

WELL EXAMINATION GUIDELINES

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The Health and Safety at Work (Petroleum Exploration and Extraction) Regulations 2016 has a requirement for well examination schemes. WorkSafe inspectors will refer to this document as an authoritative source of relevant good practice for the operation of well examination schemes in New Zealand.



Wayne Vernon

General Manager
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1.0



INTRODUCTION



This guideline outlines the process by which a permit operator¹ of a well operation (“Well Operator”) in New Zealand may satisfy their obligations under the New Zealand Health and Safety at Work (Petroleum Exploration and Extraction) Regulations 2016 (“Regulations”) for well examination. It has been prepared with input from third-party well examiners and operator company personnel. This guideline is closely based on the Oil & Gas UK *Guidelines on Well Examination* (November 2011) and we are thankful to UK Oil & Gas for their permission to do this.

1.1 Objectives

The objective of well examination is to provide an independent check on critical elements of well designs and operations. Well examination is a life cycle requirement and should be applied, to an appropriate degree, to all wells belonging to a Well Operator, whether pre-existing or new.

The purpose of this guideline is to outline how Well Operators should:

- approach well examination
- apply this process to well operations, targeting the information and operational aspects
- administer the process.

It explains the method and scope of well examination where the design, construction and maintenance aspects of wells are examined by independent and competent persons in order to ensure risks of unplanned escape of fluids from the well, and risks to the health and safety of persons from the well, are as low as reasonably practicable over its entire life cycle.

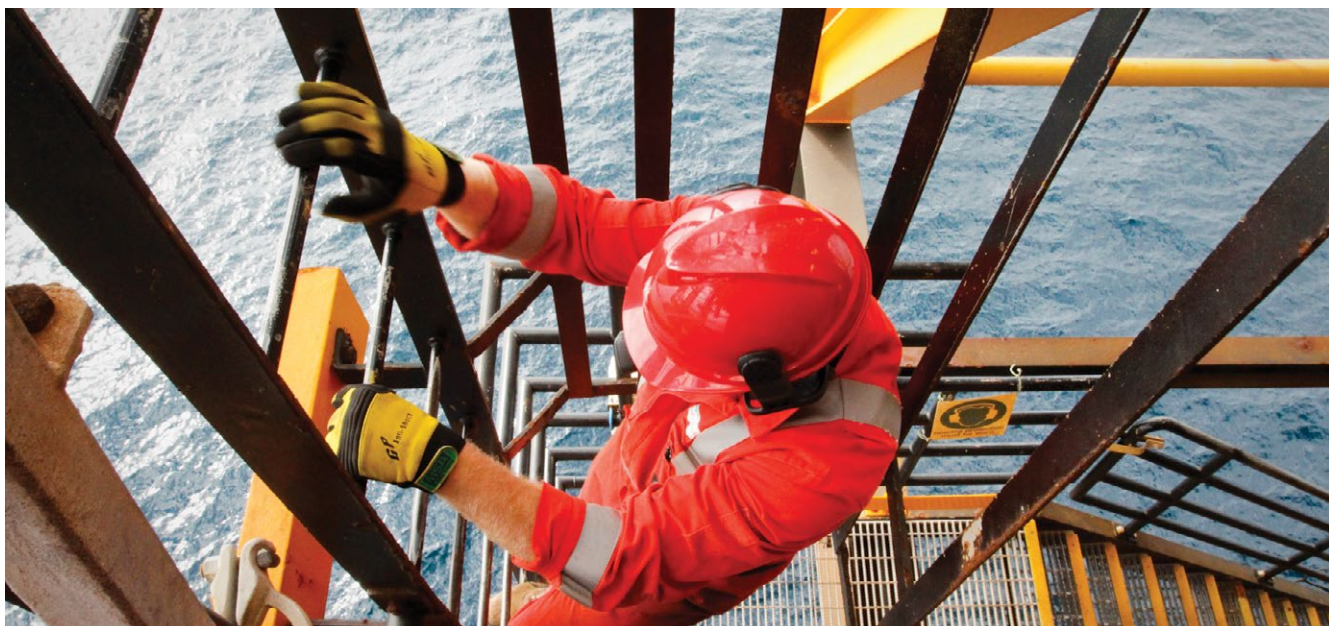
While well examination is regulated under the Regulations, avoiding unplanned escape of fluids from the well is also fundamental to avoiding adverse environmental impacts.

1.2 Background

The Regulations came into effect in April 2016 and provide a range of obligations and requirements on Well Operators. Well engineering personnel involved in the planning, design, construction and operation of wells should be fully familiar with these Regulations. Although some terminology has been changed the Regulations provide the same substantive requirements as the preceding *Health and Safety in Employment (Petroleum Exploration and Extraction) Regulations 2013*.

Regulations 64 and 65 cover specific requirements relating to well examination schemes.

¹ A “permit operator” means a PCBU who manages or controls a production installation or a well operation and to whom section 27 of the Crown Minerals Act 1991 applies.



1.3 Reasonably Practicable and ALARP

The term '*so far as is reasonably practicable*' used in the Regulations doesn't mean a Well Operator needs to do everything humanly possible; but must do what a reasonable and prudent person would do in the same situation.

Regulation 56 states the Well Operator's primary duty is to ensure that:

- so far as is reasonably practicable, there can be no unplanned escape of fluids from the well
- risks to the health and safety of persons from the well or anything in it, or from strata to which the well is connected, are as low as is reasonably practicable (ALARP).

This means the Well Operator must show, through reasoned and supported arguments, that there are no other practical measures that could reasonably be taken to further reduce risks.

The Well Operator must show the adopted control measures for any particular identified hazard collectively eliminate, or reduce the risk to health and safety to a level that is ALARP.

The approach employed in providing the required evidence of ALARP within well examination is at the discretion of the Well Operator, subject to requirements that the arrangements are in writing and an independent and competent person conducts examinations. In practice a combination of risk assessments, technical studies, and HAZOP's are likely to be necessary.

2.0

ARRANGEMENTS FOR WELL EXAMINATION



2.1 Responsibility for the Well Examination Scheme

The Regulations require that each Well Operator must have a documented well examination scheme.

A job position in the Well Operator's organisation should be identified as responsible for the well examination scheme so the responsibility remains even if an individual moves on.

If petroleum permits are sold or transferred between operators it is the responsibility of the new Well Operator to ensure a compliant well examination scheme is in place for any active or suspended wells within the permit.

