RP 6.0: INSPECTION AND CERTIFICATION OF BLOWOUT PREVENTERS

A Recommended Practice (RP) for the Canadian Land-Based Drilling and Well Servicing Industry

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CANADIAN ASSOCIATION OF OILWELL DRILLING CONTRACTORS
RECOMMENDED PRACTICE 6.0
INSPECTION AND CERTIFICATION OF BLOWOUT PREVENTERS (DR/SR)

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INTRODUCTION

The Canadian Association of Oilwell Drilling Contractors (CAODC) Engineering & Technical (E&T) Committee has developed a Recommended Practice (RP) for blowout preventer inspection and certification. This document dated December 2015 supersedes all prior editions of this Recommended Practice.

The information contained herein is a recommendation only of certification schedules for blowout preventers currently utilized in the Canadian drilling and well servicing industry. An attempt has been made to establish some practical recommended operating practices for blowout preventer equipment in the Canadian drilling and well servicing industry.

The recommendations contained in this document should be considered in conjunction with the requirements of the original equipment manufacturers (OEM). Companies should operate and maintain the equipment within the operating limitations, such as load ratings, as designed by the OEM.

If the OEM stipulates increased levels of inspection or accelerated inspection/certification cycles, the contractors must follow the OEM guidelines unless granted approval to follow this CAODC Recommended Practice by a Professional Engineer (P. Eng).

CAODC has produced this Recommended Practice based on industry experience. However, this document should be considered in conjunction with all relevant legislation and the requirements of provincial regulatory authorities. This document should not be construed as a legal opinion, and users are advised to seek legal counsel to address their specific facts and circumstances.

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REVIEW PROCESS

CAODC Recommended Practices are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Email any comments or items of concern to rpfeedback@caodc.ca.

RP REVISION SCHEDULE

Revision Date	Revision Details
October 2014	Introduction revised to standardize all RP's.
December 2015	Section 2.3.1 revised to include reference to Enform Well Service BOP certificate. Reference to Second Line BOP certificate revised to properly reference certification title.
	Section 2.4.1 revised to reflect annular and ram preventers specifically and to differentiate from in-service dates for drill-through spools, drill-through adapter flanges, bleed-off and kill-line hoses.
	Section 2.4.2 added to clarify in-service dates for drill-through spools, drill-through adapter flanges, bleed-off and kill-line hoses.
	Section 3, reference to Level III inspection frequency revised to reflect that inspection should also occur upon completion of the well.
	Section 3, note added to Level IV inspection frequency indicating that certification may be extended.

1. EQUIPMENT SUBJECT TO INSPECTION AND CERTIFICATION

All blowout preventers (BOP) and well control equipment used during drilling, well completion, and well servicing should be subject to an inspection and certification program. The BOP and well control equipment covered by this Recommended Practice include:

- Ram type BOP's;
- Annular type BOP's;
- Rotating BOP's or rotating heads;
- Working spools; and all adapter spools;
- Flexible choke, diverter and kill hoses.

2. INSPECTION TYPES

Three levels of inspection are recommended to ensure that equipment is properly maintained and is in safe operating condition:

2.1 LEVEL I INSPECTION

A Level I inspection requires visual inspection only and/or function test of the equipment for mechanical defects and proper operating condition.

2.1.1 LEVEL I INSPECTION PERSONNEL

Level I inspections are to be performed by the rig crew.

2.2 LEVEL II INSPECTION

Level II inspections, as seen in other CAODC RPs, are not applicable to this type of equipment.

2.3 LEVEL III INSPECTION

A thorough visual inspection of the assembly and parts is to be conducted for structural or operating defects (i.e. rams, ram rubbers, annular elements, studs or hydraulic leaks). Results of this inspection may require opening the BOPs for further inspection.

2.3.1 LEVEL III INSPECTION PERSONNEL

Level III inspections will normally be performed by one of the following:

- Rig Manager that has either a Enform Second Line Supervisor's Well Control (Test Well) or Enform Well Service Blowout Prevention certificate (as applicable);

- Individuals designated by the drilling and/or well servicing company who have adequate experience and knowledge of BOP and well control equipment; or

- A Certifying Professional Engineer.

2.3.2 LEVEL III INSPECTION DOCUMENTATION

Level III inspections must be documented in the rig's tour book.

2.4 LEVEL IV INSPECTION

Level IV inspections include:

- Complete shop disassembly;

- A thorough visual inspection of the parts for structural or operating defects;

- Measurement of critical dimensions and Non Destructive Testing (NDT), which may be magnetic particle, wet fluorescent or equivalent of all critical areas as described in Section 2.4.2 - Certification Procedures.

