

SCOPE

- I 1.1 This practice covers the design, construction, performance, operating controls, installation, and testing of **electric motor operators** for valves.
- I 1.2 **An asterisk (*)** indicates that a decision by the Owner's Engineer or purchaser is required, or that additional information is to be supplied by the purchaser.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I 2.1 **Table 1** lists the practices which shall be used with this practice.
- I * 2.2 **Table 2** lists practices and standards which shall be used with this practice, as specified by the Owner's Engineer and the purchaser.

TABLE 1

PRACTICES	
IP 14-3-1	Fireproofing
IP 15-6-2	Environmental Protection for Instrumentation
IP 15-10-1	Instrument Transmission Systems
IP 16-1-3	Protection of Electrical Equipment in Contaminated Environments
IP 16-2-1	Power System Design
IP 16-3-1	Wiring Methods and Material Selection
IP 16-4-1	Grounding and Over-Voltage Protection
IP 16-13-1	Field Installation and Testing of Electrical Equipment
IP 20-1-1	Inspection of Equipment and Materials

TABLE 2

PRACTICES	
IP 3-12-1	Valve Selection
IP 16-1-1	Area Classification and Related Electrical Design for Flammable Liquids, Gases, or Vapors
IP 16-1-2	Area Classification and Related Electrical Design for Combustible Dusts
STANDARDS	
ANSI / NEMA Standards	
ICS 6	Enclosures for Industrial Controls and Systems
ICS 250	Enclosures for Electrical Equipment (100 volts maximum)
ANSI / NFPA Standard	
70	National Electric Code (NEC)
CSA Standard	
C22.1	Canadian Electrical Code (CEC) - Part 1
IEC / CENELEC Standards	
529 / EN 50529	Specification for Degrees of Protection Provided by Enclosures (IP Code)
UL Standard	
UL 1709	Rapid Rise Fire Tests of Protection Materials for Structural Steel

- I * 2.3 Vendors shall comply with any **local rules or regulations** specified by the Owner's Engineer. **For other conditions of procurement and implementation** the applicable standards of manufacture and test will be specified by the purchaser.
- I 2.4 The **valve supplier and/or the operator vendor** shall assume **overall engineering responsibility** including, but not limited to, sizing the operator components, mounting the operator on the valve, terminating operator side control and power wiring inside the operator enclosure, and stroking the valve to set the limit and torque switches.

IP 15-9-2		Electric Motor Operators for Valves	EXXON INTERNATIONAL PRACTICE
Page 2 of 7			
Rev. 0	June 1997		

(This practice is appropriate for attachment to Inquiry or Purchase Document)

DEFINITIONS

- I 3.1 An **Electric Motor Operator** is a totally enclosed self contained electro-mechanical unit, consisting of an electric motor driver, stem nut reduction gearing, lost motion device, thrust bearings (where applicable), handwheel, and local position indicator. The operator also contains electrical control equipment, including torque and position sensing devices, space heater where needed, and wiring terminals. Operators may also contain control power transformer, integral reversing motor starter with electrical and/or mechanical interlocks, and motor starter controls.
- I 3.2 **Motor Operated Valves (MOV)** are valves with an electric operator that has actuating pushbuttons and position indicating lights installed integral with, or located adjacent to, the operator for use during normal process operations. These valves may also, in some cases, be operated from the control house.
- I 3.3 **Emergency Block Valves (EBV Type C or EBV Type D)** are valves for isolating or depressurizing during an emergency. EBV's are installed at strategic locations to isolate/shutdown equipment, or to enable the depressuring, removal, or displacement of the flammable material inventory of process vessels. Power operated EBV's, typically electric motor or double-acting piston type operators, may be Type C or Type D.
EBV Type "C" are typically large line size valves (10 in. or larger) that are installed at least 25 feet (7.5 m) from the equipment to be isolated, and located no higher than 15 feet (4.5 m) above grade. The actuating pushbutton(s) and position indicating lights for such a valve are installed locally at the valve actuator.
EBV Type "D" are valves whose actuating pushbutton(s) and position indicating lights are located away from the valve at a readily accessible and safe location, at least 25 feet (7.5 m) horizontally away from the potential leak source and such that it can be operated from grade. Type "D" valves are selected for installations where the valve is not readily accessible in an emergency situation.
- I 3.4 **Torque Sensing** is an integral operator function used for valve operations. It must be responsive to the mechanical torque developed in driving the valve either open or closed, or by intermediate obstructions met in either direction, or encountered at the end of valve travel.