All suspended wells must be included in the well examination scheme.

There should be continuity in the well examination scheme when transferring operational responsibility of a well. For example transfers:

- between departments (e.g. drilling – production) in the same company
- between positions (e.g. Drilling Manager – Operations Superintendent).

As part of any handover of a well, the specific requirements of the well examination scheme should be part of the formal transfer of responsibility.

2.2 Implementation of the Well Examination Scheme

Before designing any well, make sure there are well examination arrangements in place. A start-up company should have a well examination scheme in place before starting the design of their first well.

A company purchasing a permit with existing wells must have a well examination scheme in place before taking over responsibility for the wells.

Make sure the well examination scheme describes how the specific well examination process works.

2.3 Review and Revision

The Regulations require a Well Operator to review and revise the well examination scheme as often as necessary to ensure it is still relevant. Reviews may take place:

- when existing wells are brought into a well examination scheme (e.g. purchase of new permit with operational wells)
- when new types of well (e.g. extended reach drilling or hydraulic fracturing) are being planned
- when there is a change of Well Examiner
- when there are concerns that the well examination scheme is not working well.

The details of how, when and by whom these reviews are conducted, should be part of the Well Examination Scheme.

The review scope may include:

- compliance with the well examination scheme
- completeness and effectiveness of the well examination scheme
- resolving disputes.

2.4 Scope of Well Examination

The Regulations require that all wells are subject to well examination. Suspended wells are covered but permanently abandoned wells are not.

The well examination scheme should cover the following well operations:

- drilling, completion and well test designs and operations
- workover designs and operations
- well intervention operations
- production or injection wells – continuing integrity
- suspended wells – continuing integrity
- well suspension and abandonment designs and operations.

Well examination is not a substitute for normal line management controls and approvals.

Well examination relies on the examination of approved, formal documentations such as basis of design documents, casing designs and drilling programmes.

2.5 Wells Covered by the Well Examination Scheme

Include all wells, including onshore and offshore (platform and subsea) wells, in the well examination scheme over their full life cycle. Make sure the entire well inventory is covered by the well examination scheme/s (including shut-in and suspended wells). Well Operators can choose to have a single scheme for all their wells or different schemes for different types or classes of wells.

2.5.1 New Wells

The well examination scheme covers the complete life cycle of new wells from design until abandonment.

2.5.2 Operation and Maintenance of Existing Wells

The well examination scheme covers all wells during operations, producing injecting or others including routine maintenance. This phase may also include well entry for information gathering or condition monitoring, for example wireline production logging tool (PLT) logging.

If taking over wells from another Well Operator (for example by purchasing producing assets), review the well examination scheme and other records for each well as part of the process of adding additional wells to the well examination scheme/s.

It is important that the well examination scheme includes any wells, operating or suspended, that have not been re-entered or worked over for some time.

It is important to record all modifications to wells, which relate to the pressure integrity of the well; minor modifications (e.g. to wellhead or Xmas tree fittings) can have a significant effect on safety. The Well Operator's processes such as their well integrity management system may cover this type of data. The changes may be collated in an annual well integrity report or spreadsheet for all wells.

For offshore production installations the certificate of fitness/verification scheme may also cover surface modifications and in some cases an overlap will occur with the well examination scheme. Have a well examination scheme in place regardless (refer to section 5.0 regarding the interaction between Well Examination Schemes and certificate of fitness/installation verification schemes).

2.5.3 Intervention and Workover of Existing Wells

The well examination scheme covers well interventions and workover operations. Such operations may involve a handover of operational responsibility for the well. For routine operations such as PLT's, cement bond logs (CBL's) and slickline runs, well examination may be a review of a generic programme rather than examination of every work programme. The Well Examiner could then communicate any deviations from this generic programme.

2.5.4 Suspended, Part-Drilled Wells

The well examination scheme must cover wells that are suspended before they have been fully constructed (e.g. after setting the surface casing as part of a batch setting operation).

2.5.5 Suspended Drilled Wells

The well examination scheme must cover fully-constructed suspended wells. Make sure the well examination scheme:

- covers the suspended well's pressure integrity
- ensures there are sufficient barriers in place
- ensures that surface barriers are tested at regular intervals.

It is not anticipated that deep barriers such as cement plugs are pressure tested at regular intervals as this is not practical.

It is especially important that suspended wells inherited from a previous Well Operator are included in well lists and covered by the Well Examination Scheme.

2.5.6 Abandoned Wells

The well examination scheme must include abandonment operations on wells.

After abandonment, the well doesn't need to be covered by the well examination scheme. However, Well Operator's must keep well examination scheme records for at least one year after a well examination scheme has ceased to be current.

2.6 Well Examination Certificates

Maintain a valid examination certificate at all times from the point that the well is designed to the point the well is abandoned. The following table refers to the relevant certificates.

Certificate	Well Examination Requirement	Timing	Reference
Drilling Well Design (may also include completions/well testing)	Certification of well design.	Prior to commencement of intended operations.	3.3.1
Well Construction (may also include completions/well testing)	Certification of well construction meeting requirements.	After well has been constructed AND prior to the well being handed over for production.	3.3.2
Operation of Well – Production (includes producing wells, injection wells and suspended wells)	Periodic certification that well is being operated and maintained correctly.	Maximum of every 12 months from the most recent examination certificate.	3.3.3 and 3.3.4
Well Workovers/ Interventions Design (may be combined with Operations depending on nature of workover/ intervention)	Certification of design for planned operations.	Prior to the commencement of intended operations.	3.3.4
Well Workovers/ Interventions Operations (may be combined with Design above depending on nature of workover/ intervention)	Certification of well modification activities meeting requirements.	After operations have been completed AND prior to the well being handed over for production.	3.3.5
Well Suspension and Abandonment Design and procedures	Certification of design and procedures for suspension or abandonment of well.	Prior to commencement of intended operations.	3.3.4 and 3.3.6

2.7 Well Examiner

2.7.1 Independence of the Well Examiner

The person or persons carrying out the well examination should be independent of the immediate line management of the well operations involved. Well Operators should carry out audits of their schemes to ensure that a suitable level of independence exists and remains over time.

It is important that the Well Examiner is impartial and is independent from pressures, especially of a financial nature. Promotion, pay and reward systems should not compromise the professional judgment of the Well Examiner.