At a minimum, repairs will be performed as described in Section 4 – Repair Procedures.

2.4.1 IN-SERVICE DATES FOR ANNULAR AND RAM PREVENTERS

Level IV inspections are for a period of three (3) years from the in-service date. It is acceptable to store annular and rams preventers after certification and tag prior to use, if stored in accordance with a Professional Engineer or OEM Agent.

The storage period must not exceed one (1) year or twelve (12) months, otherwise the in-service date begins its three year period.

BOPs must not be placed on a well where the program for the well would exceed the certification expiry date.

Note: *the in-service date is defined as the day when the annular and ram preventers are stamped or are first shipped to a rig after the certification process.*

2.4.2 IN-SERVICE DATES FOR DRILL-THROUGH SPOOLS, DRILL-THROUGH ADAPTER FLANGES, AND FLEXIBLE BLEED-OFF AND KILL-LINE HOSES

As stated in Directive 036: Drilling Blowout Prevention Requirements and Procedures (February 2006), all BOPs, drill-through spools, drill-through adapter flanges, and flexible bleed-off and kill-line hoses used during drilling and well servicing operations must be shop serviced and pressure tested at least once every three years from the in-service date.

Drill-through spools, drill-through adapter flanges and flexible bleed-off and kill-line hoses must not be placed on a well where the program for the well would exceed the certification expiry date.

Note: *the in-service date is defined as the day the BOPs, drill-through spools, and flexible bleed-off and kill-line hoses are placed in service after the certification process.*

2.4.3 CERTIFICATION PROCEDURES

After no more than three (3) years or 36 months from the in-service date, BOPs must be taken out of service and sent to a qualified BOP repair facility.

The following guidelines are required for completing BOP certification:

i. Complete disassembly and cleaning of all mechanical and hydraulic components;

ii. Inspection by a competent person who records and documents the received condition and all repairs required. This stage shall include identification of all parts, or an equivalent system for maintaining the traceability of the unit's component parts;

iii. Each component shall have written specifications for acceptable condition approved by the OEM or certifying Professional Engineer;

iv. Measurements of all wearing components shall be made with calibrated and traceable measuring and testing instruments;

v. NDT shall be performed as appropriate, by an individual with a minimum Level II CGSB Non Destructive Testing (NDT) Certification (as defined in Section 4 – Repair Procedures);

vi. Each component repaired shall have written inspection criteria, sizes, tolerance, and part numbers. All repairs completed are to be clearly identified on the repair report;

vii. Each component repaired shall have written repair methods including welding procedures, heat treatment, and parts standards approved by the OEM or certifying Professional Engineer. Reference shall be made to the appropriate API, ASME and AWS standards;

viii. Parts replaced or added to the BOPs — including elastomers — must be traceable and designed for the purpose with equivalent or superior performance, and must be approved by the OEM or certifying Professional Engineer. All parts replaced are to be clearly identified on the repair report;

ix. Replacement of all elastomers, annular packing elements, and ram rubbers are recommended, but at the discretion of the certifying party;

x. Qualified Personnel as defined by Section 5 – Qualified Personnel must supervise or perform all repairs;

xi. All BOPs and well control equipment must be completely assembled, function tested, and pressure tested in accordance with Section 6 - Pressure Testing Parameters Applicable to Shop Certification of BOP Equipment. This test must be completed before shipment and recorded on the final certification. Pressure tests must include:

- A low well-bore pressure test at 1,400 - 2,100 kPa;
- A high well-bore pressure test at equipment rating;
- A closed function hydraulic pressure test to manufacturer's rating;
- An open function hydraulic pressure test to manufacturer's rating;
- All pressure tests are to be held for a 15 minute duration;

- Additional pressure tests are at the discretion of the OEM or certifying Professional Engineer;
- Main bore drift test.

xii. BOP equipment must be properly stored according to OEM or certifying Professional Engineer standards. Storage must not exceed one (1) year.

Note: *the above guidelines are also required in the case where the BOP was subject to significant well control operations such as:*

- *An uncontrolled flow;*
- *Pressure in excess of the manufacturers rating; or*
- *A sour fluid exposure, where the equipment is not certified for sour service.*

2.4.4 CERTIFICATION DOCUMENTATION

Certification will consist of an inspection report, repair report and testing documentation, with review and sign off by the certifying party.

The certification document required at the work site must include the following information as a minimum:

- Name of the facility undertaking certification process;
- Facility certification work order or job number traceable to repairs and inspections conducted on the particular piece of equipment;
- Date of certification;
- Confirmation that the equipment was certified as per this RP;
- Manufacturer of equipment;
- Model of equipment (including pressure rating and bore size);
- Serial number of equipment;
- In-service date;
- Signature of certifying party.

