs, isometric drawing sheets may be issued separately for e.g. inquiry, calculations, authority approval, but this shall then be indicated on the drawing.

2.6 COMPUTERISED SYSTEMS

Isometrics and material lists produced by computerised systems need not comply with this DEP except that the output of such sysems shall be in according with (3.5). If the isometrics have been drawn in a computer system the final isometrics shall also be delivered electronically in “dxf” format or other format approved by the Principal.

3. COMPLETION OF FORMS

3.1 GENERAL

The Contractor is responsible for completing all sheets and forms which form part of the BOMs.

All forms and sheets shall be completed in the English language unless otherwise specified by the Principal. Whenever reference is made to a drawing or other technical document not forming part of a BOM, the designation number of this drawing/document and its relevant revision letter shall be stated.

Each revision, including cancellation of a sheet, shall be indicated by a capital letter, beginning with A and subsequently B, C, etc. However, the letters I, J and O shall not be used.

The revision letter, together with date and signature, shall be stated at the appropriate place.

On the sheet concerned, the revision letter shall be given in a triangle near the place where the revision has been made. The revision letter shall be stated on the appropriate line.

Cancelled sheets may not be removed from the BOM if they are listed on the index or issue sheet. Sheets that have been cancelled shall be clearly indicated as such by writing or stamping the word 'CANCELLED' across the page.

3.2 COVER SHEET (FORM DEP 31.38.01.80-GEN.)

This form shall be fully completed with all the information required. The group number indication shall be in conformance with the key plan (4.) (If applicable). In addition, all processing units or other units, if any, for which piping is included shall be stated.

3.3 INDEX SHEET (FORM DEP 31.38.01.81-GEN.)

This form shall state all sheets which form part of the relevant BOM, with the exception of the isometric drawings.

The numbering of the sheets mentioned on the index sheet shall be from 1 to 100 inclusive.

3.4 ISSUE SHEET (FORM DEP 31.38.01.82-GEN.)

This form shall state the date of issue of the first issue as well as those of the revision(s) of all sheets of the BOM, including isometric drawings.

The columns with the preprinted sheet numbers allow of the addition of a '1', '2', etc., in front of these numbers in order to facilitate the use of this issue sheet for numbers higher than 100. The title block shall be completed accordingly.

3.5 ISOMETRIC DRAWINGS AND MATERIAL LISTS

Dimensional isometrics shall be made for all piping.

Piping shown on the isometric drawing shall be identified by the line number as stated on the engineering flow scheme and piping data sheet.

Each pipe spool shall have a unique number. The number shall consist of the diameter, line number and spool number. Pipe spools shall be numbered following the direction of flow.

The maximum dimensions of shop fabricated pipe spools should be within the limits shown in Appendix 2.

Dimensions of pipe spools prefabricated at the construction site shall be determined by local conditions and transport facilities and may exceed the limitations of Appendix 2.

The number of the field welds shall be restricted but field welds may be required to limit the dimensions of the pipe spools.

Consideration shall be given to the application of measuring length at the pipe at the field welds, to allow for construction deviations.

For abbreviations and symbols to be used on isometrics see standard drawing S 02.001.

Flange bolt holes shall straddle the centre line of the pipe. If required otherwise, a cross section shall show the exact position of the bolt holes.

The orientation of flange taps in orifice flanges shall be shown in a cross section.

The position of the handwheels of valves shall be shown on the isometric drawings.

Drain and vent points and pressure, orifice, and temperature instrument connections shall be configured according to the assemblies given in the piping classes. These assemblies may be shown in a simplified manner. If a different configuration is required (e.g. a larger drain size in a sludge pipe) this shall be shown in detail on the isometric.

The thickness of compressed gaskets shall be taken into account as follows:

- 1 mm for the 1.5 mm thick sheet gaskets
- 3 mm for the 4.5 mm thick spiral wound gaskets.

Piping components required for fabrication shall be shown in full drawn lines; components required for construction shall have a different presentation.

The amount of piping shown on one isometric drawing shall be restricted such that the isometric remains legible.

Long complicated lines may be shown on two or more isometric drawings. Each isometric drawing shall contain as a maximum one line number.

Branch reinforcement requirements given in the SIOP/SIEP piping classes are based on the design limits of the piping classes. If extra branch reinforcement is required due to external loads this shall be clearly indicated on the isometric drawing.

