SECTION N

SPECIAL EQUIPMENT SPECIFICATIONS

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Item 570	Gate Valves
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SPECIAL EQUIPMENT SPECIFICATIONS

ITEM 570
GATE VALVES

570.1 GENERAL

At locations shown on the Plans, there shall be furnished and installed valves of the type and size indicated. They shall conform strictly to the AWWA Standard Specifications for Gate Valves, AWWA C500 except for the changes and additions specifically outlined below. Valve vault, if required, shall be specified in the Special Contract Documents for the project and constructed in accordance with Item 277, VAULT AND MANHOLE CONSTRUCTION.

570.2 REQUIREMENTS IN ADDITION TO AWWA STANDARDS

A. Two Inch Valves and Smaller:

All valves two inches and smaller shall have bronze bodies with all working parts of bronze. They are to be ball valve type. They are to be open by turning counterclockwise and are to be hand wheel operated. They are to be guaranteed for one hundred-fifty (150) pounds per square inch working pressure.

B. Valves Larger Than Two Inches:

All gate valves larger than two (2) inches shall be resilient seat type with an epoxy coating system that meets requirements of AWWA C550. Valve body shall be fully coated inside and out. Valves shall have a rubber encapsulated gate, bronze mounted, internal wedging, and non-rising stems.

Gate valves sixteen (16) inches and larger shall be equipped with spur gears or beveled gears, if specified. Gate valves sixteen (16) inches and larger, unless otherwise specified, shall be equipped with non-rising stems, two (2) inch minimum bypass valves, two (2) inch square nut operated.

C. Valve Stem Packing Box:

The valve stem packing box, consisting in part in the valve bonnet, and in part in a restraining flange (stuffing box of O-ring plate) shall contain, restrain in position, and seal the valve stem.

1. The valve bonnet and restraining flange shall contain bronze stem collar thrust bushings.

2. The valve stem shall contain a raised thrust collar.

3. The valve stem shall be sealed with “O” rings except when the manufacturer’s standard valve requires the use of a stuffing box seal. Stuffing box seals shall be required to conform to the following requirements:

   (a) The packing used shall be Belmont No. 3040, Garlock (Equal Quality), or equal, asbestos fiber, Teflon impregnated, break-in oil added.

   (b) The iron flange must have ample clearance between the valve stem and the flange so that the flange cannot come into contact with the valve stem through the tightening of the gland bolts.

   (c) The bronze part of the gland shall have an adequate bearing surface in contact with the iron flange, it shall be of sufficient cross section to prevent warpage, and it shall allow for an equal distribution of pressure to the seal when the gland bolts are tightened unevenly.

4. Working Parts in Water Way:

   All working parts submerged in water when operated shall be made either of solid bronze or shall be bronze mounted at the working surfaces.

5. Accessories:

   All gate valves, including bypass valves, shall have the following accessories provided as part of the gate valve installation.

   (a) A keyed extension stem of sufficient length to bring the operating nut up to within one (1) foot of the surface of the ground when the operating nut on the gate valve of bypass valves is (3) feet or more beneath the surface of the ground.

      i. Extension stems shall not be bolted or attached to the valve operating nut.

      ii. Extension stems shall be cold roll steel one (1) inch square, fitting loosely enough to allow deflection

   (b) Joint components such as gaskets, packing rings, COR-TEN, Mayari, or equal bolts, etc., shall be furnished with each valve as required for a complete installation.

6. All valves shall open by turning the operating stem to the left and the markings shall be so indicated.

570.3 VALVE BOX AND COVER

Cast iron valve boxes and covers shall be provided for the complete installation of the gate valve and bypass valve when in buried service.

A. Each valve box shall be three (3) pieces consisting of base housing, extension hollow shaft, and cover or a section of six (6) inch C.I. bell and spigot pipe, a cover section, and a cover.

B. Each cover for water service shall have the word “WATER” cast in raised letters in the upper surface. Boxes furnished shall be of sufficient diameter to readily admit a standard valve wrench.

C. Materials shall conform to the current specifications for Grey Iron Casting, ASTM Designation A48 for Class No. 30.

570.4 HORIZONTALLY INSTALLED VALVES

Valves shown on the Plans or specified to be installed horizontally in horizontal pipelines shall be equipped with solid Grade 1 bronze tracks securely fastened in body and bonnet. On double disc valves other than the rolling disc type, the discs shall be carried on solid Grade 1 bronze rollers securely attached to the discs. On all valves in which rollers and tracks are used, bronze scrapers (Grade 1) shall be provided to traverse the tracks ahead of the rollers in both directions of travel to remove any foreign matter which may have accumulated on the tracks.

