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BVAA CODE OF PRACTICE FOR THE REPAIR OF INDUSTRIAL VALVES AND ACTUATORS



Foreword:

The British Valve & Actuator Association (BVAA) was formed in 1939 and represents over 170 companies engaged in the manufacture or supply of valves, actuators, and related products and services. We provide our members with excellent business support, development and networking opportunities. We are also the industry's training and technical authority.

This Code of Practice for the Repair of Industrial Valves and Actuators was prepared by BVAA's Repair Working Group.

The Repair Working Group comprised BVAA members involved in the manufacture of valves and actuators, BVAA members from the repair and refurbishment community, and also experts drawn from the valve and actuator owner / user base.

This Code of Practice supersedes the previous BVAA publication '*Industry Guidelines – The Repair/Reconditioning of Industrial Valves and Actuators*' published in 2005.

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Objectives:

- *To specify a Code of Practice in the repair or reconditioning of valves, actuators and related products, excluding modifications and upgrades.*
- *To provide a statement of the responsibilities falling on the manufacturers, repairers and owners involved in the repair of valves, actuators and related products.*

Scope:

- *For the purpose of this document the process of repair will include the identification, examination, dismantling, inspection, reporting, reassembly and test of the valve, actuator or related product either in situ or within a workshop, including all relevant documentation pertinent to the repair.*
- *It should be noted that the original manufacturer, his authorized agent, or a competent repairer is best placed to undertake repair.*
- *Auditable adherence to this Code of Practice is mandatory for all BVAA Approved Repair Scheme members who repair valves, actuators and related products.*

Definitions:

'Equipment' - For the purposes of this code of practice; the valve, actuator and products relating to the functioning of the valve and/or actuator, including but not limited to: Interface brackets, drains/bypass valves, actuator mounted electric/pneumatic/hydraulic control equipment, handwheels, levers, gearboxes and mechanical locking equipment.

'Original Supplied Specification' - The specification of the original manufacturer applicable to the equipment at the date it was manufactured, together with any appropriate amendment.

'Original Equipment Manufacturer (OEM)' - The manufacturer of the equipment when the product was first put into service.

'Owner' - The person placing an order to have equipment repaired or reconditioned (this may be the owner, or a sub-contractor acting on his behalf).

'Repairer' - The person carrying out the repair or re-conditioning of the equipment. This may be the OEM, a third party (e.g. Authorised Agent) or the owner of the equipment.

'Authorised Agent' - A repairer, approved by the OEM, that can demonstrate the ability to conform to strict criteria.

'Competent Person' - A person who has acquired through suitable training, qualifications or experience, or a combination of these, the relevant knowledge and skills to competently carry out the stated tasks in this Code of Practice.

'Pressure Equipment Directive' - The European Directive (97/23/EC) on the approximation of the laws of the Member States concerning pressure equipment. Transcribed into UK law as 'The Pressure Equipment Regulations' 1999 (Statutory Instrument No. 2001).

'ATEX Directive' - The European Directive (94/9/EC) regarding equipment and protective systems intended for use in potentially explosive atmospheres.

'Low Voltage Directive' - The European Directive (2006/95/EC) regarding electrical equipment designed for use within certain voltage limits.

'EMC Directive' - The European Directive (2004/108/EC) on the approximation of the laws of the Member States relating to electromagnetic compatibility.

'CE Marking' - A mark indicating that the equipment conforms to the requirements of all applicable European directives.

'Hazardous Area' - Area endangered by potentially explosive atmosphere created by the presence of flammable gasses, vapours or dust.

'COSHH' - Control of Substances Hazardous to Health Regulations 2002 (Statutory Instrument No. 2677).

CE Marked Equipment:

When repairs are carried out to any CE Marked equipment, the requirements of all other applicable Directives such as PED, ATEX, LV, EMC, must be addressed.

The repair of pressure equipment (valves or actuators) is not included within the scope of the PED. As such, any repair undertaken should follow the requirements of this Code of Practice and the repairer shall be able to demonstrate adherence to the requirements of the PED.

