NETHERLANDS OIL AND GAS EXPLORATION AND PRODUCTION ASSOCIATION

INDUSTRY STANDARD NO. 43

Surface Blowout Preventer (BOP)

Index

NETHERLANDS OIL AND GAS EXPLORATION AND PRODUCTION ASSOCIATION

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This document will be controlled in accordance with the NOGEPA Industry Standard No. 80 on Standards and Document Control.

Terms and definitions

A-annulus	means the annulus between the drill pipe, production or testing tubing and the production casing.
Bottom Hole Pressure (BHP)	means the sum of all the pressures acting on the bottom hole; typically the surface pressure plus the force exerted by the column(s) of fluid in the wellbore.
Competency	Means ability of an individual to do a job properly through a combination of training, demonstrated skills and accumulated experience.
Factory Acceptance Test Pressure (FAT)	means 1.5 x maximum working pressure, if not otherwise specified in applied codes and standards. The acceptance test pressure needs to be done when put into first service and after a major repair.
Handover	means act or process of transferring responsibility for operating a well from one competent party to another, including both custody to operate (certificate) and the requisite data and documents which describe the well construction.
HPHT Well	means a well with an expected pore pressure exceeding a hydrostatic gradient of 0.8 psi/ft (1.85SG) or requiring pressure control equipment >10.000 psi and with a static BHT >149°C (300°F)
MAASP	means the greatest pressure that an annulus can contain, as measured at the wellhead, without compromising the integrity of any element of that annulus, including any exposed open-hole formations.
Management of Change	a best practice that controls safety, health, and environmental risks and hazards as they pertain to an organization's changes to its facilities, operations, or personnel.
Off-set Wells	means existing wells, either producing or de-commissioned in the area, the data package of which serve to arrive at an optimum well design.
Pore Pressure	means the pressure of a fluid in a permeable formation.
Reservoir	means the porous and permeable formation which contains hydrocarbons or water.
Risk Assessment	means the systematic analysis of the risks from activities and a rational evaluation of their significance by comparison against predetermined standards, target risk levels or other risk criteria.
SECE: Safety and environmental critical element	means part of the installation or plant that is essential to maintain the safety and integrity of the installation.
Surface Casing	means the casing which allows first installation of the BOP stack.
Test Pressure	means the pressure to which BOP's are periodically tested. The test pressure will be determined by the well program and not exceed the maximum working pressure of the wellhead.

Well Integrity	means the application of technical, operational and organizational solutions to reduce risk of uncontrolled release of formation fluids and well fluids throughout the life cycle of a well.
Working Pressure	means the pressure that a component could be safely subjected to during the full range of normal operations.

Abbreviations

API	American Petroleum Institute
BHA	Bottom Hole Assembly
BHP	Bottom Hole Pressure
BHT	Bottom Hole Temperature
BOP	Blow Out Preventer
BR	Blind Ram
BSR	Blind Shear Ram
CL	Choke Line
CSIP	Casing Shut In Pressure
CV	Check Valve
DICV or DIBPV	Drop In Check Valve or Drop In Back Pressure Valve
HCR-valve	Hydraulically Controlled Remote Operated Valve
HPHT	High Pressure High Temperature
H2S	Hydrogen Sulfide
IADC	International Association of Drilling Contractors
IBOP	Internal BOP
ID	Internal Diameter
KL	Kill Line
MAASP	Maximum Allowable Annulus Surface Pressure
MD	Measured Depth Along Hole
MOC	Management of Change
MPD	Managed Pressure Drilling
MW	Mud weight
OBM	Oil Based Mud
OD	Outside Diameter

PMS	Preventive Maintenance System
SICP	Shut In Casing Pressure
SodM	Staatstoezicht op de Mijnen (State Supervision of Mines)
TD	Total Depth
TVD	True Vertical Depth
VBR	Variable Bore Rams
WCE	Well Control Equipment
WH	Wellhead
WHP	Well Head Pressure
WP	Working Pressure
XO	Cross Over Sub
XMT	Christmas Tree
MASP	Maximum Anticipated Surface Pressure
MEWHP	Maximum Expected Well Head Pressure
DMR	Dutch Mining Regulations
OEM	Original Equipment Manufacturer
SECE	Safety & Environmental Critical Element