The Well Examiner should maintain their independence and be allowed to review whatever information is required to perform their role. They should never be part of the decision-making processes associated with any well covered by the well examination scheme(s). They should only assess and comment on work done by the Well Operator.

2.7.2 Types of Well Examiner

How well examination is provided is up to the individual Well Operator. The following types of Well Examiner are all potentially valid under the Regulations so long as sufficient independence and competence exists.

Internal (sometimes referred to as “second party”) Well Examiner within the same company:

- personnel working for the same parent company based in another country
- another business unit in the same country
- a separate well examination department
- individual employed out with the well operations / drilling department
- permit partner.

External (sometimes referred to as “third party”) Well Examiner:

- specialist company just providing well examination services
- company providing well examination as one of their services
- individuals.

The Well Operator may use any, or a combination, of these types of service provider. Whatever type(s) is used, make sure the well examination scheme demonstrates that the Well Examiner is independent of the immediate line management of the well operations team(s). For smaller companies it may be difficult to have an internal Well Examiner who is independent for a drilling operation but the Well Operator may be able to provide an internal independent Well Examiner for operations such as well interventions.

2.7.3 Competence of Well Examiner

The Well Examiner must be sufficiently knowledgeable to carry out the tasks of well examination effectively. Generally, the level of a Well Examiner is Senior Drilling Engineer, Drilling Superintendent or Senior Petroleum Engineer.

Competence for a Well Examiner is a combination of:

- knowledge (e.g. qualifications (e.g. engineering degree), New Zealand regulations, well design, casing design)
- experience (e.g. well design, well operations, examination)
- skills / aptitude (e.g. auditing, listening, presentation)
- qualifications.

Some well types (e.g. hydraulic fracturing, horizontal, HPHT, deepwater) or operations (e.g. managed pressure drilling) may need specialist knowledge and skills. Technical competence does not need to reside with a single individual and additional persons can be used to provide the full range of competencies required. Make sure the well examination scheme addresses the competence of the Well Examiner, for both breadth and depth of knowledge.

Well Operators should conduct competency review of different types of Well Examiner (internal, external, Non-New Zealand based) on an individual basis, tailored for the specific role requirements. Assess competence when the Well Examiner is first appointed, when replaced and then as needed.

Well Operators must be sure the Well Examiner(s) are competent. Well Operators should be able to demonstrate the competence of:

- each individual involved with reference to their:
 - » knowledge
 - » experience
 - » skills
 - » qualifications
- the Well Examiner for all types of wells in the scheme
- the Well Examiner to cover all stages of the life cycle of the well/s and well operations.

3.0

CONTENTS OF A WELL EXAMINATION SCHEME



3.1 General Requirements

It is essential that well examination demonstrates the pressure containment boundary of the well is being controlled throughout the well life cycle and that the pressure control equipment that forms part of the well is suitable.

The main aspects of the well examination scheme are likely to be:

- reviewing well design documentary evidence
- reviewing well integrity documentary evidence
- interview / discussion with well engineers responsible for planning and operations
- monitoring of operations reports / review of verification reports
- reviewing production well maintenance
- reviewing dispensations and change management for wells and well operations.

A balance needs to be struck between providing the Well Examiner with all the necessary information at an early stage, but not involving them in the decision-making process.

3.2 Depth / Extent of Well Examination

The well examination scheme must require the Well Examiner to confirm that a well is designed, constructed, operated, maintained, modified, suspended and abandoned consistent with the Well Operator's and acceptable industry standards.

Including confirming (some Well Operators may use different names):

- well delivery process
- casing design process and software
- test / completion string design and software
- management of change procedure
- drilling standards / guidelines
- well integrity management system, including:
 - » annulus monitoring
 - » wellhead / Xmas tree condition monitoring
- safety management system (may be Operator's or Drilling Contractor's with appropriate bridging documentation).

The Well Examiner should check that the Well Operator follows their own internal processes during the design, construction, operation, maintenance, modification, suspension and abandonment stages of well operations.

The Well Examiner should review the Well Operator's operational plans concentrating on definition, installation, and testing of barriers throughout the well's life cycle.

The depth of examination should depend on the criticality of the operation and the hazards involved in the operations as assessed by the Well Examiner. For example, carry out detailed examination if:

- the operation is unusual for that Well Operator (e.g. first Xmas tree change-out)
- the well conditions increase risk (e.g. high pressure reservoir)
- the planned operations increase risk (e.g. pressured hydrocarbons at surface)
- there are unusual management arrangements (e.g. coil tubing crew on well service vessel).

During operations, the Well Examiner should review the Well Operator's reports (including any change management / dispensation requests) and compare to:

- Well Operator's internal processes, and
- plans and procedures for that operation, and
- industry standards applicable to that type of operation.

Consider using a checklist to ensure all critical values are recorded and compared including:

- casing setting depths
- weight / volume of cement pumped and estimated top of cement
- leakoff test / formation integrity test values
- mud weights
- pressure test values (e.g. casing, BOP, test string & wellhead)

3.3 Examination Through the Well Life Cycle

The well examination scheme must cover the life cycle of the well beginning at the design stage and ending when the well is abandoned.

If the Well Examination Scheme covers different types of wells then it should outline how often they should be examined at various stages in their life cycles.

3.3.1 Well Design Stage

The Well Examiner should examine the well design to ensure that it complies with the Well Operator's policies and procedures, and can maintain well integrity over the well's life cycle.

The well examination scheme should cover all aspects of the design stage including:

- reviewing well designs, casing designs and work programs
- checking assessment of conditions below ground (including zones and formations that could be a source of cross flow or annulus pressure potential)
- pressure testing philosophy (e.g. durations, pressures)
- barrier selection, installation, and testing
- Well Operator's process for checking material suitability
- Well Operator's process for checking equipment suitability (especially for well control).

Before any operation occurs, ensure the design stage well examination is complete and any conflicts are resolved.