When the repair of equipment, CE Marked to the PED, does not involve the replacement of the main pressure bearing parts (i.e. body, bonnet, cover or actuator cylinder etc) and the equipment is returned to the original service (i.e. fluid, pressure and temperature) the original CE Marking remains valid.

Valve & Actuators for Hazardous Area Duties:

Equipment approved for use in Hazardous Areas must be repaired and maintained strictly in accordance with the OEM procedures.

In addition, for equipment conforming to the ATEX Directive the repairer should meet the requirements of EN 60079-19: Electrical Apparatus for Explosive Gas Atmospheres – Part 19: Repair and overhaul for apparatus used in explosive atmospheres (other than mines or explosives).

For other hazardous area equipment codes such as IEC, NEC, etc, the repairer shall adhere strictly to the OEM procedures and any relevant code pertaining to equipment repair.

SECTION 1**OWNER, REPAIRER, ORIGINAL EQUIPMENT MANUFACTURER -
RELATIONSHIP & RESPONSIBILITIES****1.1 Responsibilities Falling on the Owner:**

- 1.1.1 The owner or his agent shall provide the repairer with documentation detailing any decontamination processes applied, and appropriately reflecting any potential remaining contaminants, their hazards, and how best to deal with, protect against and dispose of them. A *'State of Contamination Certificate'* shall accompany all equipment.
- 1.1.2 Prior to handover to the repairer, the owner shall endeavour to address and eliminate any other potential hazards, including trapped process media, stored pressure and energy, or any other perceived risks associated with the type of equipment in question. Any outstanding concerns shall be communicated to the repairer in writing.
- 1.1.3 The owner shall address any concerns raised by the repairer, supply requested information and show a duty of care to the repairer to ensure that the repair can be carried out safely.
- 1.1.4 The owner should maintain and provide technical detail of the valve to allow reasonable time for the specification and procurement of spares prior to the repairer's receipt of the valve.
- 1.1.5 The owner shall provide all appropriate technical information to enable the repairer to properly assess the equipment prior to stripping and to ensure correct calibration during set-up and testing.

1.2 Responsibilities Falling on the Repairer:**The Repairer Shall:**

- 1.2.1 Maintain a Quality Assurance System meeting the requirements of an appropriate international standard such as ISO 9000, ASME VIII or equivalent.
- 1.2.2 Maintain a safe system of work for the repairer's scope of activities, including the following:
- Valid risk assessments and method statements to cover on site and workshop activities
 - Tooling, testing and all other equipment suitable for safe operation in conjunction with valid risk assessments
 - Suitable personal protective equipment fit for purpose and in compliance with the risk assessments
 - Maintenance plans and calibration schedules that ensure equipment safety and availability is maintained.
- 1.2.3 Maintain appropriate procedures to safely handle and dispose of all waste associated with the repair, in accordance with statutory requirements.

1.2.4 Work in accordance with the published technical documentation from the OEM. In cases where technical documentation is not available from the manufacturer, and where agreed between the owner and the repairer, with the approval of the Competent Person, a documented procedure, applicable to the equipment type, may then be used.

Important Note: This does not apply to Safety / Relief Valves, safety related and nuclear/hazardous area certified actuators where access to OEM technical documentation is essential.

1.2.5 Work in accordance with the Owner's contract requirements, clarifying any ambiguous or conflicting details as necessary (refer to 1.2.8).

1.2.6 Use the OEM's spare parts, or components demonstrably of equivalent specification and quality if the manufacturer's parts are unavailable (see clause 2.1.6).

1.2.7 Possess and maintain a level of knowledge and expertise that is appropriate to the scope of services provided to the owner in the following areas:-

- Training and competence of personnel
- Suitably calibrated measuring and test equipment
- Controlled technical data library available for reference.

1.2.8 Ensure that, after repair, the equipment operates in accordance with, and meets the performance requirements of, the following (defined in order of precedence):-

- The owner's equipment contract requirements
- The OEM's specification.

1.2.9 Inform the owner and agree an acceptable alternative test procedure where circumstances or operating conditions dictate that the OEM's original test specifications, or an appropriate international standard, cannot be used. The test procedure used shall be identified in the test documentation.

1.2.10 Create appropriate documentation of the repair that details the fitting of any new parts and the results of any final tests and make them available to the owner.

