



Assets Planning and Delivery Group
Engineering

Strategic Product Specification

SPS 241 Inline (Axial) Control Valves

VERSION 1
REVISION 3
APRIL 2024

FOREWORD

Each Strategic Product Specification has been prepared to inform Water Corporation staff, consultants and contractors of the requirements for selecting and acquiring a manufactured product to be used in strategic Corporation infrastructure. The definition of 'Product' includes items that comprise assembled components, equipment or plant for mechanical, electrical and civil infrastructure applications.

The objective of a Strategic Product Specification is to specify fit-for-purpose Product which will contribute to the provision of effective water services at least whole-of-life cost and with least risk to service standards and safety. A Strategic Product Specification also provides uniform standards for compatibility of new water infrastructure with existing water assets.

Many Strategic Product specifications have drawn on the design, asset management and operational experience of product performance in live service gained by Corporation over time. Some Strategic Product Specifications have drawn experience of the water industry nationally referencing Australian or WSAA standards.

Strategic Product Specifications are intended to for reference and use in following typical procurement scenarios;

- Capital funded infrastructure design and construction work;
- Private developer funded subdivision infrastructure for takeover by the Corporation;
- Operationally funded infrastructure design and construction work;
- Corporation period contracts for product purchasers;
- Product purchasers for stock or miscellaneous minor work.

A published Strategic Product Specification will, in some cases compromise technical content that is typical of the same (type specification) but may exclude specific requirements that should apply to a particular project or application. In such cases, the project designer is required to document the supplementary project specific requirements in the 'Project Specific Requirements' Appendix.

The text of a published Specification should not be directly modified. In the event that a text variation is considered necessary to accommodate the needs of a particular project or application, the text modification should be documented in the appropriate Clause of a 'Project Specific Requirements' Appendix of the specification.

Enquiries relating to the technical content of this specification should be directed to the Senior Principal Mechanical Engineer, Engineering. Future specification changes, if any will be issued to registered specification users as and when published.

Head of Engineering

This document is prepared without the assumption of a duty of care by the Water Corporation. The document is not intended to be nor should it be relied on as a substitute for professional engineering design expertise or any other professional advice.

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REVISION STATUS

The revision status of this specification is shown section by section below:

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1	1/1	09/04/18	11	Removed Choked Flow definition	JF	SE
1	1/1	30/05/18	9	Added further definition to scope statement	JF	SE
1	1/2	18/07/19	9	Scope of work revised	SE	SE
1	1/3	22/03/24	9-11	Added clauses 1.4.7 and 1.4.14. Update referenced standards and definition Cavitation Limit Curve clause 1.4.6	SE, BG	SE

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Strategic Product Specification

SPS 241

Inline (Axial) Control Valves

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1 Scope and General

1.1 Scope

This Specification sets out requirements for the design, manufacture, assembly, testing, and delivery of double flanged Inline (Axial) Control Valves, also commonly known as needle, piston, sleeve or plunger valves, which are characterised by axial symmetry and flow. This specification additionally includes electric actuators, intermediate gearbox, special tools and supporting documentation for use by the Water Corporation. Valves shall be in new unused condition. This specification is intended for axial valves in which the pressure drop occurs with the flow directed towards the centre of the valve.

Note: This specification excludes globe style control valves which are covered by SPS 240.

1.2 Scope of Work

Equipment and services to be provided by the supplier shall include the following as described in this specification and as required by Section 11 Appendix A: Project Specific Requirements – Purchasing Schedule.

- a. Provision of Drawings and Performance Curves with the bid
- b. Provision of Inspection and Test Plan for acceptance prior to manufacture
- c. Design, manufacture, assembly, testing and delivery of valve complete with actuator and accessories to meet this specification and project technical requirements
- d. All fasteners, gaskets, equipment base plates, packers, shims, eye bolts and any other items necessary for site assembly
- e. Any special tools required for assembly, disassembly and maintenance
- f. Valve drawing and calculations including outline dimensions, weights, section drawings including of shaft, drive pins and sealing arrangements; parts list and materials
- g. Packing and temporary support of all supplied equipment, suitable for road transport to site in accordance with all relevant statutory regulations and suitable for storage in exposed conditions
- h. Installation, operation and maintenance manuals
- i. Recommended spare parts list
- j. Delivery of all supplied equipment to the Delivery Point.

1.3 Referenced Documents

The Specification refers to the following standards,

AS

- | | |
|----------|--|
| 60034.1 | Rotating electrical machines |
| 60529 | Degrees of protection provided by enclosure (IP Code) |
| 5200.000 | Technical specification for plumbing and drainage products |

AS/NZS

- | | |
|------|--|
| 4087 | Metallic Flanges for Waterworks purposes |
| 4020 | Testing of products for use in contact with drinking water |

4158	Thermal-bonded polymeric coatings on valves and fittings for water industry purposes
AS/NZS IEC	
60947.8	Low-voltage switchgear and controlgear. Control units for built-in thermal protection (PTC) for rotating electrical machines
ISO	
9001	Quality management systems - Requirements
IEC	
60085	Electrical insulation – Thermal evaluation and designation
ISO/IEC	
17007	Conformity assessment — Guidance for drafting normative documents suitable for use for conformity assessment
17025	General requirements for the competence of testing and calibration laboratories
17050-2	Conformity assessment Supplier's declaration of conformity Part 2: Supporting documentation
ASTM	
A380/A380M	Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
AS/NZS ISO/IEC	
17000	Conformity assessment - Vocabulary and general principles
BIS IS/ISO/IEC	
Guide 23	Methods Of Indicating Conformity With Standards For Third-Party Certification Systems - Guidelines
Guide 28	Conformity Assessment - Guidance On A Third-Party Certification System For Products - Guidelines
Water Corporation Standards	
DS 26-41	Type Specifications – Electrical – Type Specification for an Electric Actuator for a Waterworks Valve
DS 95	Standard for the Selection, Preparation, Application, Inspection and Testing of Protective Coatings on Water Corporation Assets
A1	Surface Preparation For The Application Of Protective Coatings On Steel Or Cast Iron
F2	High Build Epoxy Coating On Control Valves
WS-1	Welding Specification – Metal Arc welding

1.4 Definitions and Notation

1.4.1 Allowable Operating Pressure (AOP)

The allowable internal pressure, excluding surge, a component can safely withstand in service

1.4.2 Allowable Site Test Pressure (ASTP)

Maximum pressure applied on site in a newly installed pipeline (includes a safety factor and allowance for surge).

1.4.3 Allowable Velocity

The velocity at maximum flow rate for continuous operation through a fully open valve.

1.4.4 Australian Standards

Standards that are developed, published and maintained by Standards Australia

1.4.5 Cavitation

A condition that occurs within the valve when the fluid pressure drops below the fluid vapour pressure forming vapour bubbles which can cause vibration, noise and severe damage upon collapse.

1.4.6 Cavitation Index (Sigma)

A dimensionless number below which the performance of the valve is likely to be affected by cavitation. It is expressed as

$$\sigma = (P_2 - P_v) / (P_1 - P_2)$$

Where σ = Cavitation Index

P_1 = Inlet Pressure; P_2 = Outlet Pressure

P_v = Water vapour pressure relative to atmospheric pressure

1.4.7 Cavitation Index (σ) Limit Curve

A curve showing the Limit of Cavitation Index (σ) vs opening %, specific to the valve cylinder design, below which cavitation damage to valve components may occur.

1.4.8 Certificate

A formal certificate defined in AS/NZS ISO/IEC 17000 and operated in accordance with AS ISO/IEC 17050.1 that, as an outcome of Product Certification, attests Product conformity with the nominated product and test standards and authorizes the use of a Certification Mark.

1.4.9 Certification Body

An independent (or third party) organisation duly accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ) to operate Certification Schemes.

In the case of a non-strategic plumbing Product, a Certification Body means an organisation approved by Standards Australia to administer the National Certification of Plumbing and Drainage Products (NCPDP) Scheme in accordance with AS 5200.000.

1.4.10 Certification Mark

A trademark or other mark of product conformity with a specified standard defined in AS/NZS ISO/IEC 17000 and applied in accordance with BIS IS/ISO/IEC GUIDE 23 that is issued under the rules of a Certification Scheme.