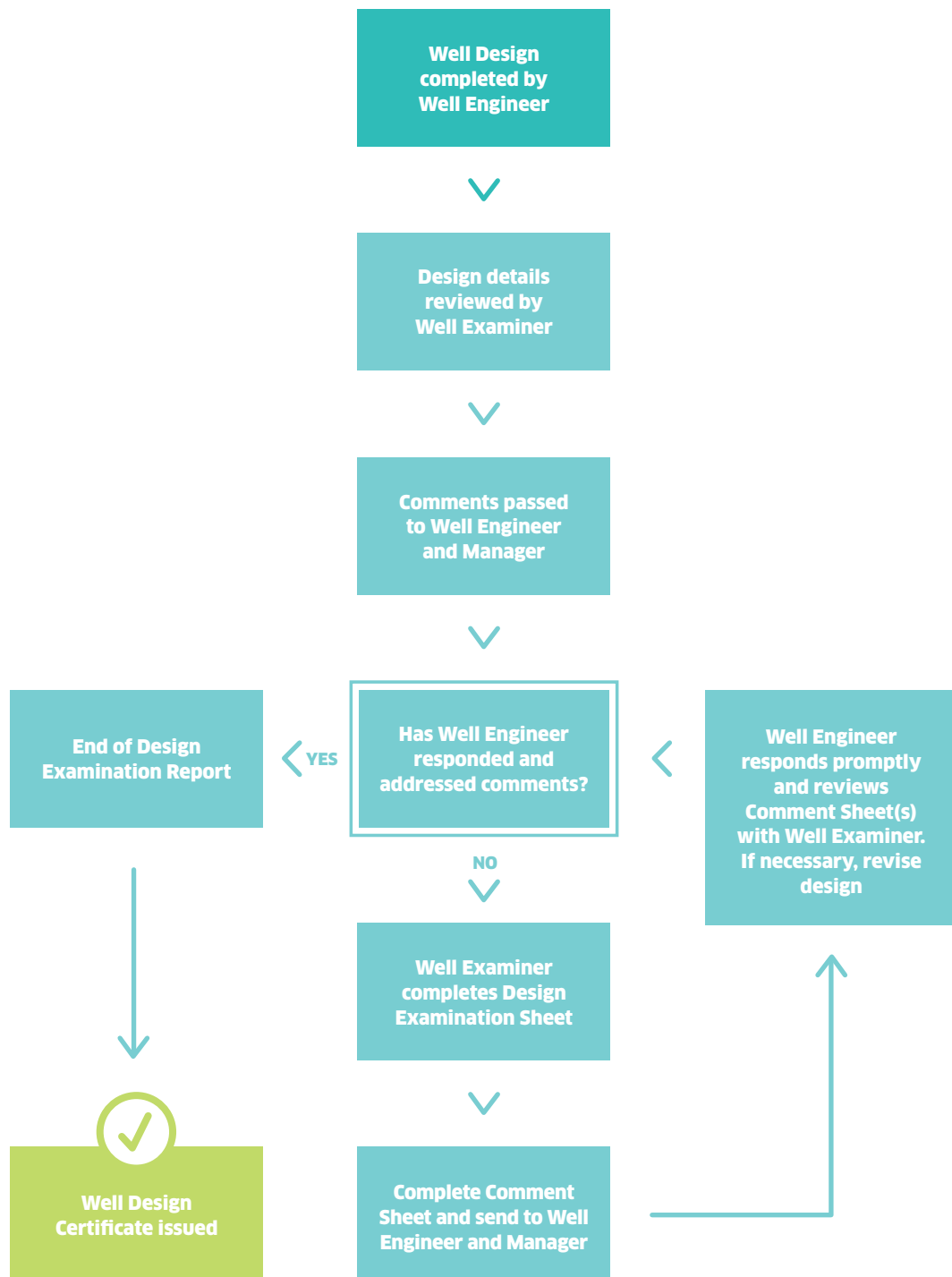
The Well Examiner should issue a Design Stage Well Examination Certificate when the design stage's well examination is complete and before drilling commences.

For more information:

- Appendix I lists typical documents to review in the design stage.
- Appendix II has an example Well Examination Design Sheet.
- Appendix III has an example Well Examination Design Certificate.

Figure 1 (page 18) provides an example of how the design stage of the well examination scheme's process could work.

Figure 1: Example of Well Examination Process – Design Stage



3.3.2 Well Construction (Drill, Test and Complete) Stage

The primary aim of well examination during the construction stage is to independently check that the well operation is performed safely and that the well is constructed to the accepted design. This is typically performed by checking daily operations reports for drilling / testing / completion programs for:

- casing / wellhead – rating, design, centralisation, lockdown
- cement – placement, slurry design, planned tops
- pore / fracture pressures – mud weight, leakoff tests
- well barriers when removing BOP / installing Xmas tree
- suspension / abandonment arrangements.

Monitor management of change and any deviations or dispensations from policy or procedures. The emphasis should be on reviewing the actual pressure containment boundary such as:

- casing and cement
- well barriers (e.g. fluid column)
- leakoff test / formation integrity tests.