1.2.11 Repairers shall document and be able to demonstrate the following Qualifications and Competences:-

- Relevant / minimum qualifications
- Suitable documented training including any OEM training courses
- Proven experience in equipment repair
- System of measuring and maintaining competence.

1.2.12 Repairers will be responsible for the control of sub-contractors activities related to part of the repair such as valve specialist subcontracting or the actuator repair to an actuator specialist.

1.3 Responsibilities Falling on the Original Equipment Manufacturer:

The original equipment manufacturer shall:

- 1.3.1 Make available original manufacturers' spare parts to the repairer or owner on request. Spares should continue to be available for a minimum period of 10 years following the last manufacture of the equipment design.
- 1.3.2 Support Owners' or Repairers' reasonable requirements for technical information, i.e. a General Arrangement drawing including list of parts, in support of standard maintenance procedures.
- 1.3.3 Make available to the owner or repairer dimensional details and wear limits, where known, that are subject to wear in service and directly affect the functional performance of the product, i.e. seat widths, minimum flow areas, etc.
- 1.3.4 Make available appropriate technical data and maintenance procedures in order to allow the repair and testing of the product in line with the original standards of manufacture, on an appropriate commercial basis.
- 1.3.5 Record and maintain any issue of, or modification of, spare parts for traceable equipment and make this data available to the owner when required, or to the repairer on the owner's behalf.

SECTION 2**REPAIR / RECONDITION PRACTICES****Examination prior to reconditioning.****2.1 General Requirements**

- 2.1.1 The scope of the repair shall be agreed between the customer and the repairer prior to the commencement of the repair.
- 2.1.2 The repairer shall comply with the requirements of this Code of Practice. It is essential that the repairer employs a traceable documented quality process which records all repair activity in compliance with BS EN ISO 9001: 2008 or equivalent.
- 2.1.3 Should the equipment supplied from the customer for repair require replacement, it shall not be substituted without prior approval from the customer. All parties concerned must be in agreement that replacement equipment is fit for purpose.
- 2.1.4 New components purchased from the manufacturer are preferred over weld repaired items. If components are to be weld repaired, they shall be metallurgically, functionally and dimensionally equal to the original component. Weld repaired components shall be completed in accordance with the appropriate material code/standard.
- 2.1.5 All seal and gasket-type 'soft components' should be replaced with new. Careful consideration should be given to the examination and possible replacement of pressure containment fasteners in relation to the equipment operating conditions and design.
- 2.1.6 Replacement parts should be 'original equipment' provided/supplied by the original manufacturer. OEM parts replaced should be as per the original 'supplied' specification, unless agreed by the valve repairer and the customer. Such replacements shall be in accordance with a defined procedure, subject to the approval of the Competent Person. Replacement parts should be recorded on the valve repairer's quality process documentation.
- Important Note: Equipment with a safety-critical function or hazardous area certified shall only be repaired with OEM supplied parts. For actuators and gearboxes designed to resist valve thrust forces, repair of thrust retaining components shall only be with OEM supplied components.*
- 2.1.7 Non-OEM parts manufactured by the repairer shall comply with the original parts' specification and the design/material shall not be altered. Full traceability of the manufacturing process shall be maintained. Such parts shall be in accordance with a defined procedure, subject to the approval of the Competent Person. Replacement parts should be recorded on the repairer's quality process documentation.
- 2.1.8 Any agreed and/or recommended specification amendments and/or upgrades shall be agreed with the owner and recorded on the valve repairer's quality process documentation.

2.2 Valve Decontamination

The repairer should ensure prior to commencing any work that the assembly has been decontaminated as far as is reasonably practicable and be aware of any hazardous process substances that could be present by being in possession of a Material Safety Data Sheet (MSDS) with specific COSHH data.

2.3 Work Preparation

2.3.1 Prior to dis-assembly, information contained on the equipment shall be checked against customer supplied data and shall be recorded on the repairer's quality process documentation. The assembly shall be individually identified with the repairer's unique reference.

2.3.2 Any specific owner requirements, including external or internal procedures, standards and or codes of practice, should be identified at this stage and recorded on the valve repairer's quality process documentation.