570.5 GEARS

Geared valves shall be equipped with cast tooth cast iron gears without gear case where valves are to be installed in a vault or inside a pump station and not to be buried in the ground. Where valves are to be buried in the ground without a vault, cut-tooth beveled steel gears having an enclosed gear case of the “extended” type, oil or grease lubricated, shall be furnished. Removable cast iron plates shall be furnished on valves with gear cases of the extended type, installed on the valve to enclose and keep the packing gland and valve stem free from dirt.

570.6 VALVE DRAWING

Detail prints in duplicate shall be furnished for approval as follows:

A. Valves two and one-quarter (2-1/4) inches through twelve (12) inches, furnished on request.

B. Valves sixteen (16) inches and larger, valve drawings shall be submitted and approved in writing prior to manufacturer commencing work on the valves.

570.7 REPORTS OF TESTS

The manufacturer shall furnish two certified copies of results of physical tests on all metals used in the manufacture of the valve and hydrostatic tests on each valve. These shall be furnished as follows:

A. Valves two and one-quarter (2-1/4) inches through twelve (12) inches, furnished on request.

B. Valves sixteen (16) inches and larger, test certificates shall be furnished.

570.8 MATERIALS OR MANUFACTURER

It is the intent of these specifications that all valves furnished shall meet all the requirements of these specifications as to materials incorporated, regardless of the pressure specified for the valve.

570.9 HANDLING AND INSTALLING GATE VALVES

Valves shall be carefully handled and lowered into position by mechanical equipment in such a manner as to prevent damage to any part of the valve. The valve shall be placed in the proper position and held securely until all connections have been made.

Where valves are to be placed in a concrete structure the floor shall be completed before installing the valve. The valves shall be securely blocked so that its weight is carried by the floor rather than being supported by the connected piping.

Valves sixteen (16) inches and larger which are not housed in structures shall be supported on concrete bases as detailed on the Plans. Valves fourteen (14) inches and smaller not housed in structures shall be supported on the same material as that supporting the connecting pipe. An adjustable cast iron valve box and cover shall be provided for all buried valves (including bypass valves) with stem extension when depth exceeds three (3) feet. The valve shall be set with the stem in a truly vertical position with the box correctly centered over the operating nut.

When the valve box is in position and the top of the box adjusted to the proper elevation, select backfill material shall be firmly tamped around the outside.

When noted on the Plans or specified in the Special Contract Documents, air bleeder assembly, etc., shall be installed with the gate valve. Taps for these appurtenances shall be made in accordance with Item 236, INSTALLING TAP ASSEMBLY IN WATER MAINS.

570.10 VALVE VAULTS

Vaults for valves shall be located as shown on the Plans or as directed by the Engineer, constructed in accordance with the Plans. Concrete construction shall meet the requirements of Item 213, CONCRETE CONSTRUCTION. Cast iron manhole frames shall be installed as detailed on the Plans.

570.11 MEASUREMENT AND PAYMENT

If gate valves were not included in the price bid for a structure or connection, they shall be measured by the units of various sizes required complete in place. The unit price bid shall be full compensation for all incidental labor including forming and placing the concrete pads, manhole frames, covers, valve boxes and stems as required.

Unless otherwise specified in the Special Contract Documents, the cost of valve vaults shall be included in the price bid for the valve.

END OF ITEM

SPECIAL EQUIPMENT SPECIFICATIONS

ITEM 571
AIR RELEASE VALVES

571.1 GENERAL

This section shall apply to the installation of both air release valves and combination air and vacuum air release valves. Air release valves are required at high points in the waterline as shown on the waterline plan and profile sheets. The appropriate valve shall be furnished and installed as shown on the Plans or as directed by the Engineer. Valve vaults shall be furnished as provided in the Special Contract Documents for the project and constructed in accordance with Item 227, VAULT AND MANHOLE CONSTRUCTION.

571.2 COMBINATION AIR AND VACUUM AIR RELEASE VALVES

Combination air and vacuum air release valves shall be of the automatic lever and float type or operate on the float and guide principle. The valves shall have an iron body and be fully bronze mounted. The floats shall be of seamless copper and shall be thoroughly tested against leaks. For lines eighteen (18) inches in diameter and smaller, the inlet shall be threaded for standard one (1) inch pipe thread; for lines greater than eighteen (18) inches in diameter, the inlet shall be threaded for two (2) inch standard pipe thread. Both inlet and outlet connections shall have female threads. Valves furnished shall be Iowa Valve Company Combination Air and Vacuum Air Release Valves, No. F-3066, or equal; the APCO Combination Air and Vacuum Air Release Valve No. 200A, manufactured by the Valve and Primer Corporation of Chicago; or Rensselaer No. 372-A, or equal.