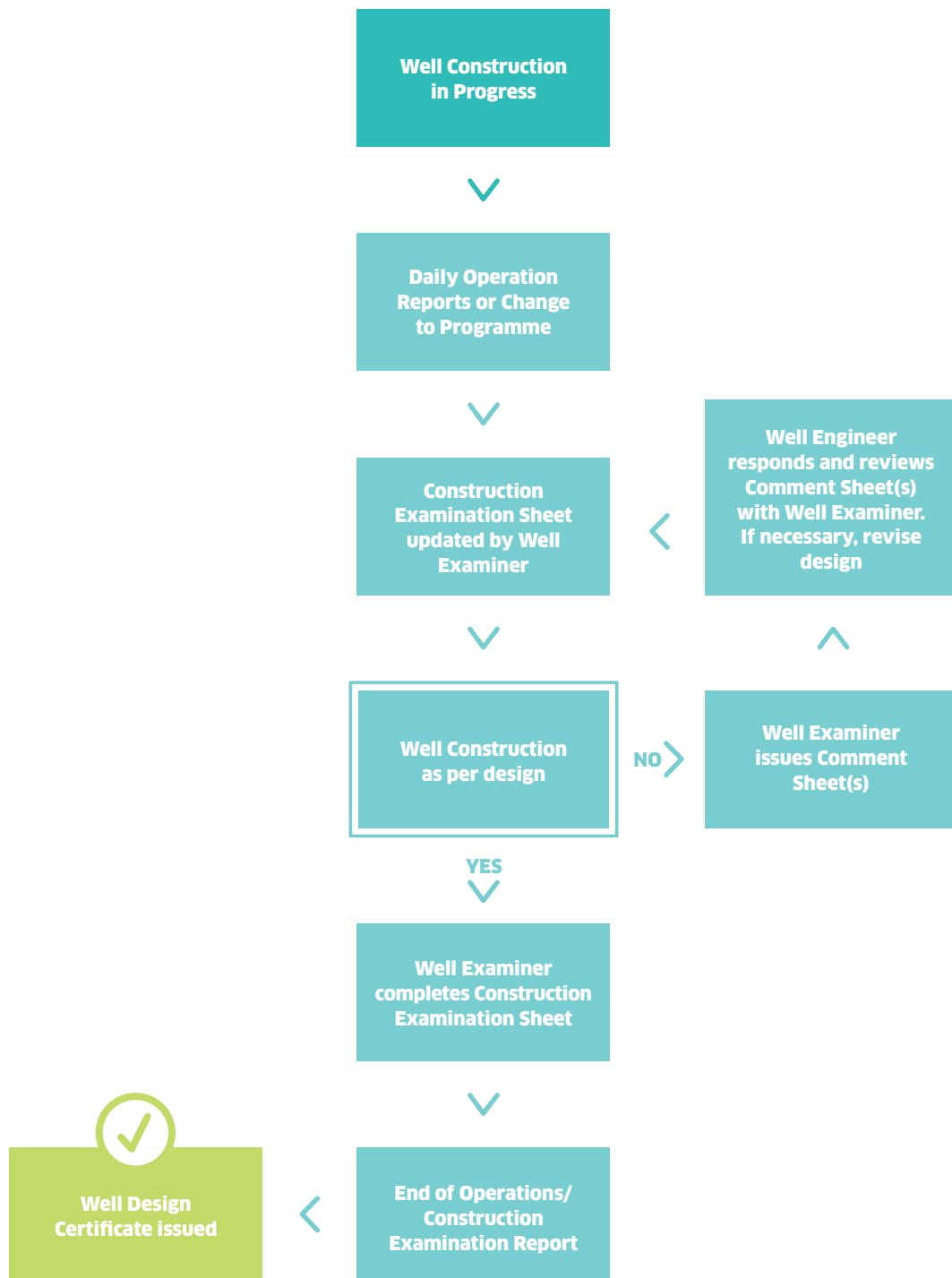
The Well Examiner should issue a Construction Stage Well Examination Certificate when the construction stage's well examination is complete.

For more information:

- Appendix IV lists typical documents to review in the construction stage.
- Appendix V has an example Well Examination Construction Sheet.
- Appendix VI has an example Well Examination Construction Certificate.

Figure 2 (page 20) provides an example of how the construction stage of the well examination scheme could work.

Figure 2: Example of Well Examination process – Construction Stage



3.3.3 Operate and Maintain (Production Stage)

This stage covers planned operations (production or injection), routine maintenance, and condition monitoring.

The Well Operator may have a well integrity management system and the well examination may consist of a review of the output from this system. For offshore production installations some relevant aspects may be covered by the installation’s certificate of fitness/verification scheme or in the installation’s safety case.

At a minimum the following activities should be included in the well examination scheme:

- downhole safety valve testing (where installed)
- Xmas Tree and wellhead maintenance
- annulus pressure monitoring
- any well problems/issues.

Changes in downhole conditions, downhole equipment, and potential changes to well integrity (e.g. corrosion, erosion, failure of completions equipment or casing) should be taken into account.

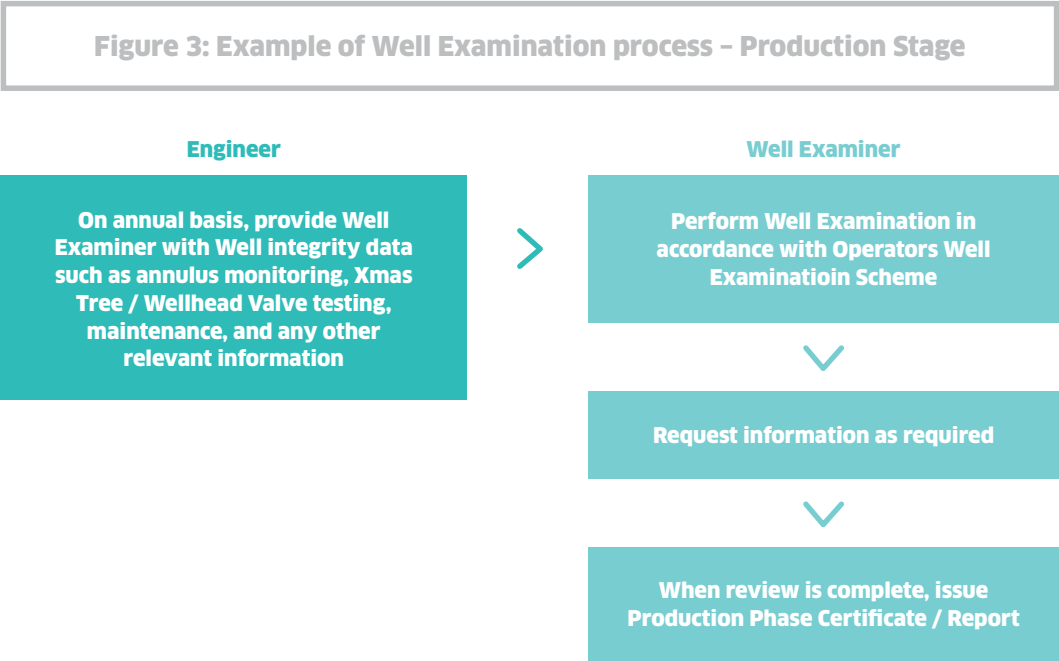
Well Operators should examine producing wells on an annual basis unless well conditions require more frequent review.

The Well Examiner should issue a Production Stage Well Examination Certificate when the production stage’s well examination is complete.

For more information:

- Appendix VII lists typical documents to review in the production stage.
- Appendix VIII has an example Well Examination Production Sheet.

Figure 3 provides an example of how the production stage of the well examination scheme could work.



3.3.4 Intervention and Workover

Well intervention operations are any operations that break into the well pressure boundary. The well examination scheme should cover any intervention and workover operations, including the notifiable operations in Regulation 67 of the Regulations.

Examples of intervention and workover operations include:

- manipulation of tubulars into a well
- coiled tubing, wireline and slickline operations
- installing different artificial lift equipment
- adding perforations in new formations
- electrical submersible pump (ESP) replacements
- zonal isolations
- well plugging due to downhole problems
- removing a Xmas tree
- repairing Xmas trees or wellhead equipment where barrier changes are required
- leak investigations using packers.