Legal Requirements

Offshore Safety Directive	EU Directive 2013/30/EU
Mining Decree Article 67, 68 & 69	The current decree section 5.3 incorporates articles relating to "Boorgaten". Of critical importance are 3 goal setting articles (67, 68 and 69) providing instructions to prevent damage and the obligation to control subsurface fluids: 1. When constructing, using, maintaining, repairing and decommissioning a borehole, measures shall be taken to prevent damage to the integrity of the well 2. The construction, maintenance, repair and decommissioning of a borehole shall take place under the responsibility and in the presence of the operator. The use of the borehole shall take place under responsibility of the operator. The activities as meant in Article 67.1 shall only be performed if the substances in question from subsoil formations can be maintained under control. For this purpose:

	1. A borehole shall be fitted with suitable casing/tubing. 2. Each series of casing/tubing, as referred to in Article 69.1, shall be cemented over a sufficient distance and then tested for reliability. 3. The first series of casing shall be properly sealed immediately after it has been properly cemented.
Mining Regulation	Chapters: 8.1, 8.2 and 8.3.

Related Documents

API Standard 53	Well Control Equipment Systems for Drilling Wells
API Recommended Practice 64	Diverter systems
API Specification 16D	Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment
API Specification 6A	Wellhead and Tree Equipment
API Specification 16A	Drill-through Equipment
API Standard 16AR	Repair and Remanufacture of Drill-through equipment
API Specification 16C	Choke and Kill Equipment
API Recommended Practice 16E	Design of Control Systems for Drilling Well Control Equipment
NACE MR 0175 / ISO 15156-2 / ISO 15156-3	Materials for use in H_2S containing environments in oil and gas production
ISO 16530-1	Well Integrity Life Cycle Governance
ISO 16530-2	Well Integrity for the Operational Phase
NOGEPA Industry Standard 1	Training
NOGEPA Industry Standard 4	Competency
NOGEPA Industry Standard 41	Well Engineering and Construction Process
NOGEPA Industry Standard 42	Well Examination
NOGEPA Industry Standard 45	Well Decommissioning / Het buiten gebruikstellen van putten
NOGEPA Industry Standard 46	Well Integrity Management
NOGEPA Industry Standard 48	Independent Verification Management
NOGEPA Industry Standard 50	Kick Tolerance
NOGEPA Industry Standard 80	Standards and document control

Important Nomenclature used in this Standard

In the context of this Standard and when so used to describe a method or practice:	
'shall'	means that such method or practice reflects a mandatory provision of law (in Dutch: *dwingend recht*). Such method or practice is mandatory for those who are the addressees of such provision (mostly the operators). A Standard can describe or quote, but not amend, mandatory provisions. When an operator in exceptional cases for technical, operational or HSE reasons cannot comply, exceptions shall be documented and reported, and risks mitigated. Please note that this does not release the operator from the obligation to comply with the law. *
'should'	means that such method or practice reflects a Good Operating Practice. An operator is generally expected to apply such method or practice, but a specific situation may require a specific alternative. In other words: the operator complies or explains, and documents the explanation. *
'could'	means that such method or practice is of an advisory nature or mentioned by way of example. An operator is not obliged to comply and is not obliged to explain if he does not comply.
* Please refer to paragraph 2.3 of Standard 80 (Standards and Document Control), for further explanation on an exception of a 'shall' provision, or on a comply-or-explain of a 'should' provision.	

1. Executive Summary

Oil & gas producing operating companies and drilling rig contractors around the world have established International Standard API Standard 53, API Recommended Practice 64 and API 16D, which provide guidance to the well operator and rig contractor on blowout preventers, diverters and their control systems for drilling and completion of wells. They address the minimum compliance requirements for the well operator and rig contractor in order to ensure conformity with those documents.

The primary purpose of a blowout preventer (BOP) and associated well control equipment is to be able to close in a well on a kick or kick indicator and to subsequently control bottom hole pressure throughout the well killing process. The BOP stack shall be designed to contain the surface pressure of a well where the entire mud volume has been evacuated. It also needs to be designed so that it has a large enough passage for all tool sizes, anticipated to be used on the well.

Key element is to ensure that all well operations, both onshore in the Netherlands and offshore on the Dutch Continental Shelf, use pressure control equipment that is suitable for the program to be executed, taking into consideration specific well conditions that may be encountered. Efficient and effective well control depends largely on the soundness of the well design, the well construction quality and the competence of personnel.