A copy of the certification document must be present and easily accessible at the rig site.

The certification of a BOP must be retained in a file system containing a copy of the records and repair history, keyed to a unique identification number. The file should contain not less than ten (10) years of data.

Sample - BOP Certification

for

ABC DRILLING COMPANY

RIG 1

7" 5000 PSI Hydril Sentry Double-Gate

Service Completion Date:	March 1, 2012
In Service Date:	March 1, 2012
Expiration Date:	March 1, 2015
Serial No:	XX-XXX
Gallons to Open:	XX US GALLONS (X.XX L)
Gallons to Close:	XX US GALLONS (X.XX L)
Stud Size:	X - X/X" - XX" Long
Ring Gasket:	R-XX

Shell Test:	34,500 kPa (5000 PSI)		*Signature*
Closed Preventer Test:	**Low 15 min**	**High 15 min**	
Upper Cavity	1,400 kPa (200 PSI)	34,500 kPa (5000 PSI)	*Signature*
Upper Chamber Operating Pressure	10,400 kPa (1500 PSI)	10,400 kPa (1500 PSI)	*Signature*
Lower Cavity	1,400 kPa (200 PSI)	34,500 kPa (5000 PSI)	*Signature*
Lower Chamber Operating Pressure	10,400 kPa (1500 PSI)	10,400 kPa (1500 PSI)	*Signature*
Hydraulic Chamber Pressure Test	**Open Function 15 min**	**Closed Function 15 min**	
Upper Cavity Hydraulic Chamber	10,400 kPa (1500 PSI)	10,400 kPa (1500 PSI)	*Signature*
Lower Cavity Hydraulic Chamber	10,400 kPa (1500 PSI)	10,400 kPa (1500 PSI)	*Signature*

File # _____

Inspected By:

(Sign)

XYZ BOP REPAIR

123 Avenue Street

(Print)

Edmonton, Alberta, XXX-XXX

Certifying Party:

Phone: (XXX) XXX-XXXX

(Sign)

Fax: (XXX) XXX-XXXX

File No: XXXX

(Print)

3. INSPECTION FREQUENCY

All equipment referred to in Section 1 - Equipment Subject to Inspection and Certification is subject to the following inspection frequency:

- Level I: daily;
- Level II: N/A;
- Level III:
    i. Upon completion of the well and/or prior to installation of the equipment on a well;
    ii. Prior to any required pressure test of the equipment;
- Level IV: three (3) years.

Note: *BOPs and well control equipment must not be placed on a well where drilling and/or well servicing operations could exceed the three-year certification expiry date. However, if unforeseen hole problems were encountered on well operations already in progress, certification may remain in effect beyond the expiry date providing approval from the applicable energy regulator has been requested and obtained.*

Note: *should the equipment be subjected to any of the following significant well control operations, a Level IV inspection shall be performed before returning the equipment to service:*

- *An uncontrolled flow;*
- *Pressure in excess of the manufacturers rating; or*
- *A sour fluid exposure, where the equipment is not certified for sour service.*

CAODC member companies may do inspections at greater frequencies, should circumstances or individual experience dictate.

3.1 HIGH HAZARD HYDROCARBONS (HHH)

It is recommended that the BOPs exposed to HHH be subject to a higher frequency of inspection and pressure testing. As soon as possible after exposure, and prior to being returned to service, they should be removed from service, cleaned and inspected for damage to rubber products and pressure

tested according to Section 6 - Pressure Testing Parameters Applicable to Shop Certification of BOP Equipment.

For additional information, refer to CAODC Technical Bulletin T-11-01 (attached).

4. REPAIR PROCEDURES

Any BOP repairs required will be categorized as MINOR or MAJOR on the following basis:

4.1 MINOR REPAIRS

Minor repairs include:

- Repair of:
  - Ram guards;
  - External seal rings;
  - Flange bolts, etc.
- Replacement of:
  - Bolt-on valves;
  - Ram rubbers;
  - Ram block assemblies or annular elements;
  - Door face seals.

4.1.1 MINOR REPAIR PERSONNEL

Minor repairs may be completed by general rig personnel under the supervision of the Driller or Rig Manager utilizing acceptable industry practices.