1.4.11 Certification Scheme

A product certification program or system which is operated in accordance with JAS-ANZ Procedure 15 – General requirements for bodies operating product certification systems and in accordance with the general rules of BIS IS/ISO/IEC GUIDE 28 and System No. 5 as defined in ISO/ITC publication - Certification - Principles and practice. In the case of a non-strategic plumbing Product, a Certification Scheme means the NCPDP Scheme.

NOTE: The effect of this is to require maintenance by the manufacturer of effective production control planning in addition to full type testing from independently sampled production and subsequent verification of conformity with specified standards.

1.4.12 Compliant Product

Product that has been assessed, by means of Product Appraisal, as conforming to standards and specifications that are nominated by the Corporation.

1.4.13 Corporation

The Water Corporation of Western Australia.

1.4.14 Inline (Axial) Control Valve

An Inline (Axial) control valve is one where the closing element moves axially in line with the pipeline fluid flow. These are also commonly known as sleeve valve, plunger valve, piston valve or needle valve.

1.4.15 Designer

The person or entity responsible for undertaking the design and selection of the valve on behalf of the Corporation and for preparing this specification including Appendix A - Project Specific Requirements

1.4.16 Manufacturer

An entity or combination of entities that are responsible for selection, processing and control of Product constituent materials or compounds and for the processing equipment that collectively result in the manufactured product.

1.4.17 Maximum Allowable Operating Pressure (MAOP)

Is the maximum internal pressure, including surge that a component can safely withstand in service.

1.4.18 Maximum Allowable Velocity

The velocity at maximum flow rate for intermittent operation through a fully open valve port.

1.4.19 Nominal Size

An alphanumeric designation of size for components of a pipe work system, which is used for reference purposes. It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections.

1.4.20 Notation

Statements expressed by use of the word 'shall' are mandatory or 'normative' requirements of the Specification. Statements expressed by use of the words 'should' or 'may' are 'informative' but not mandatory and are provided only for information and guidance. Notes in Specification text are informative. Notes that form part of Specification Tables are normative. An Appendix to the Specification that is designated 'normative' contains mandatory requirements. An Appendix that is designated 'informative' is provided for information and guidance only. The term 'specified' includes requirements of the Specification and requirements stated or referenced in other project documentation.

1.4.21 Officer

A duly authorised representative or appointed agent of the Corporation.

1.4.22 Operating Envelope

The limits of operating duties (Flows and pressure) that a valve is required to operate within as defined in Table 5.1

1.4.23 Pressure Class (PN)

A classification of pressure by PN number, based on the allowable operating pressure (AOP) expressed in Mega Pascals (PN = 10 x AOP).

1.4.24 Pressure Differential

Is the difference of pressure across the valve that exists under either static or dynamic flow conditions.

1.4.25 Product

A single unit or multiple units of manufactured end product or an assembly of manufactured component products, materials or equipment. This Specification and accompanying Purchasing Schedule define the nature and details of Product to be supplied. In this specification the product shall refer to Inline (Axial) Control Valves.

NOTE 1: An end product is most commonly an output of manufacturing processes that result in finished end products having the same features and characteristics and can be the result of a single or multiple production batches.

NOTE 2: Manufactured equipment and assemblies of Product components or materials are commonly procured for mechanical, electrical and civil infrastructure applications.

1.4.26 Product Appraisal

A formal process whereby Product, including product design, is subjected to systematic engineering assessment to determine Product fitness for prescribed end uses and to evaluate the extent of Product and production systems conformity with nominated standards and specifications. Product Appraisal includes verification of the extent of compliance in accordance with the requirements of a relevant 'Technical Compliance Schedule'

1.4.27 Product Assessor

An organization, Officer or other person who, having demonstrated specialist product knowledge and competence acceptable to the Corporation, is nominated by the Corporation, subjects Product to Product Appraisal and issues one or more Product Verification Reports.

1.4.28 Product Certification

A formal process whereby the production and management systems for the manufacture of Product, are assessed by a Certification Body to evaluate compliance of these systems with prescribed product standards and tests, under Certification Scheme rules.

1.4.29 Product Verification Report

A formal report wherein a Product Assessor evaluates the extent of Product compliance with the nominated product standards and specifications.

NOTE: Verification may be on a project-by-project basis or at agreed intervals, as appropriate to the scope of a Purchasing Schedule and Product end use, subject to determination by the Corporation.

1.4.30 Product Warranty

A formal express undertaking by a Supplier or Manufacturer that Product is:

- In conformity with the nominated product specification and referenced standards;
- Fit for the nominated Product end use or application;

- Designed for sustained operation at the nominated service performance levels for the specified design life;
- Adequately packaged for intended transportation, handling and storage conditions;
- Supported by English language installation, operating and servicing instructions;
- Adequately supported by Supplier capacity to provide technical Product support.

NOTE: Where required, a Product Warranty should indemnify the Corporation against claims made or losses suffered as a result of breach of the Warranty by means of Public and Products Liability Insurances as specified in the undertaking.

1.4.31 Purchasing Schedule

A Corporation purchase order, tender, schedule of prices, bill of quantities, or specification that details the nature, quantity and other characteristics of Product to be supplied, purchased or installed.

1.4.32 Quality System

A management system that establishes, documents, implements and maintains organizational structures, resources, responsibilities, processes and procedures for the manufacture of Product and provision of Product related services in accordance with the requirements of AS/NZS ISO 9001.

1.4.33 Standards Australia

The peak non-government standards development body in Australia which develops Australian Standards

1.4.34 Strategic Product

An essential product whose performance is critical in eliminating risk to the safe and effective provision of water services, which are functions of the Corporation under the Water Corporation Act as licensed under the Water Services Coordination Act.

NOTE 1: Strategic product is most commonly an element of permanent Corporation infrastructure. Ancillary operational and safety equipment, not intended to form part of this infrastructure, may be considered strategic by virtue of enhanced operational performance or personnel safety.

NOTE 2: Plumbing products (end-of-line water service fittings DN 32 or smaller) used in strategic services may, by virtue of statutory and regulatory requirements, be considered strategic in Corporation applications.

1.4.35 Supplier

An entity or combination of entities that is responsible for the supply of Product.

NOTE: A Supplier may be a Product manufacturer, owner, producer, distributor or vendor or an agent, tenderer or contractor for supply of Product or Product related service.

1.4.36 Testing

The determination of Product characteristics by inspection and by the application of specified test procedures.

1.4.37 Valve

The term valve (or valves) referred to in this Specification shall mean Inline Regulating Control Valve (or valves), their primary and secondary gearboxes and electric actuators.

1.4.38 WSAA

The Water Services Association of Australia of which the Water Corporation is a corporate member.

2 Materials and Components

2.1 General

Table 2.1 provides basic or minimum materials of construction of valve components. Alternative materials may be proposed provided they are equivalent or superior in performance, strength, durability and corrosion resistance, subject to acceptance and authorisation by the Corporation.

The vendor shall provide a section general arrangement that includes a full parts list (Bill of Materials). The material, standard and grade of each component shall be specified on the parts list.

Table 2.1 – Material Requirements

Name	Fig	Material	Standard	Grade
Valve Body, Cover	Figure 2-1	Ductile Iron	ISO 1083	JS500-7U or JS400-15U
		Cast Steel	ASTM A216/A216M	WCB
		Stainless Steel	ASTM A351/A351M	CF8M
Piston (Plunger) Guide Rails (Chloraminated water applications)	Figure 2-2	Composite, polymer based bearing material.		Manufacturer select Refer Clause 2.1.3
Piston (Plunger) Guide Rails (All other applications)	Figure 2-2	Aluminium Bronze	EN ISO 24373	S CU 6100 (CuAL8) Refer Clause 2.1.3
Fasteners, Drive Connecting Rod Pins, Drive Keys	Figure 2-1	Stainless Steel	ASTM A276/A276M	316
Crank, Shaft and Drive Bearings	Figure 2-3 Figure 2-4	Nickel Aluminium Bronze, Phosphor Bronze	AS 2738	C95810, C90810
Body and Seat Sealing Ring	Figure 2-2	EPDM		
O Rings	Figure 2-1	NBR, PERB80, EPDM		
Drive Crank	Figure 2-1	Stainless Steel	ASTM A276/A276M	316
Drive Connecting Rod(s)	Figure 2-1	Stainless Steel	ASTM A276/A276M	316
Drive Shaft	Figure 2-3	Stainless Steel	ASTM A276/A276M	316
Piston Complete (Piston & Control Sleeve)	Figure 2-1	Stainless Steel	ASTM A276/A276M	316
Seal/Retaining Complete	Figure 2-2	Stainless Steel/EPDM		316SS/EP80
Piston Hub	Figure 2-1	Stainless Steel	ASTM A276/A276M	316
Thrust Washers	Figure 2-4	PTFE		

