



BOP and Riser Recertification

OEM recertification for maximized asset life

BOP Recertification Program

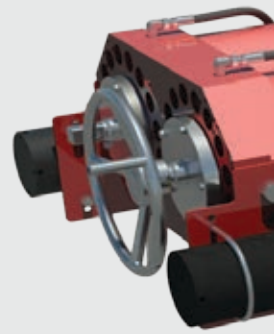
Operators are accountable for ensuring that BOPs are properly maintained and recertified according to local government regulations. The risk associated with pressure control is great and highly visible, making traceability during BOP recertification a serious consideration. That's why Cameron exclusively recertifies only Cameron BOPs to aid in protecting operators and the integrity of their assets.

Pressure control equipment is designed and manufactured to exacting standards and tolerances for the express purpose of safeguarding life, property, and the environment. Because BOPs are intended to control pressure, careful consideration should be given as to how the components that make up a BOP work together to ensure it is fit for this very serious purpose.

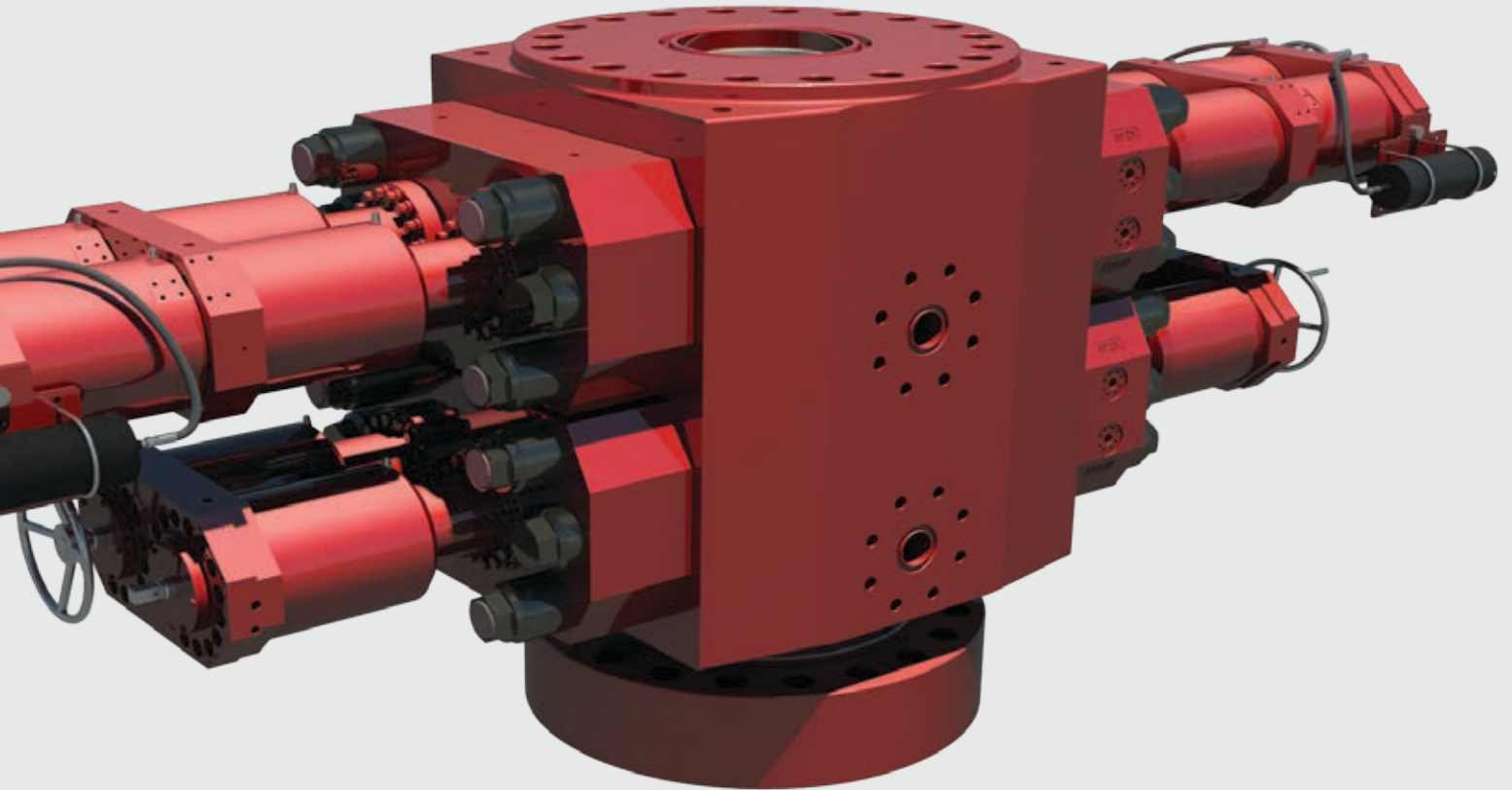
In-Field Recertification (SP-001060-21)

Cameron now offers on-site BOP recertification, minimizing downtime associated with required inspection and recertification. The BOP remains on the stack to perform the inspection required for recertification and is removed only for the time required to perform recertification activities, eliminating transport time between the lease and the Cameron facility. In-field recertification may extend the time from five to ten years before the BOP will need to be returned to a service facility for repair/remanufacture.