4.2 MAJOR REPAIRS

Major repairs include:

- Any component or surface found to be outside the manufacturers allowable tolerances;
- All weld repairs to any BOP component;
- Any modification to a BOP part, such as buildup or resizing pin fits;

- Any replacement of pressure containing or well-bore fluid exposed parts such as, bodies, seals, and fasteners. Field replacement of pressure containing or well-bore fluid exposed parts must be done or supervised by a BOP Technician. The corresponding service report must be completed as required for a repair report during a certification. Such parts include:
    - Ram shafts;
    - Pistons;
    - Hinge pins;
    - Locking shafts;
    - Annular seals etc.

All equipment requiring major repairs are required to be shop repaired and recertified as described in Section 2.4.2 - Certification Procedures.

4.3 QUALIFIED BOP REPAIR FACILITIES

The following elements must be present for a repair facility to be considered a qualified BOP repair facility:

- Qualified repair personnel with training from a BOP Original Equipment Manufacturer (OEM), or personnel approved by the certifying Professional Engineer and further described in Section 5 – Qualified Personnel;
- Adequate facilities to allow disassembly, reassembly and testing in a safe and controlled manner;
- Measuring instruments and tools necessary for the repairs undertaken which are periodically calibrated against national standards;
- Written inspection procedures and repair methods for all repairs undertaken specific to the repair facilities quality management system;
- Possession of OEM inspection and repair standards or inspection and repair standards approved by a certifying Professional Engineer;
- Adherence to a quality control process, including a current quality control manual, sufficient to ensure that all BOP service conforms to the repair methods and standards as required by the OEM or certifying Professional Engineer;

- Adequate record keeping, suitable for tracking of repair history specific to each unit serviced. The records will include sign off by the OEM or certifying Professional Engineer.

5. QUALIFIED PERSONNEL

The certifying party must be an OEM designated representative, a certifying Professional Engineer, or a designated person with industry experience approved by the certifying Professional Engineer.

5.1 CERTIFYING PROFESSIONAL ENGINEER

The certifying Professional Engineer must have:

- Previous experience or training in repair of pressure vessel and pressure control equipment;
- A practical working knowledge of BOP equipment;
- Experience with general quality control standards;
- Professional status in Canada.

The certifying Professional Engineer will approve or provide inspection and repair methods as well as approve the quality control procedure to ensure the repairs are completed as required and adhere to applicable API, ASME and AWS Standards.

5.2 BOP TECHNICIANS

BOP Technicians shall have training from a BOP OEM or be a mechanical trade's person (millwright, mechanic, etc.) with adequate experience including:

- Knowledge of working principles of the equipment type and model;
- Mechanical competency in the disassembly, repair and re-assembly of the equipment type and model;
- Training through in-house programs, OEM training or previous on-the-job training under supervision in facilities which provide a similar service;
- Otherwise approved by the certifying Professional Engineer.

5.3 WELDERS

Welders must hold a valid Journeyman Welding Certificate with a B pressure Endorsement and should have experience in BOP repair or as specified by the certifying Professional Engineer or OEM.

5.4 NDT PERSONNEL

At a minimum NDT Technicians are required to have Level II, Canadian Government Standards Board (CGSB) certification or other approved certification/training at the discretion of the certifying party, and must have prior experience in the inspection of BOPs.

6. PRESSURE TESTING PARAMETERS APPLICABLE TO SHOP CERTIFICATION OF BOP EQUIPMENT

EQUIPMENT	p, LOW	t	p, HIGH	t
	kPa	MINS	kPa	MINS
Ram type BOPs	1400-2100	15	1 x p, NOM	15
Annular type BOPs	1400-2100	15	1 x p, NOM	15
Rotating BOPs/rotating heads	1400-2100	15	1 x p, NOM	15
Working (drill through adapter) spools	N/A		1 x p, NOM	15

6.1 TABLE LEGEND

6.1.1 p, LOW = LOW TEST PRESSURE

6.1.2 p, NOM = NOMINAL WORKING (RATED) PRESSURE

6.1.3 p, HIGH = HIGH TEST PRESSURE

The tolerance applicable to p, HIGH (Closed Preventer Test – High) with pressure values as listed in Table 1 is: - 0% / + the lower of 7% or 500 psi.

6.1.4 t = MINIMUM HOLDING TIME

Acceptance criteria is no visible leakage as per API 16A. The holding time for the pressure testing shall begin after pressure stabilization. By allowing certain pressure decline over time during the “closed preventer test”, CAODC is taking into account the physical properties of the test fluids as well as the materials used for pressure boundaries in BOPs (e.g. elastomers are used for annular elements). However, it is at the discretion of the certifying party to accept the above suggested values or to tighten the tolerances and/or designate supplementary testing to ensure that the BOP is safe to operate.