If a prefabricated pipe is to be subjected to tests or processes prior to its installation (e.g. hydrostatic test, hardness test, heat treatment etc.), these requirements shall be stated on the isometric drawing together with the relevant data.

If piping is subject to inspection and/or approval by a national or local authority, each relevant isometric drawing shall be clearly marked as such and shall state the name of the authority concerned.

All pipe support locations shall be indicated on the isometric drawings. Weld-on attachments of the pipe supports should be welded to the pipe during prefabrication of the pipe spools.

Equipment shall be identified by its equipment number; nozzle numbers shall be stated at the connection to the pipe spool. Instruments shall be identified by their tag number as indicated on the process engineering flow scheme.

For easy identification of the location of piping shown on the isometric drawing, reference points to structures and/or equipment shall be stated. Plant North shall be shown on all isometric drawings.

At termination points continuation to other isometric drawings shall be stated.

Material list(s) shall be produced for each isometric drawing. The material list(s) shall contain the description, quantity and MESC numbers of all piping components, shall have a clear reference to the applicable isometric drawing and shall indicate the revision date and letter of the list.

3.6 GENERAL-PURPOSE SHEET (FORM DEP 31.38.01.44-GEN.)

This form serves several purposes, namely:

- for the key plan, see (4);
- to show detailed parts or special components which cannot be shown on the isometric drawing proper;
- for descriptions, instructions and other information related to the BOM (e.g. materials

list).

4. KEY PLAN

A key plan shall be made if there is more than one BOM for the same type of material on the project (e.g. if there are 700 carbon steel isometrics there will be three carbon steel BOMs and a key plan is then required).

The key plan shall be shown on sheet 2, using form DEP 31.38.01.44-Gen. of the relevant BOM. It gives a survey of the construction limits for the piping of the project and is divided into groups. Each group shall be identified by its group number.

On the plan, the area for the group for which the BOM is prepared shall be cross-hatched.

The key plan may be drawn as a simple outline of the plant concerned or a simplified version of the plot lay-out.

5. REFERENCES

In this DEP reference is made to the following publications:

NOTE: Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.

SHELL STANDARDS

Index to DEPs and Standard Specifications	DEP 00.00.05.05-Gen.

STANDARD FORMS

NOTE: Standard Forms are contained in a binder (DEP 00.00.10.05-Gen.)

Standard Forms binder	DEP 00.00.10.05-Gen.
General-purpose sheet	DEP 31.38.01.44-Gen.
Cover sheet	DEP 31.38.01.80-Gen.
Index sheet	DEP 31.38.01.81-Gen.
Issue sheet	DEP 31.38.01.82-Gen.
Isometric drawing sheet	DEP 31.38.01.86-Gen.