Castle Nuts, Nyloc Nuts, Customised Nuts, Washers, Split Pins	Figure 2-4	Stainless Steel	ASTM A276/A276M	316
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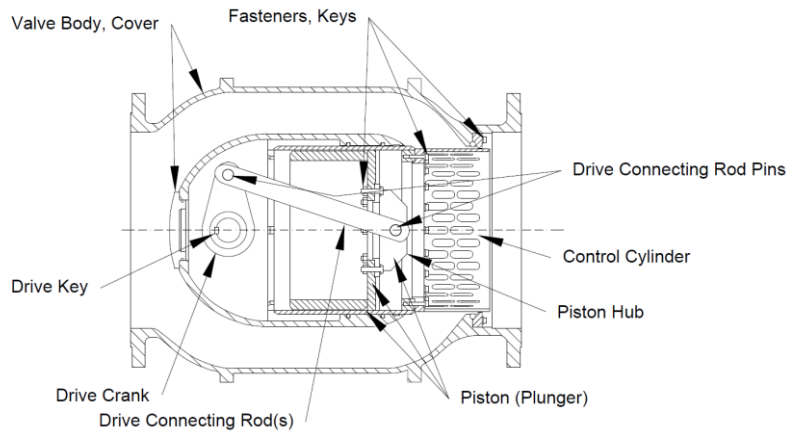


Figure 2-1 Cross sectional view.

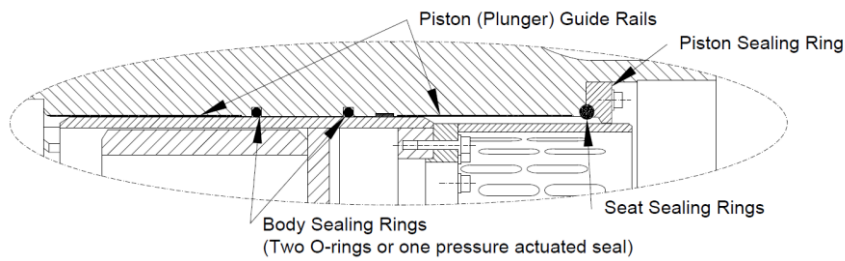


Figure 2-2 Cylinder (piston) details view.

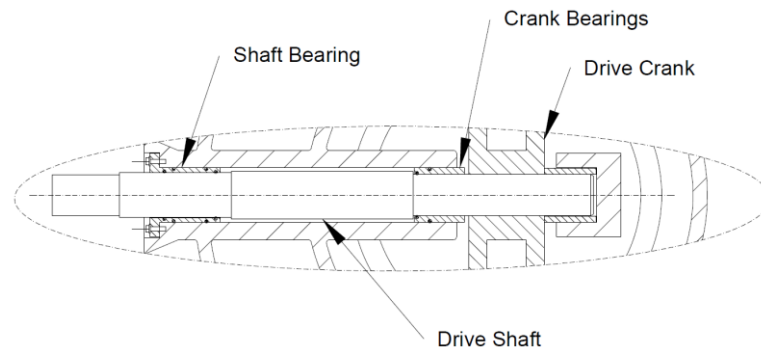


Figure 2-3 Drive shaft arrangement view.

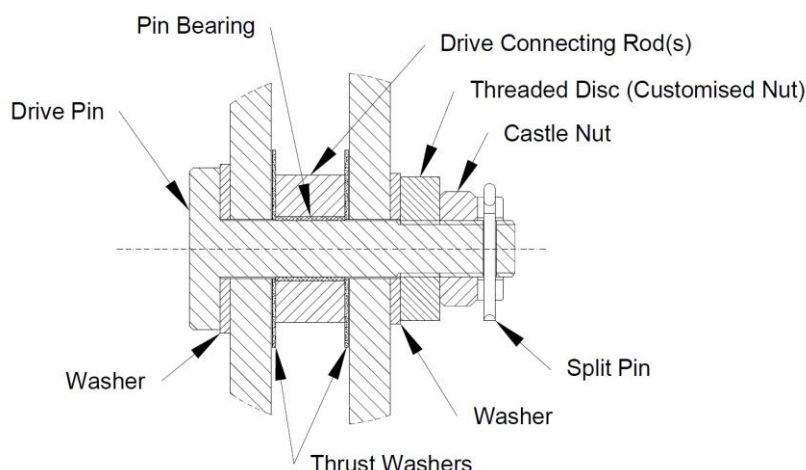


Figure 2-4 Drive pin locking system details.

2.1.1 Material Certification

Material certificates shall be provided for valve body, cover, drive shaft, piston, bearings and slotted sleeves to the requirements of EN10204 Type 2.2.

2.1.2 Non-metallic Materials

Non-metallic materials used in the components of the Product shall be fit for the intended purpose, shall exhibit dimensional stability and resist degradation when exposed to direct sunlight or extended periods of immersion.

2.1.3 Cylinder (piston) Guide Rails

For all general (i.e. non-chloraminated) water applications the cylinder (piston) guide rails shall be weld deposit to the valve body using an Aluminium Bronze weld overlay process. The weld electrode material shall be Aluminium Bronze EN ISO 24373 S CU 6100 (CuAL8) or approved equivalent.

Where specified in Appendix A, valves for use in chloraminated water applications (where the PH may be ≈ 9) shall be manufactured from a suitably selected composite bearing material. Material properties shall include: low friction, high resistance to wear and recognised international drinking water compliance certification. Composite bearings shall be mounted in a suitable corrosion resistant carrier and fastened using corrosion resistant threaded fasteners, to the body of the valve. Carrier threads shall be sealed to mitigate corrosion.

Bronze guide rails attached to the body with screws are not accepted due to the *Water Corporation* having experienced rapid corrosion of this component in a chloraminated water application.

2.1.4 Stainless Steel

Stainless steel castings, plate and bar subjected to welding during the manufacture of any component shall be a low carbon or stabilized grade. Stainless steel components except fasteners shall be passivated in accordance with ASTM A380/A380M. Stainless steel castings shall be heat treated in accordance with AS 2074.

2.1.5 Contamination of Water

Valve materials and coatings shall comply with AS/NZS 4020. Where this isn't available for the manufacturers standard coating, alternate compliance NSF 61, WRAS etc may be considered.

3 Design and Manufacture

3.1 General

Valves shall be suitable for on/off, incremental positioning or modulating control as required in the purchasing schedule.

The valve shall be:

- (a) Integral body, double flange;
- (b) Resilient seated;
- (c) Unidirectional flow;
- (d) Designed for long term durability of components under the range of differential pressure and flow conditions specified in Section 11;
- (e) Selected so that the application Cavitation Index is above the Cavitation Index Limit Curve for the valve at all times;
- (f) Based on design criteria that will provide for a minimum life expectancy of 50 years;
- (g) Designed for actuation with an electric actuator.

Calculations showing the stresses and deformations of valve components occurring under the most adverse conditions specified shall be provided on request.

3.1.1 Design – Operating Conditions (*Designer*)

Inline control valve applications are complex requiring a number of engineering design options and system parameters to be specified. This specification shall not be used for purchasing until the designer has specified the operating envelope, performance and cavitation related information in Table 11.1 in Appendix A, which forms an integral part of the *Purchasing Schedule*. The Designer shall also provide a chart with a minimum of 8 flow data points showing:

- Upstream and downstream pressures vs flow
- Calculated Cavitation Index (σ) vs flow
- Expected frequency of operation (% of time) at each flow interval.

3.1.2 Design – Verification (*Supplier*)

Valves shall be designed and sized to give satisfactory cavitation free performance in meeting the specified operating conditions contained in the *Purchasing Schedule*. The supplier shall demonstrate this by completing the information in Tables 12.2 and associated charts, providing:

- Kv vs position curves
- Cavitation (σ) limit curve, specific to the selected valve cylinder design plotted together with the application Calculated Cavitation Index vs flow
- Flow vs Position curve for the valve in the specified application from 0-100% open position

3.1.3 Designation of Size

Valve size shall be as specified in the *Purchasing Schedule* and reviewed by the manufacturer. The manufacturer may recommend an alternate size, if more suited to the

required operating range and operating strategy. Where the alternate size is accepted, the *Purchasing Schedule* shall be revised accordingly.