571.3 FITTINGS FOR COMBINATION AIR AND VACUUM AIR RELEASE VALVES

In installing combination air and vacuum air release valves in lines eighteen (18) inches and smaller, the Contractor shall furnish two (2) one (1) inch brass nipples and a one (1) inch screw end gate valve. In installing release valves in lines greater than eighteen (18) inches in diameter, the Contractor shall furnish two (2) two (2) inch brass nipples and a two (2) inch screw end gate valve. Valves and nipples furnished shall be designed for a hydrostatic working pressure of 150 pounds per square inch and shall have sufficient metal thickness to support the combination air and vacuum release air valves under all conditions. The Contractor is to furnish all other piping and materials that may be required for the complete installation.

571.4 INSTALLING AIR RELEASE VALVES

The proper valves and fittings shall be installed in mains in accordance with the following table:

I.D. of Main (Inches)	Size of Valve and Fittings (Inches)
42 and Larger	3
18 Through 36	2
16 and Smaller	1

Taps shall be made in accordance with Item 236, INSTALLING TAP ASSEMBLY IN WATER MAINS. Brass nipples and the gate valve shall be installed, and the release valve shall be mounted and installed tightly into place true and plumb.

571.5 MEASUREMENT AND PAYMENT

Air release and combination air and vacuum air release valves shall be measured by the units required complete in place, which shall include the furnishing and installing of air release valve, screwed gate valve and two brass nipples. Except as otherwise specified and provided, payment will be made at the unit price bid per installed air release valve required, which payment will be full compensation for furnishing, hauling, handling, placing, installing, jointing, testing and all incidental expenses necessary to install valves and valve vaults in strict accordance with drawings, specifications and/or instructions of the Engineer.

END OF ITEM

SPECIAL EQUIPMENT SPECIFICATIONS

ITEM 572
BUTTERFLY VALVES

572.1 GENERAL

All valves shall be manufactured in accordance with AWWA Standard C504, RUBBER SEALED BUTTERFLY VALVES, as amended to include the special requirements specified in this section.

572.2 SPECIAL REQUIREMENTS

A. Valve bodies shall be close grained cast iron ASTM Designation A126, Class B.

1. Flanges shall be an integral part of the valve body.

2. The flanges shall conform in dimensions and drilling to ANSI B16.1, Class 125 Cast Iron Flanges, unless otherwise specified in Paragraph 572.7e of this specification.

3. The valve body laying length shall be as designated in AWWA Standard 504 or as otherwise specified in Paragraph 572.7d.

B. Valve disc shall be of alloy cast iron, or of ductile iron in accordance with AWWA Standard C504, Section 7.

1. No external ribs shall be cast transverse to the flow path.

2. Mold lines shall be smoothly transitioned with fillets and radii.

3. Mill scale, slag, and nodules shall be removed from the disc.

4. The disc edge shall be ground or lapped as required to insure proper seating and long life of the seat.

C. The seat seal shall be contained in the valve body, and shall be replaceable. The seat seal material shall be as follows:

1. Natural rubber when consigned to valves which are to be used in treated or raw water transmission.

2. Synthetic when consigned to valves for use in sewage transmission system.

D. The valve shaft shall be made of a one-piece unit unless otherwise specified in Paragraph 572.7h of this specification. If stub-shaft construction is authorized, design shall be such that free play is taken up in assembly by tapered, wedged, or keying devices, or by close fit shrink techniques.

1. Construction shall allow easy disassembly for maintenance service.

2. Shaft minimal design shall also account for the following:

(a) Stress concentration generated by abrupt changes along the shaft such as shoulders, grooves, flats, or other irregularities.

(b) Fatigue factors to assure long maintenance free life.

(c) All valves shall be suitably designed for installation with the valve shaft in a horizontal position.

(d) Valves shall have lifetime self-lubricating bearings. Additional valve lubrication shall be with an oil which will not deteriorate rubber or synthetic.

(e) Torque conversion mechanisms such as gear or linkage trains shall not fail under the most severe load condition imposed by the operator whether it be hand or operator applied.

(f) The operating mechanism or gear box shall be designed for easy adaptation to different types of operators such as manual, hydraulic actuator or motor, electrical motor, etc.

(g) Adjustable position stops of sufficient strength to absorb the maximum possible loading applied by the operator shall be provided with double locking provisions furnished on each stop.

(h) A valve position indicator shall be provided on the valve.