NOGEPA Industry Standards are requirements and operating practices, agreed upon by the member companies of NOGEPA, and NOGEPA Standard 43 has been adjusted to comply with API standard 53 and address specific Mining Regulation requirements. Following approval by the NOGEPA EXCOM, well operators are bound by the NOGEPA Industry Standards with the exception of a conflict between the national legislative regime and the NOGEPA Industry Standards, in which case the national legislative regime prevails.

Furthermore comments and considerations of an advisory nature are provided as context of the requirements to assist in interpretation.

Subject to the requirements in Standard 43, there will be a 3-year review cycle of this Standard, or sooner as required, to reflect changes in regulations, interpretation, industry practices and experience, international standards, technologies, documentation requirements, etc.

2. Scope and application

2.1 Scope

The scope of this standard is restricted to:

- The Netherlands and the Dutch Continental Shelf, and
- Well operations as defined in the Offshore Safety Directive, in essence those well operations that inherently carry significant risks. This standard is limited to drilling well services and decommissioning operations using a BOP, where the XMT has been removed.

Notes:

- API S53 does not address workover, well services or interventions.
- Non-standard wells (such as HPHT and MPD wells) will require additional considerations and prior consultation with SodM

2.2 Application

This Standard **should** be applied on both on- and offshore operations with surface BOP stacks. It applies to drilling of a new well, workover operations and well decommissioning operations with a drilling rig and/or a workover unit when the Xmas Tree (XMT) is not installed on the well.

3. Application of industry standards

In 2012, the API revised its Recommended Practice, *API RP53 Blowout Prevention Equipment Systems for Drilling Wells* and issued it as a Standard, *API S53 Well Control Equipment Systems for Drilling Wells*.

For this reason, the previous version of this Standard 43 has been amended to primarily replicate API S53 and associated industry standards. For detailed guidance on installation, use and maintenance of well control equipment, well operators **should** refer to the applicable industry standards.

It is the responsibility of the well operator to ensure the latest edition of applicable industry standards are used.

It is recognized that in some cases national legislative requirements (i.e. Dutch Mining Regulations) may be in conflict with the applicable industry standard. Where national legislative requirements are more stringent than the applicable industry standards, they shall prevail.

Examples of such cases are given and discussed in section 4.

4. Prevailing legislation

The following issues have been identified where the Mining Regulation are more stringent than the Industry Guidelines. In all cases, the Mining Regulations shall therefore prevail.

Industry Standard	Mining Regulations
API S53, 5.2.1.6 *Wells with a MASP greater than 3,000 psi shall, at a minimum, consist of a kill line configuration with two full-bore manual valves plus a check valve, or two full-bore valves, one of which is remotely operated.*	Art. 8.3.1.11 sub 3 *A non-return valve (NRV) shall be installed in the kill line .*
API S53, 5.3.14.4 a-g *Must close largest-volume annular preventer, a maximum of four rams and open the hydraulic-operated valve(s).*	Art 8.3.1.5 sub 1b *The control system shall contain sufficient fluid to close and open the annular preventer, a pipe ram and the blind/shear ram and subsequently close the annular preventer and a pipe ram or the blind/shear ram.*
API S53, 5.4.2.2 *The five-year inspection period shall begin using one of the following criteria:*	Art. 8.3.2.6 sub 2 *All parts shall be inspected at least every 5 years in accordance with the manufacturer's guidelines.*