3.1.4 Allowable Operating and Test Pressures

Table 3.1– Classification and Rating for Valves

PN	AOP (kPa)	MAOP(kPa)	ASTP(kPa)
16	1600	1920	2400
21	2100	2520	3150
25	2500	3000	3750
35	3500	4200	5250
40	4000	4800	6000

3.2 Environmental Conditions

Valves shall be suitable for permanent location and operation under the environmental conditions specified in Appendix A. Including as appropriate:

- a) At the extremes of ambient temperature specified in the purchasing schedule
- b) Periodic clean-up by means of high pressure hose;
- c) For outdoor applications, an environment containing high levels of windblown sand and dust, subject to rain and extreme solar/UV radiation;
- d) For below ground applications, in an open concrete pit forming a dirty, humid and corrosive environment, potentially subject to flooding.

3.3 Hydrostatic Sealing

Valves shall provide drop-tight shut-off at the 1.1 x AOP (Allowable Operating Pressure) and be leak free under hydrostatic test conditions of 1.5 x AOP (valve open).

3.4 Maximum Rated Velocity

Valves shall be designed for water velocities not exceeding the following,

- a) Valve inlet and outlet 5 m/s for continuous operation
- b) Valve inlet velocity 8-12 m/s for free discharge applications

3.5 Noise

Noise level may be critical factor in the selection of a valve depending on the sensitivity of the location. Accordingly, minimum noise performance may be necessary as required in the *Purchasing Schedule*. Noise from the operating valve shall not exceed 85dBA measured at 1m distance, unless specified otherwise in the *Purchasing Schedule*.

3.6 End-of-Line Service Rating

Valves shall be rated for full end-of-line service at AOP without restraint at the free end.

3.7 End Connections

Valve flanges shall conform to either AS/NZS 4087 or EN1092 drilling and shall be capable of sealing against the appropriate standard mating flange under all operating and test conditions. The Corporation may nominate a preferred standard in the *Purchasing Schedule*. The flange is not to be rated greater than the allowable operating pressure of the valve. The backs of all flanges shall be machined or spot-faced if the rake angle is

greater than 2°, to provide a satisfactory bearing for bolt heads and nuts. Flanges shall be suitable for full-face gaskets.

3.8 Flow Coefficients and Operating Range

The manufacturer shall provide flow coefficient (K_v) curve over the full (0% to 100%) range of valve opening position, and the corresponding performance details requested in Table 12. of Appendix B, and shall indicate the preferred operating range of the valve, at the specified pressures and flows, for long term reliable performance.

Note. Valves shall normally be selected to ensure a minimum opening of ~>10% in normal steady-state system control operation (i.e. excluding transition), in order to promote good control authority of the valve over the hydraulic system and reduce the effects of hysteresis.

3.9 Lifting Eyebolts

Valves assemblies exceeding 25 kg shall be provided with a means for lifting the total mass of the valve assembly. Where provided, eyebolts shall comply with AS 2317.1.

3.10 Position Indicator

All valves shall have a basic position indicator for local operation. Valves shall be fitted with a position indicator (to show the degree of opening) that can be clearly read from the local operating position.

3.11 Welding

All construction welding of steel or cast steel valve components shall be in accordance with AS/NZS 1554.1, Category SP. All welded valve bodies and machined internal parts shall be given post-weld heat treatment in accordance with AS 1210. All construction welding of stainless-steel valve components shall be in accordance with AS/NZS 1554.6, Weld Category 1B.

Welding of the cast body, other than welding for the deposition of the valve seat or guide rails, shall not be permitted.

3.12 Direction of Rotation and Locking

The valves and actuators shall be designed to close when the input shaft of the gearbox actuator is rotated anti-clockwise, e.g. the valve shall close when the operator hand wheel or key is rotated anti-clockwise. All hand wheels shall be fitted with provision for locking with a padlock. Direction of rotation for open/closed positions shall be clearly marked on the handwheel.

3.13 Actuator /Gearbox Orientation

The gearbox, input shaft and actuators shall be located on the side of the valve as specified in the Purchasing Schedule, when viewed from upstream in the direction of flow.

3.14 Actuator /Gearbox Rating and Selection

The Actuator/Gearbox/Valve drive train shall be designed and selected so that:

- (a) The actuator is capable of transmitting a minimum of 150% of the maximum input torque of the gearbox, which is required to operate the valve under 'maximum torque' operating position and conditions.
- (b) Long and reliable service life with the frequency of operation or modulation specified in the purchasing schedule.
- (c) Both the gearbox and valve are capable of receiving the maximum stall torque of the actuator.

3.15 Electric Actuator

Where required in the Purchasing Schedule, valves shall be procured with an electric actuator complying with DS26.41. The Valve Supplier is responsible for correctly sizing the electric actuators based on operating conditions specified in the *Purchasing Schedule*

Failure of the electric motor drive or its gearing shall not prevent manual operation of the valve.

3.16 Vibration Performance

Valves shall be selected so that the following maximum vibration limits when measured at site by RMS non-directional transducer at the horizontal centerline of both inlet and outlet flanges, are not exceeded, throughout the required operating envelope.

- Steady State (Constant flow, differential pressure or valve position) -4.2 mm/s
- Transient States (Changing flow, Differential Pressure or valve position) or infrequent operating duties - 6.1 mm/s

Note: Manufacturer should indicate during tender response where non-compliance with the above values is expected.

3.17 Sealing of Fasteners

All stainless-steel fasteners which are threaded into Cast Iron (Grey or Ductile) components shall be sealed using Loctite 577 or an equivalent AS/NZS4020 approved sealant, to reduce water ingress and corrosion potential.

3.18 Control Cylinder

Where the valve incorporates a control cylinder (piston or sleeve), the working penetrations of the cylinder (holes, slots or polygons) shall be machined by an automated positioning and cutting process (e.g. CNC machining), to ensure a high degree of accuracy of position, linearity and repeatability of all machined surfaces.

External surfaces of the cylinder which are in sliding contact with bearings shall be machined appropriately to ensure optimum bearing life.

Note: refer Figure 2-1 for components naming clarification

3.19 Drive Shaft Bearings Arrangement

Drive shaft bearing arrangement details shall be provided including cross section drawings showing surface finishes, seal and bearing materials, their location on the shaft and the method of lubrication where non-self-lubricating bearings are used.

Note: refer Figure 2-3 for typical arrangement details

3.20 Drive Connecting Rod(s) Pins

A low friction washer (thrust washer - PTFE or similar) shall be used between rotating surfaces to reduce friction related torque on the drive pin locking system.

Drive connecting rod(s) pins shall be secured in place by a threaded disc secured in place against a locknut. The locknut shall further incorporate a secondary locking system (Loctite 577, Castle nut and split pin, or Nyloc nut) to secure the connection.

Alternate locking systems may be considered, subject to provision of detailed cross section drawings. Split pins or 'R-Clips' shall not be used as the sole means of securing drive pins in place.

Note: refer Figure 2-4 for typical arrangement details and components naming clarification

3.21 Drive Connecting Rod(s) Bearing

The Pin Bearings at the connection of the Piston Hub and Crank Arm shall be of self-lubricating design (e.g. PTFE lined sintered bronze). The drive pins shall be held in place as required for the drive connecting rod(s) pins (see clause 3.20).

Note: refer Figure 2-1 and Figure 2-4 for typical arrangement details and components naming clarification

4 Protective Coatings

4.1 General

Ductile Iron and Steel components shall be coated with two pack epoxy coating in accordance with Corporation Technical Specifications F2 as per Water Corporations Design Standard DS95 for Standard for the Selection, Preparation, Application, Inspection and Testing of Protective Coatings on Water Corporation Assets. Valves, actuators and gearboxes shall be coated with either a fusion-bonded polymeric (FBE) coating in accordance with AS/NZS 4158 or two-pack epoxy coating as per F2 Water Corporation specification.

4.2 Coating Design

The corrosion protection system shall be fully effective for all internally wetted surfaces.

The coating of cast iron components at all dissimilar metal interfaces shall form a complete seal in order to prevent formation of galvanic couples. This includes seat-retaining screws, which shall be sealed via the coating or an effective thread sealant. All surfaces that cannot be effectively coated and tested shall be of corrosion-resistant material.