2.3.3 The repairer shall record the following information:-

- Full product specification
- Inspection processes
- Technician identity
- Tool/calibration/test equipment identity
- Spare part usage
- Test detail (pre and post)
- Test results
- Calibration results
- Paint specification
- Inspection identity.

2.4 Pre-test Precautions

2.4.1 Prior to test or dis-assembly, precautions shall be taken to safely release trapped pressure, trapped product and/or stored energy or any other perceived hazards by means of a valid Risk Assessment and a method statement / procedure to minimise such hazards.

2.4.2 Where practicable and safe it is good practice to conduct equipment pre-tests to validate the functionality of the equipment in the 'as received' condition.

2.4.3 Any pre-test results should be recorded on the repairer's quality process documentation.

2.5 Disassembly and Examination

- 2.5.1 Equipment component orientation and alignment shall be recorded. Equipment can also be photographed to assist with re-assembly, clear identification of direction of flow, actuator supply and control connections etc.
- 2.5.2 A valve assembly should be dis-assembled to component level in accordance with OEM's recommendation. The valve should be cleaned employing appropriate cleaning materials/agents.
- 2.5.3 The actuator, gearbox and any interface bracket assembly, applicable to operating the valve, shall be disassembled to a level necessary to affect the repair in accordance with the OEM's recommendations.
- 2.5.4 All components shall be visually inspected for defects. Additional examination such as magnetic particle, radiography, dye penetrant or other methods may be utilized to determine the extent of defect. Defects shall be recorded on the repairer's quality process documentation.
- 2.5.5 All components shall be stored together in appropriate containers clearly marked with the repairer's unique reference, for identification purposes. To ensure valve shell component integrity, these components shall be stripped of paint, where required. Any components considered to be unsuitable for re-use shall be segregated and clearly identified accordingly. With the exception of soft components, these should be available for customer inspection, if required.

2.6 Welding, NDT and Special Processes

- 2.6.1 Welding and NDT processes shall be performed by qualified personnel only, using approved written procedures and controlled equipment. Personnel performing welding on pressure containing components shall have an appropriate third party qualification in line with a recognised international standard (e.g. ASME IX). Results of NDT and welding processes shall be available for verification.
- 2.6.2 Welding on non-pressure containing parts should be appropriate for the materials involved and using controlled welding procedures that are approved by a suitably qualified person.
- 2.6.3 Before any welding is carried out, material identification is to be completed, where possible always refer to the original material certification for proof of material grade and heat treatment condition. PMI instruments may be used to identify materials where their accuracy is appropriate for purpose.

2.7 Preparation Prior to Welding

- 2.7.1 Defect Removal - Defects in excess of acceptable standards agreed with the owner shall be removed by suitable means. The wall thickness of pressure containing parts shall be

maintained in accordance with international product standards. Non-pressure containing parts may be in accordance with the owner's requirements.

- 2.7.2 If removal of surface defects to an acceptable standard does not result in reducing wall thickness below the acceptable value specified in the international product standard, the area shall be blended smoothly into the surrounding surface.

2.8 Repairs by Welding

The following guidelines should be adhered to at all times:-

- 2.8.1 Following defect removal, inspect the excavated area using the NDT method which originally disclosed the defect. NDT approved operators and procedures must be adhered to in accordance with the process being used.
- 2.8.2 Approval of a weld repair should be obtained from the customer / end user prior to commencing the weld repair.
- 2.8.3 Post-weld heat treatment shall be carried out in accordance with the weld procedure considering welding materials and service conditions.
- 2.8.4 Inspect the post-weld surface using the same NDT methods and criteria used to find the defect.
- 2.8.5 Pressure retaining parts should be hydro tested to 1.5 times the pressure rating of the valve. This should be carried out post-weld.