With early notification, in-field recertification can be scheduled to ensure minimal downtime is experienced in the field.



Why OEM Recertification?



Cameron EVO Ram-type BOP*

- OEM Trained Employees for Shop and Field OEM
- Certified Drawings, Procedures, and Methods OEM
- Proper OEM Inspection and Testing of Equipment
- Full OEM Traceability
- OEM Certificate of Conformance (COC)/Data Package
- Access to Full Cameron Resources
- Design Status and Control



1

Equipment Arrives at Cameron Facility



2

Disassembly



3

Clean – Wash/Sandblast

Equipment Arrives at Cameron Facility

Disassemble, Clean, and Inspect (DCI)

Repair/Remanufacture Process

Assemble, Test, and Paint

Welding



7

Machining



8

Assembly



9

Recertification by the OEM offers these benefits:

- Minimized downtime
- Comprehensive maintenance history is maintained

Essential OEM Maintenance

It can be costly, if not dangerous, to use non-OEM components in a Cameron BOP. The use of non-OEM components is not recommended by Cameron and will void the warranty.

The core of Cameron quality is control. We control every aspect of product design, manufacturing, and testing; our system is structured to consistently produce quality products with repeated performance. BOP recertification is infused with the same Cameron quality philosophy. By putting a BOP through rigorous tests to determine beyond doubt that it was manufactured to Cameron standards, our professionals can proceed with utmost confidence to verify working condition.



4

Dimensional Inspection



5

NDE Testing – Magnetic Particle Inspection (MPI)



6

NDE Testing – Liquid Penetrant



Recertified Equipment Shipped to Customer

Shell Test and Functional Test



10

Remote Monitoring and Chart Recording



11

Recertified Equipment Shipped to Customer



12

Pre-Macondo, any API-certified facility could recertify BOPs. Post-Macondo, the risks of taking a BOP to a non-OEM facility for recertification are greater. Today, if a non-OEM shop is used to recertify a BOP, the work has to meet or exceed the OEM’s standards. API specifications govern the top flange, bottom flange, outlet flanges, and the through-bore. All other criteria for recertification follow OEM standards.

Traceability: Special Testing

The heart of the BOP is its engineered design and the quality of the material it is constructed from. When Cameron receives a BOP for recertification, it is subjected to close scrutiny. In many cases, a BOP is submitted that does not have any clear identifying markings and, therefore, the origin of manufacture is uncertain. If the origin of the BOP is not readily apparent, the BOP undergoes chemical and mechanical tests, followed by a series of Charpy impact tests on core samples.

This practice goes well beyond what is considered an industry standard. The purpose of these tests is to ensure that the BOP is a Cameron product and we, with an increased level of confidence, can certify its working condition. Shavings are pulled during mechanical inspection and are used to determine yield strength, while chemical testing determines material type. The Charpy impact tests show whether the metal can be classified as brittle or ductile. Should the BOP pass these tests, it is entered into the recertification program that follows S-53 API recommendations; this option helps bring the BOP back to OEM certification standards.

Remanufacturing and Repair Procedures

All Cameron remanufacturing and recertification of BOPs seeks to maintain the API monogram. All repair procedures are determined per the classification of work for which the BOP is intended.

A Certificate of Conformance is issued upon completion of the repair and remanufacturing process. While receiving thorough inspection, the ram components are handled on a quick turnaround basis.

In the past, equipment tracking and materials information was stamped onto the component using a low-impact process, which can become illegible. Cameron has remedied this situation by applying a very visible asset number and serial number to each piece of equipment, enhancing traceability and use for tracking and logging of maintenance. RFID tagging also is used to track Cameron assets, increasing data integrity and providing accurate asset utilization information and equipment maintenance history.

Through a process consisting of disassembly, inspection, reassembly, testing, and parts replacement, we restore equipment to specified levels with factory warranties and installation support.



Asset number enhance traceability

Remanufacturing of Equipment

Cameron offers a full range of equipment repair services, including disassembly, inspection, reassembly, testing, and parts replacement. We restore your equipment to the levels you specify, with factory warranties and installation support.

We also provide the full complement of machining, welding, heat-treating, and other remanufacturing operations necessary to return your equipment to useable condition. Customers can select their equipment to be repaired according to levels of repair for BOPs and wellhead equipment.