5 Testing

5.1 General

Product shall be tested in accordance with the test requirements of this Specification. Testing shall be deemed acceptable when test outcomes have been formally verified by a Certification Body or witnessed by a testing Officer. Product for which a test requirement has not been met shall be classified as 'non-compliant' Product.

NOTE 1: Testing should be carried out by an organisation accredited by NATA or in accordance with ISO/IEC 17025.

NOTE 2: A testing Officer should normally be an Officer who has specialist knowledge of or training in product or materials testing appropriate to the Product characteristics to be tested.

5.1.1 Notification of Testing

The Corporation shall be notified in writing of each formal test proposal at least twenty-eight (28) days prior to the preparation of Product for testing except where a specified test has been the subject of a current valid Certificate issued by a Certification Body. This notification is required to enable the Corporation to make all necessary arrangements including appointment of a testing Officer in a timely manner.

5.1.2 Access to the Place of Manufacture

The testing Officer shall be afforded access, at all reasonable times, to all places of manufacture of Product or product components and shall be authorised to arrange or undertake such testing there as the Corporation deems appropriate to the testing regime specified.

5.1.3 Place of Manufacture other than WA

Where any Product or product component is being manufactured other than in Western Australia the Corporation may appoint a local inspecting Officer to undertake inspections and witnessed testing as required. The testing Officer shall be provided with all due authority and permits required to carry out testing at the place of manufacture.

NOTE 1: The cost of witnessed testing arranged by the Corporation will normally be borne by the Corporation unless otherwise negotiated.

5.2 Valve Factory Acceptance Tests

The valve shall be tested at manufacturer's works in accordance with the following clauses. Where the contractor is not exempted by full quality assurance certification, the officer shall be present during testing:

5.2.1 Examination of Valve Body and Welds

- (a) The uncoated valve body shall be visually inspected internally and externally.
- (b) Where it is intended to weld stainless steel or bronze to apply weld deposits or overlays for seat rings or guide rails, the following NDT requirements shall apply:
 - i Following machining of the face to be welded, dye penetrant testing shall be carried out to confirm freedom from casting defects.
 - ii Following welding and machining, the finished weld overlay surface shall be inspected visually and by dye penetrant inspection.

The NDT testing and acceptance criteria shall be carried to AS 4041 Class 1 piping.

5.2.2 Body Strength Test

Fit blank flanges to both sides of the valve and unseat the obturator to equalize pressure. Subject the valve to a hydrostatic pressure of 1.5 times the Allowable Operating Pressure for a minimum period of 15 minutes.

During the test there shall be no visible leakage through the shaft seal or any other part of the body. There shall be no plastic deformation or distortion of the valve body or valve components.

The exterior of the valve shall remain completely dry throughout the test.

5.2.3 Piston / Plug Strength

The plug or sleeve strength shall be tested at to a pressure of 1.5 times the Allowable Operating Pressure for 15 minutes. The pressure shall be applied hydrostatically to the upstream of the closed plug or sleeve with the other side of the plug or sleeve open to the atmosphere. There shall be no visible evidence of any damage to the plug or of leakage through the plug itself. No part of the valve or plug shall be permanently deformed by the test. This test shall be performed in both directions.

5.2.4 Sealing test

For actuated valves, the sealing testing shall be performed with valve closed with the actuator stopped by the position limit switches.

The seat seal shall be tested at 1.1 times the Allowable operating pressure for 5 minutes. The pressure shall be applied hydrostatically to one side of the closed plug or sleeve with the other side of the plug or sleeve open to atmosphere. There shall be no leakage past body seals to atmosphere.

5.2.5 Valve operational test

The following valve operational test shall be performed after the strength and sealing tests:

Open and close the valve 3 times via the handwheel or electric actuator and ensure that seating is correct. Check and confirm that opening/closing directions comply with Section 3.12 of this specification.

5.2.6 Coating Test

All coated surfaces shall be tested in accordance with AS/NZS 4158. The entire coated surface (except for external corners or embossed areas) shall be tested for coating continuity using a fully variable DC high voltage holiday detector in accordance with AS3894.1. Defects found during testing shall be repaired, where allowable, in accordance with AS/NZS 4158.

5.3 Inspection and Test Documentation

5.3.1 ITP Documentation and approval

The Manufacturer shall prepare an Inspection and Test Plan (ITP) identifying relevant hold points and reporting requirements applicable to manufacture of the valves. The ITP shall as a minimum include the tests and documentation in Table 5.1.

Inspection and test reports which represent output documents from the ITP shall be provided to and approved by the testing officer, prior to shipping of the valves.

Table 5.1 Inspection and Test Documentation

SPS 241 Clause	Test Type	Valve Reporting Requirements Test Standard
Hold Point – Prior to Manufacture		
-	Check valve, materials and drawings against purchase specification	R - Each Valve. Submission of drawing with bill of materials
-	Check performance curves against required operating envelope	R - Each Valve
	Check Inspection and Test Plan in accordance with this table.	R - Each order
Hold Point – Prior to Dispatch		
2.1.1	Material Certificates	R - Each Valve
3.7	Flanged Connection Type and dimensions	I - Each Valve
5.2.1	Visual inspection – Structural and surface defects	I - Each Valve
5.2.1	Non-destructive manufacturing Tests	R - Each Valve
5.2.2	Body strength test	R - Each Valve
5.2.6	Coating thickness and continuity	R - Each Valve
5.2.3	Piston/plug strength test	R - Each Valve
5.2.4	Seal seat tests	R - Each Valve
5.2.5	Standard operation tests	R - Each Valve
3.8	Hydraulic Performance	R - Each Valve
3.16	Vibration Levels	R - Each Valve
3.12	Direction of closure	I - Each valve
-	Final valve inspection	R - Each valve

LEGEND **I- Inspection – Manufacturer Internal Quality Assurance**
R- Reporting requirement to the Corporation

5.4 Certification

For the purposes of acceptance, each test certificate shall, as a minimum, bear the relevant Product item serial number and shall certify that the Product item has complied with the specified test requirements. Material and Welding NDT Certificates

Where applicable, material certification as per clause 2.1.1 and NDT inspection and testing certificates shall be supplied for each valve.

5.4.1 Certificates for Factory Acceptance Tests

Certificates shall be provided for Factory Acceptance Tests referred to Clause 5.2 of this Specification.

5.5 Site Acceptance Tests

Following installation the valve will be tested by the purchaser's representative at site.

The tests shall include

- a. A full operation test from fully open to closed
- b. A measurement of valve piston/plug position travel versus actuator travel from fully open to fully closed
- c. A measurement of differential pressure across the valve and flow rates at various valve openings
- d. Ability of the valve to maintain a set downstream pressure under various flow conditions
- e. Confirmation of Kv curve at various percentage openings
- f. Measurement of vibration levels and sound pressure level throughout the required operating range where required in the purchasing schedule

The supplier shall be present at these tests if requested in the purchasing schedule.

6 Marking and Packaging

6.1 Marking

Each product shall be marked and packaged in accordance with the following.

6.1.1 Body Markings

Each valve shall have the following cast on the body of the valve:

- a) Manufacturer's name or mark
- b) Nominal size
- c) Year of manufacture
- d) Pressure class (PN) of valve
- e) An arrow denoting essential flow direction if applicable
- f) Serial number (see Note)
- g) Gear ratio (see Note)
- h) The mass of valve in kilograms

The lettering shall be as large as practicable, but not less than 6 mm high for sizes DN 80–DN 150, 10 mm high for DN 200–DN 300, 20 mm high for DN 350–DN 600.

6.1.2 Nameplate or label

Where, owing to size or any other reason, casting of the above lettering is not practicable, such information shall be shown on an engraved stainless steel nameplate.. This nameplate shall be securely attached to a raised pad on the body of the valve casting using stainless steel fixings positioned to be clearly visible after installation.

6.2 Packaging

6.2.1 General

Product shall be packaged with appropriate protection, which shall prevent damage or defects as a result of handling, storage or transportation. Flexible packaging material shall have a minimum expected life in outside storage conditions of 12 months from the date of delivery.

6.2.2 Identification Tag

Wherever requested in the Purchasing Schedule each Product item shall be identified using a weatherproof marking pen on a corrosion resistant metal identification tag securely wired to the Product in a conspicuous position using a galvanized tie wire with the following information:

- a) Material Master Record number (MMR)
- b) Contract number
- c) Purchase order number.