Include the procedures and operations in the well examination scheme. Detail the review's scope and the body to carry out the review in the well examination scheme.

Examine workover operations using a similar process to drilling operations.

Workover operations include well entries for maintenance and repair. The operational responsibility for the well may be handed over for these operations. The well examination scheme should cover the procedures and equipment used in these operations.

For intervention / workover programs, the Well Examiner would usually examine:

- equipment specifications
- barrier testing before, during and after well entry
- monitoring and control of intervention control panel.

It is not necessary to carry out a separate individual well examination for every routine well intervention/workover such as wireline operations, coiled tubing rig-ups, or pumping operations. A well examination of a general process is sufficient unless the process changes on a one-off basis. The Well Operator should supply a copy of the standard procedures to the Well Examiner for examination. Once examined, the Well Examiner will confirm in writing they have been examined and are acceptable.

3.3.5 Suspend

The Regulations require well suspension operations, and suspended wells (including suspended wells purchased from another permit operator), to be covered by a well examination scheme.

Wells should be suspended in line with good industry practice and any relevant New Zealand regulations and guidelines. Suspended wells should be left in a state designed to maintain well integrity with no requirement for interventional maintenance unless there are exceptional circumstances.

The Well Operator should maintain a database of suspended wells. The Well Operator should record the results of integrity monitoring work (e.g. testing of surface valves).

Well Operators should examine suspended wells on an annual basis unless well conditions require more frequent examination. The Well Examiner should review the well integrity monitoring program's results and any dispensations issued.

A base-line suspended well examination should be conducted if suspended wells are acquired and no previous well examination has been performed.

3.3.6 Abandon

Well abandonment plans, procedures and operations are subject to well examination. If the Well Operator intends to permanently abandon a well, the programme should be submitted to the Well Examiner and a Certificate of the design of the Abandonment Design issued.

When a well is abandoned it is no longer necessary to include it in the well examination scheme.

Whilst the well no longer needs to be included in the well examination scheme after abandonment, Regulation 65 requires that specified well examination records must be kept for at least 12 months after a well examination scheme, including any revisions of the scheme, has ceased to be current.

4.0



BOUNDARY AND LIMITS OF THE WELL EXAMINATION SCHEME



4.1 Boundary of the Well Examination Scheme

The Well Operator's arrangements in writing (the well examination scheme) cover everything within the well "pressure containment boundary". This includes the downhole pressure containing equipment and the pressure containing equipment on top of the well such as blowout preventers or Xmas trees, but excludes well control equipment downstream that can be isolated from the well by valves.

Examples of where the well (and therefore the well examination scheme) ends are:

- above the top BOP in the BOP stack and outside the choke and kill valves
- downstream of swab and production wing valves of a Xmas tree
- at the top of the stuffing box of a wireline BOP
- above the rotating control device (RCD) and downstream of the operations
- choke for managed pressure drilling (MPD) or underbalanced operations equipment
- downstream of swab and production wing valves of a surface test tree
- above the wellhead (or conductor) and the top barrier in a suspended well.

Well examination schemes do not need to include:

- well test flowline and downstream equipment (e.g. choke, heater, separator)
- rig gas handling equipment (e.g. diverter, mud gas separator, vent lines)
- returns handling equipment for MPD or underbalanced operations.

Section 4.3 covers what a well examination scheme can exclude.

4.2 Limits of the Well Examination Scheme

Well examination is not a part of a Well Operator's well design, construction, or maintenance processes. It is an independent check of the results of these processes.

If a well needs specialist input or expertise (e.g. extended reach drilling) the Well Operator should make sure that this expertise is included in its well design and operations team. The Well Operator cannot rely on the Well Examiner to compensate for any lack of expertise in the team.

High hazard wells may need specialist input or studies (e.g. casing design for deviated HPHT wells). The Well Operator or a competent third party may provide these. The Well Examiner will check that this process has been carried out and review the results of the studies.

Well examination may need to review factors outside the well pressure containment boundary that may have an adverse impact on it, for example:

- site survey / subsidence
- SIMOP's
- wellhead protection (for subsea wells)
- confirming that seabed surveys have been carried out, before and after operations (for offshore wells).

4.3 What is Excluded from a Well Examination Scheme

It is not anticipated that the well examination scheme will rely on physical examination of wells. A well examination scheme based on documents and discussions with onshore personnel will generally be sufficient.

Operational performance and efficiency aspects of well operations are not part of the well examination scheme.

The Well Examiner may ask if the Well Operator is adhering to Standards in writing but is not expected to check compliance with each and every Standard.

For clarity, the following documents may not need to be examined:

- well control contingency plans
- well control procedures
- oil spill contingency plans
- installation verification schemes or certificates of fitness (included in safety cases for offshore installations)
- well sections from the safety case for the installation.

5.0

WELL CONTROL EQUIPMENT



5.0 Well Control Equipment

The main well control equipment (drilling BOP's and associated equipment) is part of the "pressure containment boundary". The Well Examiner needs to be sure that the specification of the proposed/existing well control equipment is suitable for the task and is correctly certified, inspected, pressure tested and maintained.

Unless otherwise provided for (e.g. through a certificate of fitness/verification scheme for the installation), examples of well control equipment the Well Examiner could examine include:

- drilling BOP
- wireline BOP, lubricator, stuffing box and controls
- snubbing unit BOP, grippers and controls
- coiled tubing unit BOP, stuffing box and controls
- surface test tree, valves and controls
- rotating control device (RCD), operating choke and controls for MPD or under-balanced drilling (UBD)
- subsea wireline or workover riser system.

Typically, the Well Examiner requests information such as:

- certification
- details of previous inspections
- configuration
- equipment specifications
- planned pressure test plans.

The Well Examiner will not normally physically examine well-related safety-critical equipment but will need to be sure that where equipment is considered to be "safety critical" it is suitable.

When a well is part of an installation subject to a certificate of fitness/verification scheme (as is required for offshore installations), there may be overlap with the well examination scheme. In these circumstances work done to meet the requirements of the certificate of fitness/verification scheme could contribute to the well examination scheme. The Well Examiner should make sure the well control equipment conforms to the Well Operator's Standards and good practice. The Well Examiner does not need to be involved with reviewing certification and maintenance records if these are addressed under the certificate of fitness/verification scheme, though the Well Examiner may ask for proof that this is in place.