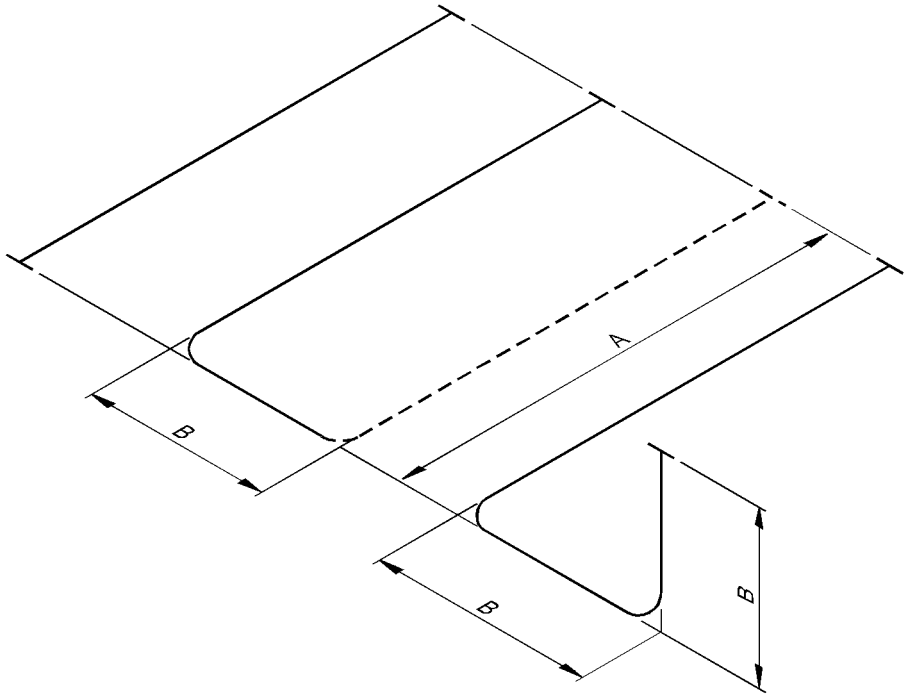
STANDARD DRAWINGS

Mechanical symbols for isometric drawings	S 02.001.

APPENDIX 1 ABBREVIATIONS FOR ISOMETRIC DRAWINGS

AARH	arithmetic average roughness height
Acc	according
App	appendix
Ass	assembly
BE	bevelled ends
BFL	blind flange
BW	butt weld
CAF	compressed asbestos fibre
C to C	centre to centre
C to E	centre to end
C to F	centre to face
Cl	class
CO	cleaning out
Conc	concentric
Cond	condensate
Cont'd	continued
Cplg	coupling
D	drain
Deg	degree
DEP	Design and Engineering Practice
Desc	description
Dia	diameter
Dim	dimension
Disch	discharge
DN	diameter nominal
Drg	drawing
Ecc	eccentric
E to E	end to end
Elb	elbow
Elev	elevation
Exh	exhaust
Fab	fabricated or fabrication
F to B	flush to bottom
F to F	face to face
F to T	flush to top
Fem	female
FEP	fluorinated ethylene propylene
FF	flat face
Fl	flange
Flex	flexible
Flg	flanged
FO	flushing out
FOS	flushing out, supply
FOR	flushing out, return
FW	field weld
Gr	grade
GRE	glass-reinforced epoxy resin
HB	"Hamer" blind
HC	hose connection
HDPE	high-density polyethylene
HP	high pressure
ID	inside diameter
IF	internal flush
Jack'd	jacketed
L	length
LC	locked-closed
LDPE	low-density polyethylene
LFL	lap-joint flange
LG	level gauge
LO	locked-open
LR	long radius
Lub	lubricated, lubrication, lubricating
Mat	material
Max.	maximum
MESC	Material and Equipment Standards and Code
M & F	male and female
Min.	minimum
Misc	miscellaneous
Mitre	mitre bend
ML	make-up length
MTO	material take off
NC	normally closed
NNF	normally no flow
No	number
No's	numbers
NO	normally open
NPT	national pipe taper (thread)
NTS	not to scale
OD	outside diameter
PCTFE	polychlorotrifluoroethylene
PE	polyethylene
PLE	plain end
PP	polypropylene
PR	primary rating
Press	pressure
PTFE	polytetrafluoroethylene
PVC	polyvinylchloride
R	radius
Red	reducer, reducing
Ref	reference
Reinf	reinforced
RF	raised face
RJF	ring joint face
RO	restricting orifice
RV	relief valve
SB	spectacle blind
SC	sample connection
Sched	schedule
Scr	screwed
SG	sight glass
SML	seamless
SO	steaming out
SO Fl	slip-on flange
Sp	spade
SP	set pressure
Spec	specified, specification
Sq	square
SR	short radius
STA	steam trap assembly
Stab	stabilized
Std	standard
Str	strainer
St St	stainless steel
St Tr	steam tracing
Suct	suction
SW	socket weld
Swg	swaged (swedged)
SWG	standard wire gauge
T	tee (fitting)
Tbg	tubing
Temp	temperature
Th	thickness
Thr	threaded
Thr E	threaded end
Thr Fl	threaded flange
TP	test pressure
TSO	tight shut off
TW	thermowell
UC	utility consumption
U/I	up to and including
V	vent
Vac	vacuum
WN Fl	welding-neck flange
WP	working pressure
W Temp	working temperature
W Th	wall thickness

APPENDIX 2 SHIPPING LIMITATIONS



Nom. pipe size	A max.	B max.
DN 80 and smaller	6 m	3.5 m
DN 100 and larger	12 m	3.5 m

NOTE: B_{max} = 2.3 m if transport by container is envisaged