6.2.3 Marking of Packaging

Where requested in the purchasing schedule, the Product shall be identified by marking on the outside of any protective packaging the same information as shown on the identification tag.

7 Manuals

7.1 Format and Language

Where required, Product shall be supplied complete with appropriate installation, operation and maintenance instructions or manuals, in clear diagrammatic and text format, in English

7.2 Content

The manuals shall contain all the relevant information required to commission and maintain the Product in operational service, including the following:

- a) Details of Product features
- b) Operational adjustments, Kv Curve and Noise Curve
- c) Installation and commissioning instructions
- d) Preventative maintenance requirements and intervals
- e) Testing procedures
- f) Trouble shooting guidelines
- g) Complete list of parts and associated exploded views or sectional diagrams and reference part numbers

8 Spare Parts and Special Tools

8.1 Spare Parts

8.1.1 Interchangeability

All spare parts shall be interchangeable for a manufacturer's Product of the same size and model.

8.1.2 Availability

Spare parts and servicing facilities for the product shall be readily available in Western Australia.

Where required in the purchasing schedule, supplier shall supply spares recommended for 5 years operation packaged separately for long term storage.

8.1.3 Special Tools

Any special tools required for service and maintenance of the Product shall be supplied.

9 Transportation, Handling and Storage

9.1 General

Transportation, handling and storage facilities shall be designed to prevent Product damage or defects and to maintain Product free of deleterious matter. Product shall not be dropped off elevated vehicle platforms or sites. Mechanical handling equipment shall be in accordance with AS 2550.1, AS 2550.3, AS 2550.5 and AS 2550.11 and shall be appropriate to the loads to be lifted. Manual handling shall be in accordance with the National Standard for Manual Handling and the National Code of Practice for Manual Handling, published by National Occupational Health and Safety Commission, Australia. Product restraint during transportation shall be in accordance with Load Restraint Guide—Guidelines for Safe Carriage of Loads on Road Vehicles, published jointly by the Federal Office of Road Safety and the National Road Transport Commission, Australia.

NOTE: Where wire ropes or chains are used for loading and unloading, they should not come into direct contact with Product. Lifting elements in direct contact with Product should be of a non-abrasive design e.g. elastomeric or fabric webbing straps. During transportation, Product restraints should be checked for tension at regular intervals of travel and should not be released until the transporting vehicle is resting in a secure stable disposition on level ground.

9.2 Preservation of Product in Storage

Product shall be stored in original Product packaging in accordance with the published requirements of the manufacturer, prior to installation. Sensitive component materials shall be protected from extended exposure to direct sunlight and high temperatures e.g. elastomeric components shall be stored in accordance with the general principles of AS 1646. Designated Product storage areas shall be of sufficient size to accommodate Product deliveries and shall be flat, reasonably level and free of combustible vegetation, sharp stones or projections that could cause Product damage or defects.

10 Quality Assurance

10.1 Certification

10.1.1 Certification of Product

Wherever this Specification requires compliance with nominated Product and test Standards, conformance shall be certified by means of a Certification Scheme, conducted by a Certification Body. Each Certificate shall expressly attest compliance of all Product items with the nominated Standards. Wherever specified, Certificates shall be submitted to the Officer nominated for this purpose. Product shall be marked in accordance with the requirements of the Certification Body.

NOTE: Compliance of Product including related accessories and services with nominated Standards and specified requirements may be verified by means of a Product Verification Report provided by a Product Assessor. The Product Verification Report should identify all relevant Certificates of Product compliance, duly issued in accordance with Certification Scheme rules.

10.1.2 Quality System

The processes for manufacture, testing, supply, transportation, handling, delivery and storage of Product to be supplied in accordance with this Specification shall form part of a documented Quality System. The System shall be certified by a Certification Body as complying with the requirements of AS/NZS ISO 9001 and shall provide for identification and traceability, control of production and delivery to the specified destination, customer verification and control of documents and records.

10.1.3 Product Re-verification

Product compliance with the Specification shall be subject to re-verification by a Product Assessor when, during the agreed Product supply period, there occurs any:

- Substantive change in Product design, material formulation or performance
- Product failure to perform in operational service to the nominated performance specification.

Re-verification shall require the issue of a new or supplementary Product Verification Report. Product components and test outcomes that are not significantly affected by the Product change or failure may be excluded from the scope of re-verification, provided that these outcomes have already been reported in a current valid Product Verification Report that is acceptable to the Corporation.

Wherever the requirements of the Specification apply to a Product supply period in excess of three years, continuing acceptance of Product shall be subject to re-verification. The purpose of re-verification shall be to confirm the continuing compliance of Product quality and production control processes with the requirements of the Specification

10.2 Compliance and Acceptance

10.2.1 Means of Demonstrating Compliance

Compliance with this Specification shall be demonstrated by means of Product Appraisal and issue by a Product Assessor of a Product Verification Report that confirms compliance. Otherwise, Product shall be deemed non-compliant and ineligible for registration as Product authorized for use in Corporation infrastructure.

NOTE 1: Where a project includes design work including Product design, Product Appraisal may form part of the project design review process and the Product Assessor may be a member of the project design review team.

NOTE 2: A Product Verification Report should verify the extent of compliance with the Specification including all relevant 'Technical Compliance Schedule' Appendices and the currency of a Certificate where relevant to the Product.

10.2.2 Acceptance Criteria

For acceptance, Product shall be supplied as specified in the Purchasing Schedule.

Prior to the implementation of any arrangement to supply Product, the Supplier shall, in accordance with specified requirements:

- nominate applicable Product Warranty terms; and
- provide documentary verification in the form of a current valid Certificate or Product Verification Report as appropriate to the Product; and
- detail each element of Product that does not comply with the specified requirements together with the extent of non-compliance.

NOTE: Where the Specification includes Technical Compliance Schedules, the nature and extent of all non-compliances should be provided in accordance with the appropriate Schedules.

10.3 Non-compliant Product

10.3.1 General

Product for which design, workmanship or performance fails to conform to the specified requirements shall be clearly tagged and quarantined by the Supplier as non-compliant and shall be subject to rejection for return to and replacement by the Supplier.

Where the Specification includes a 'Technical Compliance Schedule', Product shall be deemed non-compliant except where a Supplier has demonstrated compliance in accordance with the requirements of the 'Technical Compliance Schedule' Appendices of the Specification.

10.3.2 Manufacturing Repairs (In-process)

Welding, the use of fillers and other repairs shall generally not be permissible on Product which is in the course of production. Repairs to custom-built Products such as axially-split pumps and large valves may be considered only if determined by the Corporation to be minor casting repair work in non-strategic locations. Accordingly, details of any defect which the Manufacturer considers can be repaired; together with details of proposed repair procedures shall be submitted in writing for determination by the Corporation.

The Manufacturer shall make provision in its production Quality System and in the appropriate ITP's for sufficient hold points whenever casting defects are encountered. Production work on non-compliant components shall cease and repair work shall not commence until the following details have been confirmed by the Corporation in writing:

- (a) that repair of the non-compliant components in lieu of their replacement is acceptable; and
- (b) that proposed repair procedures are acceptable; and
- (c) that any proposal to vary the terms of the original Product Warranty as a consequence of the in-process repair is acceptable.

10.3.3 Product Warranty

The Supplier shall replace non-compliant Product with Product that conforms to the acceptance criteria or shall repair or rectify all faults, damage or losses caused by defective Product. Except as may otherwise be specified, the Product Warranty shall indemnify and keep indemnified the Corporation against all losses suffered by the Corporation as a result of non-compliant Product for a period no less than 24 months after Product delivery or 12 months after Product installation, whichever period elapses first.

10.3.4 Product Repair

All reasonable proposals for repair or remedy of defects will be considered, provided that each such proposal is accompanied by a methodology statement that accords with the performance objectives of this Specification, as determined by the Corporation. For acceptance, a proposal for repair or remedy of Product defects shall not void or otherwise diminish the provisions of the Product Warranty.

11 Appendix A: Project Specific Requirements – Purchasing Schedule

11.1 General

Project specific information and requirements not included elsewhere in this Specification shall apply as specified under Clauses 11.2.

11.2 Project Specific Requirements

11.2.1 Project Requirements for Valve

The following table details the project specific design requirements for the Inline Control Valves. The valve shall cover the design range indicated in system curves and further indicated in detail in **Table 12. in Appendix B: Technical Compliance Schedules** (Normative).