2.9 Equipment Assembly

- 2.9.1 Where practicable, equipment should be assembled in accordance with the OEM's maintenance manuals. In cases of OEM manuals no longer being available a controlled written procedure must be followed. Where an appropriate procedure does not exist, one must be produced by a Competent Person.
- 2.9.2 Suitable assembly lubricants applicable to the equipment service conditions shall be used. Interfaces between valve seat and disc sealing faces shall be free from any grease or sealant unless specified in the OEM's maintenance manual. On 'critical service' valves (e.g. Oxygen, Chlorine, Hydrogen, Nuclear, etc.) agreement from the end user should be obtained and recorded to confirm lubrication requirements. For actuators and gearboxes, lubricants shall meet the OEM's specification.
- 2.9.3 Fasteners used for equipment pressure containment and mounting shall be torque tightened to the values quoted by OEM. If torque tightening values are not available, fastener size, material and component material being fastened (as applicable) shall be used to determine acceptable values. Tightening should be done in an even, progressive, cross-diagonal pattern. All bolting should be fully engaged and the bolt thread shall extend at least 1 pitch or 2.5mm beyond the face of the nut.

2.9.4 Equipment shall be re-fitted in the 'as received' orientation. In cases where the owner requires a change in orientation to the equipment arrangement, a risk assessment shall be carried out and documented to ensure correct operation, mechanical support and access remain within the specification of the equipment. Changes shall be recorded.

2.10 Valve Pressure and functional testing

There shall be a procedure to ensure that all repaired valves are tested for shell strength, seat tightness and functionality in accordance with international standards, unless a specific alternative has been requested by the end user. The testing must always relate to the pressure class for the valve to ensure over pressurisation does not occur during testing. The standard used and test results shall be recorded on the test certificate. The test procedure applied must be compatible with the process conditions and be agreed with the owner.

Note: Where a valve has been stripped of its paint, it shall be tested in accordance with the above procedure prior to re-painting.

2.11 Actuators

All repaired actuators shall be tested for functionality in accordance with the OEM instructions. Pneumatic and hydraulic actuators shall also be pressure tested in accordance with the manufacturer's recommendations to confirm sealing integrity of the actuator body and internal seals.

Where replacement or repair of components affecting output torque performance have been made, the actuator shall be tested to ensure that the output torque produced meets the OEM's specification.

2.12 Supplementary Testing

Additional tests may be carried out at the specific request of the end owner. This should be confirmed in writing. All test results shall be recorded.

2.13 Protection and preservation

Consideration shall be given to corrosion protection in line with owner requirements.

The repairer shall ensure that all protective substances do not present a hazard and shall also clean and dry the valve interior should special conditions require it.

All openings or joint facings shall be protected to prevent the ingress of dirt and damage during transit.

Should the equipment be stored with the repairer, storage conditions shall be in line with the OEM's instructions.

2.14 Traceability of Repair

Upon satisfactory completion, the tested equipment shall be marked and securely labelled for traceability purposes. This should include the repairer's company name, job identification and date of repair.

Valves - If it has been removed during the repair, a valve's original valve nameplate should be re-fitted, but shall only be updated if the valve specification has been changed or the data contained is misleading. Where updating the original nameplate is not practicable, a replacement label with the amended data shall be securely attached. In cases where the valve specification has been changed the repairer should inform the OEM of the changes made in order that they can update their records as described in 1.3.5.

Actuators - Actuator nameplates shall not be replaced or updated without approval from the OEM.

SECTION 3 - CERTIFICATION AND DOCUMENTATION**3.1 Certification**

Certification shall contain at least the following information:-

- The Repairer's name and address
- Date and unique identification of certificate
- Owner's name, address and order reference
- Equipment details including unique reference
- Original Manufacturer's serial number (where available)
- Repair description and test details
- Any other details, as requested by the Owner
- The signature of the Repairer's representative.

3.2 Documentation**By the Repairer:**

To permit traceability, the following documents shall be uniquely identifiable to the repaired equipment and must be retained for 10 years.

- 3.2.1 Copies of all relevant documentation received or processed, including material certificates, details of work carried out, and / or list of replacement parts used relating to the repair of the equipment.
- 3.2.2 Records of Weld procedures, Welder Qualification, Welding Consumables, NDT Operator Qualification and NDT inspections undertaken.

By the Owner:

It is recommended that: -

- 3.2.4 Records should be maintained of all repairs / reconditioning work performed on the equipment, including a copy of all certification.
- 3.2.5 Records of all modifications carried out on the equipment should be retained for a minimum period of 10 years.