6.2 PRESSURE STABILIZATION CRITERIA FOR CLOSED PREVENTER TESTING

6.2.1 CLOSED PREVENTER TEST p, HIGH

The pressure can be considered stabilized once the observed pressure drop is less than the lesser of 150 psi/ 15 min or 3% of the test pressure.

6.2.2 CLOSED PREVENTER TEST p, LOW

The pressure can be considered stabilized once the observed pressure drop is less than 15 psi/ 15 min.

6.3 FOR TESTING API 16C ONLY

EQUIPMENT	p, LOW	t	p, HIGH	t
	kPa	MINS	kPa	MINS
Flexible choke and kill line hoses	N / A	N / A	1 x p, NOM	15

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TECHNICAL INFORMATION BULLETIN T-11-01

(All Drilling and Service Rig Contractors)

June 15, 2011

Subject: **High Hazardous Hydrocarbon (HHH) and BOPs**

At the May 19, 2011 CAODC Engineering and Technical (E&T) Committee meeting, the impact of "High Hazardous Hydrocarbon" (HHH) on well servicing and drilling rig BOPs was discussed.

In an effort to determine the severity of the potential problem, contact was made with three qualified BOP repair facilities and representatives from Trican Well Servicing in Calgary and Red Deer from their engineering and coil tubing divisions. From these discussions it was determined that there is a significant problem with HHH, in particular to well servicing BOP rubber components due to their likelihood of exposure. The Engineering and Technical (E&T) Committee is continuing to investigate the root issues and finding a resolution to the issues.

At the Committee meeting, it was determined that there are several areas of concern:

1. High Hazardous Hydrocarbons commonly used as base fluids in fracture stimulation processes are known to have high aromatic hydrocarbon content. Aromatic content is determined by utilizing a chemical process called Aniline Point, which is defined as the temperature at which equal volumes of aniline and the desired oil are completely miscible. According to experience, Trican suggests that exposure to oil with an Aniline Point less than 65 degrees Fahrenheit will promote degradation of elastomers;

2. Test by Control Technology, were conducted whereby Buna N Nitril BOP components were exposed to high aromatic hydrocarbon and then soaked in water overnight. Results strongly supported material degradation to the elastomers;

3. Varying rubber constituents (elastomers) has been known to significantly improve performance and durability when exposed to high aromatic content oils. Trican contends that they experienced this premature failure problem more than six years ago and switched from the common elastomer component - Buna N Nitril to HSN (highly saturated nitril) and as a result do not experience degradation in their coil tubing well control equipment when exposed to HHH;

4. Coil Tubing BOP manufacturers including Vanoil/Forum; Lee Specialties and TOT(NOV), according to Trican, utilize HSN as an OEM approved product line;

5. Service Rig BOP manufacturers including Hydril; Schaffer and Cameron (Townsend) have resisted overtures by Mr. Evans at Control Technology to utilize Vitron (a fluoroelastomer,

which is known to be more resistant in aggressive chemical environments) as an OEM approved product line. So he is compelled to use existing OEM recommended parts Buna N Nitril;

6. Several multinational operators mandate that only OEM parts be utilized in servicing procedures and due to perceived liability issues service contractors feel compelled to follow these directions;

7. Knowingly or unknowingly service contractors are utilizing Buna N Nitril rubber products in an environment that is outside OEM recommended environments as per OEM design, thus already exposing themselves and their clients to an unsatisfactory level of risk;

8. Approximately 60 percent of the bop elastomer replacement parts are “O” rings that are readily available in HSN; HNBR and Vitron in Edmonton;

9. The rams and door seal elastomers can be easily constructed in Edmonton in elastomer mold fabrication shops out of any elastomer; HSN; HNBR and Vitron;

10. OEM Buna N Nitril BOP seals cost six dollars each; it is estimated that an equivalent HNBR seal would cost twenty five dollars each.

The purpose for this Technical Bulletin is to educate members, particularly in the service rig membership. The E&T Committee is continuing to gather information and data on this issue. In the interim, it is advisable to educate any service rig well control OEMs about the environment in which service rig BOPs are working. Clearly these BOPs are working outside the OEM limits if they utilize Buna N Nitril in a HHH environment. It is recommended that contractors begin demanding that the OEM endorse HSN; HNBR and or Vitron seals as OEM approved.

In an effort to effectively address this issue, CAODC will consider amending its Recommended Practice 6.0 for Land Based Drilling Rigs - Drilling Blowout Preventer Inspection and Certification and Recommended Practice 7.0 for Service Rigs - Well Servicing Blowout Preventer Inspection and Certification.

Should you require additional information or clarification please contact Mark Scholz (403) 264-4311 ext 113.

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