Table 11.1: **SCHEDULE OF PROJECT SPECIFIC REQUIREMENTS**

Project Name			
Item No	SPS 241 Clause	Description	Project Requirements
1.0	-	General	
1.1	-	Equipment ID number	
1.2	-	Number Required	
1.3	3.1.3	Size DN (Supplier to review and confirm)	
1.4		Pressure Rating PN	16/21/25/35/40
1.5	3.7	End Connections - AS/NZS 4087 / EN1092 / Either	
1.6	3.13	Actuator /Gearbox Orientation	Left hand side
2.0	3.2	Environmental Conditions	
2.1	3.2	Ambient Temperature (°C)- Min - Max	
2.2	3.2	Average Ambient Temperature °C	
2.3	3.2	Relative Humidity %	
2.4	3.2	Installation	Indoor/Outdoor/other (specify)
2.5	3.2		Inland/Coastal Area
2.6	3.2		Hazardous/Non Hazardous Area
2.7	3.2		Above ground or non-flooding pit or/ a pit subject to flooding
2.8	3.5	Allowable sound pressure at 1m dBA	85dBA/Other (Specify.....)
3.0		Fluid Properties	
3.1	2.1.3	Fluid (Raw Water/ Potable Water/ Chloraminated Water)	
3.2		Fluid Temperature Range Max/Min °C	
3.3		Specific Gravity kg/m ³	
3.4		Residual chlorine Content ppm	
3.5		Other contaminants (Fluoride) ppm	

3.6		pH	
3.7		Chlorides	ppm
3.8		Total Dissolved Solids (TDS)	ppm
3.9		Viscosity	cP
3.10		Mode of operation	On/Off or/ Incremental positioning or Regulating
4.0		Arrangement & Pipe Details	Upstream Downstream
4.1		General Arrangement Drawing to be provided (Designer)	
4.2		Internal diameter (mm)	
4.3		Maximum pipe allowable operating pressure	kPa
4.4		Pipe material nominal diameter DN	mm
5.0		Hydraulic Parameters	
5.1		Valve Centreline level	m AHD
5.2		System Curves – Refer 11.2.2	
5.3		Performance Schedule – Refer 11.2.3	
5.4		Duty set point range for flow control	l/s
5.5		Duty set point range for pressure control	m AHD
5.6		Min/Max allowable valve closing time	Mins/Mins
5.7		Min/Max allowable valve opening time	Mins/Mins
5.8		Fail safe positions	
5.9		Cavitation – Supplier to complete Table 12.	
6.0	4	Coatings	
6.1		Internal System	DS95 – F2
6.1.1		Coating material	AS 4020 Compliant
6.1.2		Total Coating Thickness	DFT of 375 to 600 microns
6.2		External Coating System	DS 95 – F2
6.2.1		Coating material	
6.2.2		Finish Colour	
6.2.3		Total coating Thickness	DFT of 250-375 microns for all except flange faces. DFT of 50-250 microns on Flanges

11.2.2 System Curves, Functional Description & Proposed GA Drawing

The designer shall attach the system characteristic curves defining the required operating envelope and other information required in Section 3.1.1, (clarifying whether pressures are ‘gauge’ or m AHD), describe the system control philosophy and provide a general arrangement drawing of the proposed installation.

11.2.3 Valve Performance Schedule

The designer shall complete columns 2 to 5 in the Table 12. Valve Performance Schedule. The intent of this table is to provide the Supplier with an understanding of both the common and the most onerous hydraulic scenarios at which the valve is expected to operate to ensure the valve is appropriately sized.

11.2.4 Electric Actuator Requirements

The designer shall complete Annexures to Specification for an Electric Actuator for Waterworks Valve as required in DS26-41, on behalf of the Principal regardless of the form of contract.

11.2.5 Project Requirements for Electric Actuator to be completed by the valve manufacturer

Information on page 27 of DS26-41 shall be completed by the valve manufacturer when the actuator is being supplied as a part of a complete electrically operated valve as required in DS26-41.

12 Appendix B: Technical Compliance Schedules (Normative)

12.1 Technical Compliance Schedules

Suppliers shall demonstrate Product compliance with the Specification by completing the following Technical Compliance Schedules shown in Table 12.1A and Table 12. on an item by item basis.

For acceptance, the extent of scheduled technical item compliance shall be supported by verifiable documentary evidence. Each scheduled item nominates a Standard or Specification clause number with which the extent of Product compliance shall be demonstrated.

The Supplier shall denote compliance of an item by ticking the unshaded ‘Yes’ column appropriate to that item. Where Product does not comply with specified requirements, the Supplier shall tick the ‘No’ column and shall detail the reasons for non-conformance and any proposed alternatives in the ‘Comments’ column. The Supplier shall denote acceptance and understanding of a Specification clause by ticking the corresponding ‘Noted’ column wherever unshaded.

Failure to notify the Corporation of all non-compliant Product components, including the extent of non-compliance, may void an accepted offer to supply or may result in rectification of all non-compliant Product elements, at the Supplier’s cost.

Table 12.1A – TECHNICAL COMPLIANCE SCHEDULE 1

Inline (Axial) Control Valve					
Section/Clause		Noted	Compliance		Comments
			Yes	No	
1. SCOPE AND GENERAL					
1.1	Scope				
1.2	Works included				
1.3	Referenced Documents				
1.4	Definitions and Notation				
2. MATERIALS					
2.1	General				
2.1.1	Material Certification				
2.1.2	Non Metallic Materials				
2.1.3	Piston (plunger) Guide Rails				
2.1.4	Stainless Steel				
2.1.5	Contamination of Water				
3. DESIGN AND MANUFACTURE					
3.1	General				
3.1.1	Design and Selection				
3.1.2	Designation of Size				Manufacturer review required
3.1.3	Allowable Operating and Test Pressures				
3.2	Environmental Conditions				
3.3	Cavitation				
3.4	Hydrostatic Sealing				
3.5	Maximum Rated Velocity				
3.6	Noise				
3.7	End-of-line Service Rating				
3.8	End Connections				
3.8.1	Flanges of Higher PN Rating				
3.9	Flow Coefficients and Operating Range				
3.10	Lifting Eyebolts				
3.11	Position Indicator				
3.12	Welding				
3.13	Direction of Rotation and Locking				
3.14	Gearbox Orientation				
3.15	Actuator/Gearbox Rating and Selection				
3.16	Electric Actuator				
3.17	Vibration Performance				

4. COATINGS					
4.1	General				
4.2	Coating Design				
5. TESTING					
5.1	General				
5.1.1	Notification of Testing				
5.1.2	Access to the Place of Manufacture				
5.1.3	Place of Manufacture other than WA				
5.2	Valve Factory Acceptance Tests				
5.2.1	Examination of Body and Welds				
5.2.2	Body strength Test				
5.2.3	Piston / Plunger Strength Test				
5.2.4	Sealing Test				
5.2.5	Valve operational Test				
5.2.6	Coating Test				
5.3	Inspection and Test Documentation				
5.3.1	ITP Documentation and Approval				
5.4	Certification				
5.4.2	Certificates Factory Acceptance Tests				
5.5	Site Acceptance Tests				
6. MARKING AND PACKAGING					
6.1	Marking				
6.1.1	Body Markings				
6.1.2	Nameplate or Label				
6.2	Packaging				
6.2.1	General				
6.2.2	Identification Tag				
6.2.3	Marking of Packaging				
7. MANUALS					
7.1	Format and Language				
7.2	Content				
8. SPARE PARTS AND SPECIAL TOOLS					
8.1	Spare Parts				
8.1.1	Interchangeability				
8.1.2	Availability				
8.1.3	Special Tools				
9. TRANSPORTATION, HANDLING AND STORAGE					
9.1	General				
9.1.1	Preservation of Product in Storage				
10. QUALITY ASSURANCE					
10.1	Certification				
10.1.1	Certification of Product				
10.2	Quality System				
10.3	Product Re-verification				
10.4	Compliance and Acceptance				
10.4.1	Means of Demonstrating Compliance				
10.4.2	Acceptance Criteria				
10.5	Non-compliant product				
10.5.1	General				
10.5.2	Manufacturing Repairs (In-process)				
10.6	Product Warranty				
10.7	Product Repair				