Industry Standard	Mining Regulations
• *The date that the equipment owner accepts delivery of a new build drilling rig with a BOP system* • *The date that the inspected equipment is placed into service, when preservation and storage records (in accordance with art. 4.5.8) are available.* • *The date of the last inspection for the component, if preservation and storage records (in accordance with art. 4.5.8) are not available.*	
API S64 5.7 *The minimum internal cross sectional area of the diverter side outlets shall be designed to accommodate the flow rate specified by the purchaser of the equipment and shall not be less than an equivalent 8 inch diameter on a surface diverter and 12 inch diameter on a subsea diverter.*	Art. 8.3.1.2 sub 3 *All diverter lines and the diverter outlet have a minimum ID of 250 mm (10 inch).* The MBR art 8.3.1.2 Sub 3 does not apply if the operator has demonstrated in the document referred to in Article 37, 2nd paragraph, of the Decree that during the drilling activities referred to in the 1st paragraph, there is no danger of harmful outflow of shallow gas or liquids.
API S53 5.1.3.4 through 5.1.3.7 *A minimum Class 2 BOP stack arrangement with one ram shall be installed for wells with a MASP of 3,000 psi or less.* *A minimum Class 3 BOP stack arrangement with one blind ram or blind/shear ram and one pipe ram shall be installed for wells with a MASP of 3,000 to 5,000 psi. The third device may be a ram or annular preventer, whichever is desired.* *A minimum Class 4 BOP stack arrangement with one annular preventer, one blind ram or blind/shear ram and one pipe ram shall be installed for wells with a MASP of 5,000 to 10,000 psi. The fourth device may be a ram or annular preventer, whichever is desired.* *A minimum Class 5 BOP stack arrangement with one annular preventer, one blind ram or blind/shear ram*	Art. 8.3.1.4 sub 1a, 1b & 1c, 2a & 2b *After installing and cementing the first pressure containing casing (surface casing), the BOP shall consist of :* • *An annular preventer* • *A pipe ram* • *A blind ram*[1] *After installing and cementing the second pressure containing casing, the BOP shall include:* • *A second pipe ram* • *In this configuration, the blind ram shall also have a shearing capability.* ***Notes**:* *This effectively means that on all wells, <u>independent of MASP</u>, a minimum Class 3 BOP stack is required after the first pressure containing casing is installed*

[1] For the first installation (surface casing only), shearing capability is not required.

Industry Standard	Mining Regulations
and two pipe ram shall be installed for wells with a MASP greater than 10,000 psi. The additional device(s) may be a ram or annular preventer, whichever is desired.	*and cemented. After installing and cementing the second pressure containing casing, a minimum Class 4 BOP stack is required, independent of MASP.* *A requirement for a Class 5 BOP stack is not provided.* *Dispensation can be requested for using a reduced BOP stack for non self flowing wells*
API S53 5.2.1.4 and 5.2.1.5 *Wells with a MASP of 5,000 psi or less shall have a 2 inch (50 mm) choke line.* *Wells with a MASP greater than 5,000 psi shall have a 3 inch (75 mm) choke line.*	Art 8.3.1.11 sub 4 *The choke line shall have a minimum (nominal) ID of 75 mm (3 inch).* ***Notes**:* *This is independent of MASP, so in all cases.*
Not stated in API 53, 64 or 16D	Art. 8.3.3.1 sub 1 & 2 and 8.3.3.2 *After installation of the BOP system on a producible well, all personnel directly involved with well operations shall participate in a well control drill at least once per week. Participating personnel shall be registered in the daily drilling reports.* *Drills shall be held during operations by alternately simulating a situation for the purpose of recognizing a flowing well in a timely manner and correctly close in the well with pipe in the hole:* *These drills will as a minimum consist of:* • *Recognizing pressure changes and gain or loss of fluids in the well.* • *Correctly positioning the drill string in the BOP.* • *Correctly installing a safety valve on the string.* • *Observing fluid level in the well (flow check.)* • *Closing in the well and recording the required time.*
API S53 Table C.5 *Pressure testing frequency of BOP components shall not exceed 21 days.*	Art. 8.3.2.2 1a & 1b *The installed rams and annular preventers, choke manifolds and lines shall be tested for adequate sealing*

API S53 4.2.3.6 through 4.2.3.9 *For land wells with a MASP of 3000 to 10,000 psi, at a minimum, one choke shall be remotely operable.* *For land wells with a MASP greater than 10,000 psi, at a minimum, two chokes shall be remotely operable.* *For offshore wells with a MASP of 3000 to 5,000 psi, at a minimum, one choke shall be remotely operable.* *For offshore wells with a MASP greater than 5,000 psi, at a minimum, two chokes shall be remotely operable.*	Article 8.3.1.7 *1. The choke manifold shall be well accessible.* *2. The choke manifold shall be equipped with at least two adjustable chokes:* *a. that, when the manifold is in operation, can be exchanged individually without any danger, and* *b. of which at least one can be remotely adjusted.*

5. Specific requirement and exceptions

The well operator should perform a risk assessment against the BOP configuration requirements of API S53 to confirm whether this guideline is suitable for the planned well operations.

Where it is planned to re-enter an existing well, previously drilled with a lighter BOP stack, the well operator should asses its suitability or mitigating measures (e.g. tensioning above the wellhead) if a heavier (API S53 compliant) BOP is intended to be used. This to ensure that the wellhead and conductor can maintain the additional load associated with a heavier BOP.