6.0

STANDARDS USED IN WELL EXAMINATION



6.0 Standards Used In Well Examination

The Regulations do not specify which Standards to examine any well against.

Perform well examination against the standards set out as policy by the Well Operator.

Typical examples of Standards that a Well Examiner could see are:

- Casing Design
- Well Integrity
- Well Control
- Barriers
- SIMOP's
- Completions / Well testing
- Hazardous Materials
- Lost Circulation
- Directional Drilling.

It is part of the Well Examiner's competency to ensure the adequacy of the well design and to judge operations over the lifecycle of the well against appropriate standards. The Well Operator needs to specify which Standards they are using.

Well Operators may use their own internal standards and should make these available (and any dispensations) to the Well Examiner.

The Well Operator should define standards in relation to operating, maintaining, and testing wells, including leak-rate hurdles for valves and annuli (e.g. API 14), testing frequency and rationale.

The Operator should have a policy on managing aging well stock which should include downgrading of components properties over the well's life and increased maintenance and observation.

The Well Operator should have a documented risk assessment / dispensation process for situations where wells fail to meet standards.

7.0

ADMINISTRATION OF A WELL EXAMINATION SCHEME



7.1 General requirements

Well Operators have responsibility for the effectiveness of their well examination scheme. It cannot be delegated to the Well Examiner.

All personnel involved in any well operation should be aware of the well examination scheme and any duties they have under it.

7.2 Keeping Records

The Well Operator must keep records of the well examination scheme and store them at an address notified to WorkSafe New Zealand, this could be the Well Operator's office.

Well Operators must keep, for at least one year after a well examination scheme has ceased to be current, records of:

- the well examination scheme
- any revision of the well examination scheme
- any examination and testing carried out
- the findings of any examination and testing carried out
- any remedial action recommended
- any remedial action performed.

Also consider keeping records which detail how the well examination scheme will be carried out, such as:

- ensuring the well examination scheme is followed
- the Well Examiner's:
 - » appointment
 - » independence from the well operations line management
 - » competency for the well operations being examined
- suitable action to take on any reports made by the Well Examiner
- the review and revision arrangements.

7.3 Well Examination Scheme Reports

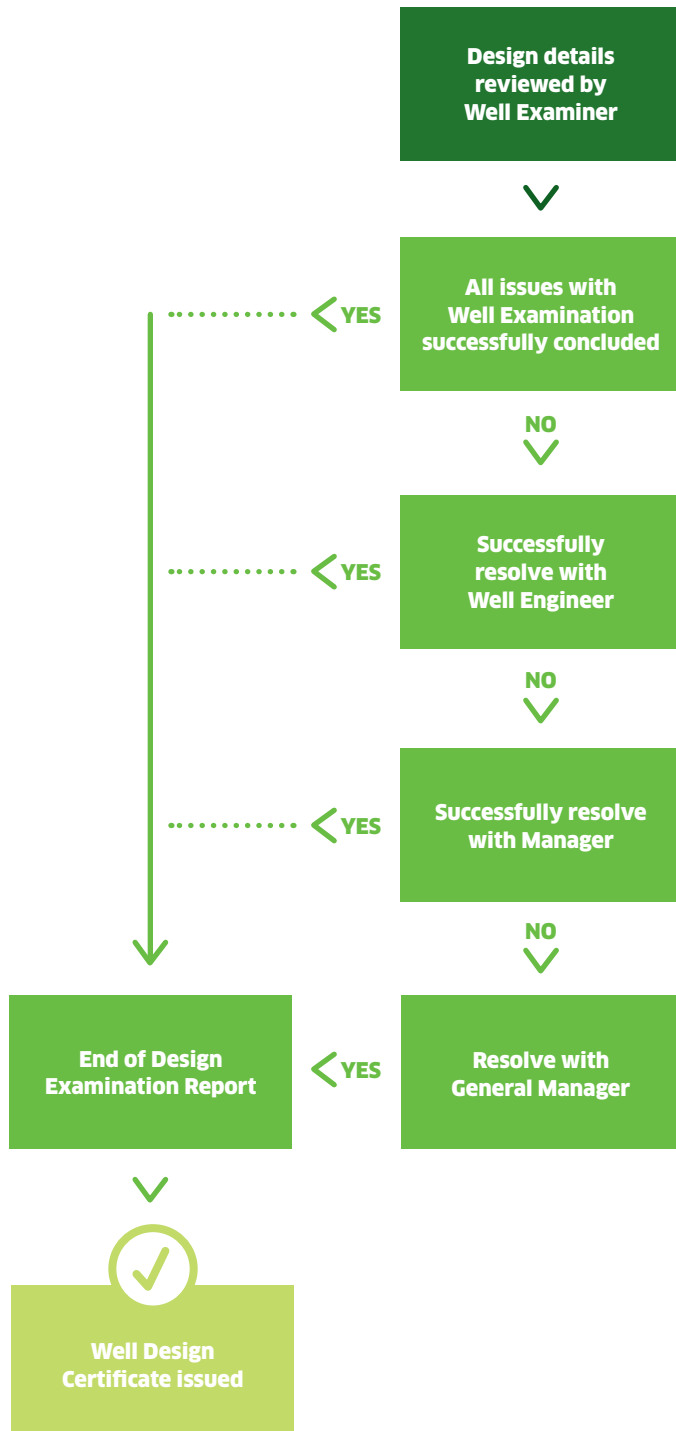
The Well Examiner must make reports to the Well Operator about the findings of any examination and testing carried out. The Well Operator should record and keep any remedial action recommended by the Well Examiner and what remedial action has actually been carried out. The well examination scheme should describe how to handle these reports as the responsibility for action rests with the Well Operator.

7.4 Resolving Disputes

The well examination scheme should specify the system for resolving disputes between the Well Operator and Well Examiner.

Figure 4 is an example of a simplified approach to deal with dispute resolution.