Table 12.1B: TECHNICAL COMPLIANCE SCHEDULE 2

Inline (Axial) Control Valves		
1	SUPPLIER'S REPRESENTATIVE	
1.1	Full name	
1.2	Postal address	
1.3	Facsimile number	
1.4	Email address	
1.5	Phone number	
1.6	Mobile number	
2	QUALITY ASSURANCE	
2.1	Extent of third party accreditation of supplier	
2.2	Extent of third party accreditation of manufacturer	
2.3	Details of certificates and verification reports attached	(Yes/No)
3.0	TECHNICAL INFORMATION	
3.1	Performance information supplied	(Yes/No)
3.2	Details of the manufacturer's inspection and testing plans supplied.	(Yes/No)
3.3	Valve, gearbox and actuator drawings supplied	(Yes/No)
3.4	Details of servicing facilities in Perth supplied.	(Yes/No)
3.5	Additional pamphlets and drawings in conjunction with the technical literature supplied.	(Yes/No)
4.0	VALVE DESIGN AND MANUFACTURE	
4.1	Manufacturer's name	
4.2	Place of manufacture	
4.3	Valve model	
4.4	Valve seal type	
4.5	Size (DN)	
4.6	Pressure Rating (PN)	
4.7	Valve including actuator suitable for above ground outdoor use	(Yes/No)
4.8	Valve including actuator suitable for submerged service	(Yes/No)
4.9	Valve is rated for full end-of-line service without restraint at the free end.	(Yes/No)
4.10	Flanges, valve body and components are of the same rating	(Yes/No)
4.11	Mass of valve (with actuator as applicable)	kg
4.12	Flange standard and rating	
4.13	Maximum normal flow velocity	m/s
4.14	Maximum intermittent flow velocity	m/s
4.15	Maximum allowable operating pressure	kPa
4.16	Maximum differential pressure at maximum and minimum flow	kPa

5.0	MATERIALS	MATERIAL	STANDARD	GRADE
5.1	Valve Body, Cover			
5.2	Piston (Plunger) Guide Rails			
5.3	Fasteners, Drive Connecting Rod Pins, Keys			
5.5	Crank, Shaft and Drive Bearings			
5.6	Sealing Ring			
5.7	O Rings			
5.8	Drive Crank			
5.9	Drive Connecting Rod(s)			
5.10	Drive Shaft			
5.11	Piston (Plunger)			
5.12	Seal/Retaining Ring Complete			
5.13	Control Cylinder			
6.0	Dimensions			
6.1	Length – face to face	mm		
6.2	Height	mm		
6.3	Width	mm		
6.4	Valve Weight	kg		
6.5	Centre line of valve to centre line of manual actuator (above/below valve centre line)	mm		
6.6	Actuator Weight	kg		
6.7	Weight complete unit	kg		
7.0	PERFORMANCE			
7.1	Maximum Working Pressure			
7.2	Maximum Differential Pressure			
7.3	Body Test Pressure			
7.4	Seal Seat Test Pressure			
7.5	Seat seal leakage rate at seal test pressure			
7.6	Minimum flow rate at maximum differential pressure of mH ₂ O			
7.7	Maximum Flow rate at minimum differential head of m H ₂ O			
7.8	Maximum flow velocity (at inlet & Outlet)	m/s		
7.9	Maximum velocity exiting cage	m/s		
7.10	Flow Coefficient (max. opening) – Kv			
7.11	Noise level (dB) at 1 m from valve body at – Full flow range			
7.12	Maximum unseating torque at max. differential pressure of ...m H ₂ O			
7.13	Maximum Running Torque at differential pressure of ... m H ₂ O			
7.14	Position Accuracy			
7.15	Hysteresis and repeatability of Kv curve			
7.16	Flow Characteristics			
7.16.1	Kv of valve at 10% stroke			
7.16.2	Kv of valve at 20% stroke			
7.16.3	Kv of valve at 30% stroke			
7.16.4	Kv of valve at 40% stroke			
7.16.5	Kv of valve at 50% stroke			
7.16.6	Kv of valve at 60% stroke			
7.16.7	Kv of valve at 70% stroke			
7.16.8	Kv of valve at 80% stroke			
7.16.9	Kv of valve at 90% stroke			
7.6.10	Kv of valve at 100% stroke			

8.0	COATINGS				
8.1	Internal System				
8.1.1	Coating material				
8.1.2	Total Coating Thickness				
8.2	External Coating System				
8.2.1	Coating material				
8.2.2	Finish Colour				
8.2.3	Total coating Thickness				
9.0	VALVE TESTING				
9.1	Operating Pressure Differential	kPa	Max		Min
9.2	Noise Level	dB(A)	Max		Min
9.3	Valve Opening	%	Max		Min
9.4	Opening in Degrees		Max		Min
9.5	Pressure drop for Choked Flow	kPa	Max		Min
9.6	Flow coefficient (max opening)	Kv			
9.7	Valve shaft unseating torque	Nm			
9.8	Valve shaft operating torque at maximum rated flow	Nm			
9.9	Valve shaft operating torque at emergency flow	Nm			
10.0	POSITION INDICATOR				
10.1	Manufacturer				
10.2	Model				
10.3	Scale Marking				
11.0	ELECTRIC ACTUATOR				
11.1	Manufacturer				
11.2	Model				
11.3	Power supply and tolerance				
11.4	Degree of protection IP				
11.5	Motor size	kW			
11.6	Motor full load current	A			
11.7	Motor rated voltage	V			
11.8	Motor starting current	A			
11.9	Motor efficiency – Full load	%			
11.10	Power factor – Full load				
11.11	Motor duty (Number of starts per hour)				
11.12	Output shaft speed	rpm			
11.13	Operating time valve open to valve closed	secs			
12.0	ELECTRICAL				
12.1	Power supply (V, phase, Hz)				
12.2	Instruments & Control				
12.2.1	Control				
12.2.2	PLC/Controller				
13.0	FACTORY ACCEPTANCE TESTING				
13.1	Factory Inspection				Yes/No
13.2	Standard operation tests				Yes/No
13.3	Hydrostatic Pressure Tests/ Free end tests				Yes/No
13.4	Piston/plug strength Test				Yes/No
13.5	Seal seat tests				Yes/No
13.6	Hydraulic Performance				Yes/No
13.7	Noise				Yes/No
14.0	PRODUCT WARRANTY				
14.1	Warranty Period				

15.0	DOCUMENTS TO BE SUBMITTED WITH OFFER	
15.1	Completion of this data sheet	Yes/No
15.2	Completion of Technical compliance schedules	Yes/No
15.2	QA certificates – Manufacturer	Yes/No
15.3	QA Certificates – Supplier	Yes/No
15.4	Valve Characteristics Curves	Yes/No
15.5	GA drawings with sufficient details indicating dimensions, all components, materials of construction, sealing arrangements and coating details etc.	Yes/No
15.6	Technical literature in support of information given in offer.	Yes/No
16.0	ADDITIONAL COMMENTS BY SUPPLIER	
16.1	Indicate specific recommendations / installation requirements for upstream, downstream pipe requirements	
16.2	Any other recommendations	
Name of supplier’s representative		
Company Name		
Signature		
Date		
Contact Nos		

12.2 Details of Valve Performance – Designer and Supplier to complete

The Designer shall complete columns 2-5. Supplier shall provide the information required by completing columns 6 to 12 as shown:

Table 12.2

Valve Performance Schedule

Scenario 1 - Valve Make & model: Size: Max. Kv Capacity (m³/hr/bar) :

Case (1)	Completion by Designer					Completion by Supplier					
	% of working life (2)	Flow Rate l/s (3)	Upstream Head (P ₁) (4)	Downstream Head (P ₂) (5)	Cavitation Coefficient Sigma (6)	Valve Opening (7)	Sigma Limit Value (8)	Noise from Valve at 1 m (9)	Downstream head at which incipient cavitation occurs (10)	Downstream head at which substantial cavitation occurs (11)	Hours between major service at this duty (12)
	% of Year	L/s ML/d	(m H ₂ O g)	(m H ₂ O g)		%		dBa	(m H ₂ O g)	(m H ₂ O g)	Hrs
1.01											
1.02											
1.03											
1.04											
1.05											
1.06											
1.07											
1.08											

Note

Fluid Temperature = 25°C P_v= Vapour Pressure absolute $\sigma=(P_2-P_v)/(P_1-P_2)$ All pressures are in absolute values
If cavitation is expected at any operating point the Supplier shall complete column 12. Hours between major service at this duty.

Name of supplier's representative			
Company Name		Date	
Signature		Contact Nos	

END OF DOCUMENT