Certificate of Conformance

For wellheads, a Certificate of Conformance (COC) is issued upon completion of inspection in the field. For BOPs, a COC is issued upon completion of the repair and remanufacturing process at a Cameron-approved facility. Backed by design, engineering, and industry standards, the COC states the condition of the equipment per Cameron quality procedures.

TEST AND FIX LEAKS

- Pressure test, correction of any leaks, and minimum repair is completed as necessary for desired product performance
- Customer approval obtained prior to fixing leaks

FIRST CLASS

- For 18-3/4" and 15,000 psi or greater BOPs
- For all wellhead equipment
- Certification to API specifications
- Disassembly, inspection, and repair/remanufacture to meet all original specifications of the Cameron manufactured part

WORKING CLASS

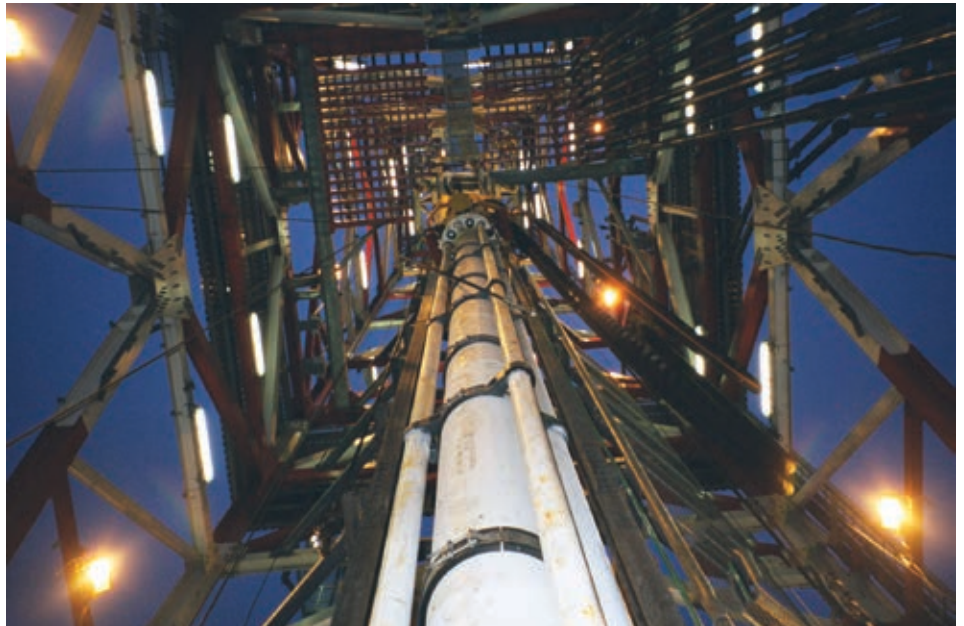
- For all 3000, 5000, and 10,000 psi BOP equipment
- For all wellhead equipment
- Disassembly and inspection
- Part replacement, welding, repair, heat-treatment, and machining
- Reassembly and testing
- Non-OEM parts are replaced with Cameron parts

COMBINATION CLASS

- For all BOP equipment
- API dimensions and specifications are maintained
- Repair/remanufacture (well bore wetted and pressure-containing components improved to first-class repair level; hydraulic system to working-class repair level)
- Inspection and repair of BOP operating system

Riser Recertification Program

The drilling riser acts as a conduit that provides extension of an oil well to a drilling facility, so its ability to create a barrier against leakage is vital. Corrosion, pitting, erosion, component deterioration, mechanical damage, or missing parts can affect riser integrity and can lead to riser downtime or failure.



In line with many operators' need to extend riser service life, Cameron offers comprehensive inspection and recertification services for drilling risers. As an OEM, we have full access to the original performance/design criteria. Our design and quality engineers have developed recommended procedures for preventive maintenance, inspection, and testing. We also provide a full range of equipment maintenance services, such as disassembly, inspection, repair/remanufacture, reassembly, testing, and parts replacement.

Our field service and inspection technicians are equipped with the appropriate tooling and are thoroughly trained in the processes and procedures of installing the risers. They help to ensure proper storage of risers to avoid potential mechanical damage and promote safety, apply rust preventatives and clean the internal diameter.

Riser inspection typically occurs two to three times per year, depending on operational needs. However, more frequent inspection and maintenance may be required, depending on well condition, the owner's preventive maintenance, inspection and testing (PMIT) program, or OEM recommendations. A Certificate

of Conformance – Fitness-for-Service document is issued following inspection, and maintenance of the well control equipment is carried out in accordance with OEM recommendations and the PMIT program. Inspection and maintenance activities follow this process:

1. Verification of markings
2. Disassembly
3. Cleaning
4. Inspection/evaluation
5. Repair/remanufacture/replacement
6. Assembly
7. Testing
8. Marking/coating

Risers are restored to a level per SP-001060-04 and SP-001060-19.

BOP and Riser Recertification



cameron.slb.com/recertification

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