Figure 4: Example of Dispute Resolution Process



APPENDICES



APPENDIX I Typical Documents to Review in the Design Stage

1. Company Standards and Policies relating to well engineering
2. Well Proposal or Basis of Design – ideally include formation depths, movable hydrocarbons depths, fluid types, H₂S, CO₂, pressures/temperature plots, SIWHP's etc
3. Details of offset data highlighting problems, casing setting depths and other relevant data
4. A high level well summary/outline can be of great help to understand the issues and objectives if one is available
5. Site Survey and Shallow Hazard Assessment
6. Casing Design Document and key assumptions
7. Tubing Design Document and key assumptions
8. Kick Tolerance
9. Directional and Survey Plan / Design
10. Cement Plan / Design
11. Mud Plan / Design
12. Any specialist studies which may affect well design / pressure envelope of well
13. Rig / BOP Details (or required specifications if rig not yet selected)
14. Pressure Testing Plan (frequency, duration and test pressures)
15. Wellhead / Casing / Tubing Specifications
16. Drilling Program Outline; (draft is fine)
17. Risk Assessment, HAZID, or Pre-Operational documents;
18. Dispensations from Policy (if applicable)
19. Abandon / Suspend Design
20. Details of where double barrier isolation may not be possible
21. Details of where well test/completion/production design may impact on the design of the well – i.e. MAASP, pumping/frac pressures, gas lift injection pressures, acidizing details

Note: Well test, Completion and Production Well Examination is generally performed separately but certain design data may be requested as it will impact on the design stage of the Well Examination.

The above list is not exhaustive and as the Well Examiner may request additional information as he/she understands the issues better.

APPENDIX II Example Well Examination Design Sheet

[illegible]

APPENDIX III Example Well Design Examination Certificate

EXAMINATION CERTIFICATE – DESIGN STAGE

Well Number:

Field:

Well Type:

Well Operator:

Programme Description:

The design documentation for the subject well referenced above has been examined in accordance with the ***** Well Examination Scheme (Well Integrity) and the design and the well examination documentation completed.

The documentation provided to date (see below) demonstrates that the well design is in compliance with ***** well standards, good oilfield practice and New Zealand health and safety legislation.

Documentation Examined

The undersigned as Well Examiner confirms that the well design associated with the drilling of the ***** well has been examined and found to be in compliance with ***** well standards.

Signed

UNSIGNED AT PRESENT

Independent Well Examiner

Date

APPENDIX IV Typical Documents to Review in the Construction Stage

1. Activity Reports (e.g. Daily Drilling Reports, Completion/Well testing reports, etc.)
2. Final Well Schematic
3. Final Wellhead Schematic, if applicable
4. Cement report including cement tops/verification
5. Mud reports
6. Casing reports
7. Programme Amendments or Management of Change
8. BOP and Barrier tests
9. Pressure test details
10. Copies of completed Handover Certificates (i.e. from Drilling to Production).

APPENDIX V Example Well Construction Examination Sheet

[illegible]

APPENDIX VI Example Well Construction Examination Certificate

EXAMINATION CERTIFICATE – CONSTRUCTION STAGE

Well Number:

Field:

Well Type:

Well Operator:

Programme Description:

The undersigned as Well Examiner confirms that the well operations associated with the drilling of the ***** well has been examined and found to be in compliance with ***** well standards.

Signed

UNSIGNED AT PRESENT

Independent Well Examiner

Date

APPENDIX VII Typical Documents to Review in the Production Stage

1. List of wells in Well Operator's Inventory
2. Well Integrity Standards
3. Integrity monitoring program
4. Test requirements and frequency
5. Details on how Operator manages aging well stock
6. Operating Envelope for wells (MAASP)
7. Any changes to well in previous year
8. Annulus pressure records and details of bleed downs/offers conducted
9. Test results for DHSV, tree valves and annulus valves
10. Maintenance records / failure reports
11. Risk assessments
12. Dispensations

APPENDIX VIII Example Well Production Examination Sheet

Operator:

[illegible]

APPENDIX IX Glossary

ALARP

As Low As Reasonably Practicable

API

American Petroleum Institute

BOP

Blow-out Preventer

DHSV

Downhole Safety Valve

HAZOP

Hazard and Operability Study

HPHT

High Pressure High Temperature

Installation

Means a “production installation” or a “non-production installation” as defined in the Regulations

MAASP

Maximum Allowable Annulus Surface Pressure

MPD

Managed Pressure Drilling

Pressure Containment Boundary

The well is defined in terms of its pressure containment boundary. Any equipment that is vital to controlling the pressure within the well is therefore covered. This would include downhole pressure containing equipment (including casing and cement), and the pressure-containing equipment on top of the well such as blowout preventers or Christmas trees, but excludes well control equipment downstream that can be isolated from the well by valves. Examples of where the well ends are:

- above the top blowout preventer (BOP) in the BOP stack and
- outside the choke and kill valves; or
- downstream of the swab and production wing valves of a
- Christmas tree; or
- at the top of the wireline stuffing box of a wireline BOP.

Permit

Means an exploration or mining permit issued under the Crown Minerals Act 1991

Permit Operator

Means a person conducting a business or undertaking (PCBU) who manages or controls a production installation or a well operation and to which section 27 of the Crown Minerals Act 1991 applies

PLT

Production Logging Tool

Regulations

Health and Safety at Work (Petroleum Exploration and Extraction) Regulations 2016

ROV

Remotely Operated Vehicle

SIMOP

Simultaneous Operations

Well

- a. means a borehole drilled for the purpose of exploring for, appraising, or extracting petroleum; and
- b. includes—
 - i. any borehole for injection or reinjection purposes; and
 - ii. any down-hole pressure containing equipment; and
 - iii. any pressure-containing equipment on top of the well

Well Intervention

Means an operation in which a well is re-entered for a purpose other than to continue drilling or to maintain or repair it

Well Examiner

In this document “well-examiner” covers any individual, team, department or company providing well examination services

Well Operation

- a. the drilling, completion, suspension, or abandonment of a well; and
- b. includes—
 - i. the recommencement of drilling after a well has been completed, suspended, or abandoned; and
 - ii. any other operation in relation to a well during which there may be an accidental release of fluids from the well that could give rise to the risk of a major accident

Well Operator

In relation to a well or proposed well, means a permit operator of a well operation

Workover

An operation in which a well is re-entered for the purpose of maintaining or repairing it.

APPENDIX X References

- Health and Safety at Work (Petroleum Exploration and Extraction) Regulations 2016
- Oil & Gas UK – Guidelines for well-operators on competency of well-examiners. Issue 1: November 2011. ISBN 1 903 003 71 7
- Oil & Gas UK – Guidelines for well-operators on well examination. Issue 1: November 2011. ISBN 1 903 003 70 9



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