OPERATOR DESIGN REQUIREMENTS

GENERAL

- I * 4.1 The use of integral and/or remote mounted motor starter and control transformer will be specified by the Owner's Engineer.
- R 4.2 Stem Protector. For **rising stem valves**, a weatherproof galvanized or painted schedule 40 steel pipe cover shall be provided for the stem extension above the operator, and threaded into the operator enclosure to protect the valve stem.
- I * 4.3 **Materials of construction** shall be manufacturer's standard for the specified environmental exposure, unless otherwise specified by Owner's Engineer.
- I 4.4 **Fireproofing** is required for operators, and wiring systems in specified fire hazardous areas in accordance with [IP 14-3-1](#). The fireproofing materials and methods for the valve operator, and power and control wiring systems, shall be as specified in [IP 14-3-1](#), Section 7.
The use of **intumescent epoxy coatings** is the preferred method for fireproofing electric motor operators, except where the operator is subject to long-term exposure to high ambient temperatures [greater than 150°F (65°C)], or where the nature of the fire is likely to be jet impingement.

HANDWHEEL AND CLUTCHING MECHANISM

- O 4.5 The operator shall be equipped with a permanently attached handwheel of the automatic declutching type that precludes mechanical engagement of the handwheel while the driver is in operation.
The **declutching device** shall:
 - a. Allow power over-ride of the handwheel operation at all times.
 - b. Permit manual handwheel operation of the valve in the event of a frozen or seized driver.
- O 4.6 **Handwheel drive** shall permit the valve to be stroked open or closed in 15 minutes or less, by one person. Rim pull on the handwheel during valve unseating shall not exceed 100 lbs (4.5 N) force total. Rising valve stem shall not interfere with handwheel operation.

LOCAL VALVE POSITION INDICATION

- O 4.7 A **mechanical position indicator** shall be provided on the operator showing the open/intermediate/closed valve positions.
- O * 4.8 **Continuous indication of valve position** shall be incorporated in the operator if the valve is specified to be in regulatory service. This shall be achieved by the following methods, and as specified by the Owner's Engineer:
 - a. For rising stem valves, drilling and tapping the top of the valve stem for a 3/8 inch (10 mm) diameter stainless steel rod. This rod shall extend through the protective valve stem extension cover and terminate in a 2 inch (50 mm) diameter stainless steel disk. The rod and disk shall be painted a fluorescent color to allow for easy observation.
 - b. A dial or pointer indication, or digital "percentage open" readout of valve position on the valve operator.
- O,I * 4.9 Local lamp indication of CLOSED and OPEN shall be provided. In the intermediate position, both lamps shall be on. Alternatively, a separate lamp of a different color may be furnished as indication of intermediate position. The specific colors of the lamps shall be specified by the Owner's Engineer.

OPERATOR PERFORMANCE REQUIREMENTS

- O * 5.1 The **operator** shall be of sufficient **size to open or close** the valve through its full stroke at 80 percent of rated voltage and against maximum specified process pressure drop and temperature, as specified by the Owner's Engineer. For all block-valve services, the pressure drop used for sizing shall be the difference between the higher design pressure (of either side) of the piping to which it is attached and atmospheric pressure on the other side.
- O * 5.2 Nominal **operator actuating speed** shall be 12 inches (300 mm) per minute for sliding stem valves, and 1 minute for 90 degree rotation on rotary valves, unless otherwise specified by the Owner's Engineer.
Refer to **Par. 8.4** for the operator actuating speed requirements of valves in EBV service.
- O,R * 5.3 The operator shall be capable as a minimum of functioning in an ambient temperature ranging from minus 20°F (-30°C) to plus 130°F (+55°C). The Owner's Engineer shall specify when more stringent requirements are necessary.

ELECTRIC MOTOR OPERATOR DRIVERS

ELECTRICAL AND MECHANICAL COMPONENTS

- S,R * 6.1 Electrical classification. The entire **motor operator assembly**, including the motor and associated integral controls, shall be suitable for outdoor service and rated for the area classification specified by the Owner's Engineer.
- R 6.2 A **space heater** shall be provided as required in each control enclosure. The heater shall be ceramic, and shall be sized to prevent condensation, with a minimum rating of 10 watts. Space heaters shall not be powered from the control power transformer.
- R 6.3 **Internal operator wiring** to terminals and external control circuit wiring shall be stranded, 18 AWG (1.0 mm²) minimum, copper wiring capable of carrying 5 Amps at voltages up to 240 Volts. Insulation shall be rated for 600 volts and 195°F (90°C) minimum. Individual terminals shall be legibly marked.
- O 6.4 **Temperature compensation** shall be provided according to the manufacturers' specifications for valves operating at elevated temperatures, to allow for stem expansion and contraction without affecting valve seating.

ELECTRIC MOTORS

- I,R * 6.5 Motors shall be rated for intermittent duty, 3 phase and single speed with high starting torque, and totally enclosed with lifetime pre-lubricated (sealed) ball bearings. Motor voltage and frequency will be specified by the Owner's Engineer. Insulation rating shall be Class F, with Class B temperature rise, unless specified otherwise by the Owner's Engineer.