(i) When specified in Paragraph 572.7i of this specification, valve position indication shall be provided remotely. If electrical components such as switches or potentiometers are used to provide the signal source from the valve, they shall be hermetically sealed.

572.3 OPERATORS

Valves shall be provided with operators, as specifically designated in Paragraph 572.7j of this specification. When power operators are specified to be furnished with the valve, the valve manufacturer shall be responsible for the proper sizing of the operator for the service intended.

Operators shall conform to the following:

A. Manual operators shall be furnished as standard, mounted directly on the valve or offset with housed extensions for submerged or buried service.

1. Standard manual operators shall be equipped with a handwheel which provides a mechanical advantage such that an eighty (80) pound pull on the wheel rim will develop sufficient torque to move the valve with the maximum differential pressure against the valve.

2. Extended manual operators shall be furnished with the same closing requirements as required for the standard operators. The valve position indicator shall be at the top of the extension housing with the handwheel.

B. Remote power operators shall be furnished to operate the valve either electrically or hydraulically. Power operators shall be geared, orificed, or otherwise restricted to provide a valve rate of travel, full sweep, open to close or close to open, in the time interval specified in Paragraph 572.7k of this specification. Operators shall be equipped with an auxiliary handwheel of the declutching type to provide for actuation of the valve in the event of power failure. Handwheel mechanism must be of the noncoincidental type. The handwheel shall not rotate when the handwheel is not in use. The handwheel and gearing shall be sized such that not mor than eighty (80) pounds shall be required on the handwheel to move the valve with full differential pressure against the valve.

1. Electrical power operators shall be motor driven in accordance with AWWA C504.

(a) The motor, junction boxes, limit switches, relays, harnessing, etc., shall be moisture proof.

(b) The electrical system shall be caged and mechanically grounded.

2. Hydraulic power operators shall be of a cylinder type conforming to the requirements of AWWA C504 except that the rate of operation shall be approximately the same in the opening and closing cycles of operation.

(a) The hydraulic operating pressure shall be specified in Paragraph 572.7m3 of this specification.

(b) The cylinder shall withstand a hydrostatic test pressure of three (3) times the maximum working pressure specified.

(c) Hydraulic hoses, lines, or fittings included as part of the power operator shall withstand a hydrostatic pressure of one and one-half (1-1/2) times the maximum working pressure specified without leakage while subjected to a motion equivalent to actuator travel in a valve opening and closing cycle.

(d) Internal stops shall be permitted; however, sufficient incremental adjustment shall be allowed for satisfactory adjustment of valve position in the open and closed position.

572.4 VALVE DRAWINGS

Shop drawings, six copies, shall be required to be furnished to the Engineer for approval prior to the manufacturer commencing work on the valves order. Approval by the Owner and Engineer shall be considered as an interim approval and shall not be construed to relieve the manufacturer of his responsibility to produce valves to the full requirements stated in this specification. No valves shall be fabricated prior to the receipt of this approval by the Owner except upon written permission by the Owner. The manufacturer, however, shall have the option of submitting prints to the Engineer for approval on each particular type of valve that he wished to bid on and upon approval of these by the Engineer, the manufacturer may then bid on any type of valve covered by these approved drawings by simply referring to the approved drawing number in his bid proposal. These drawings, if submitted with this understanding, will be kept on file by the Owner and Engineer until replacement is requested either by the Owner or the manufacturer.

572.5 RECORD OF MANUFACTURE

Butterfly valves will not be acceptable unless they are produced by a manufacturer which has been engaged regularly and continuously for the past five years in the production of valves which have been in satisfactory use and operation in municipal water systems.

Technical manufacturing drawings or test certification records relating to butterfly valves for contract installation must be supplied by the Contractor to the Engineer on his request not later than two weeks after beginning construction when an identical valve has previously been approved by the Owner, or prior to installation when an identical valve has not previously been approved by the Owner.

Technical manufacturing drawings or test certification records must be supplied for all valves purchased by the Owner when requested by the Engineer. Technical drawings or certification records shall have the Engineer's approval before final payment will be made.

572.6 TEST AND TEST RECORDS

On Owner valve purchases, when specified in Paragraph 572.7 of this specification, or when requested by the Engineer, the manufacturer shall be required to furnish certified test reports which verify any one or all of the requirements specified herein above and which may be categorized as:

A. Material
B. Proof
C. Leakage

D. Rate

572.7 SPECIFIC PURCHASE REQUIREMENTS

A. Number of Butterfly Valves Required: _____

B. Valve Size, Nominal Diameter, Inches: _____

C. Valve Class: _____

D. Valve Body Laying Length: _____

E. Valve Body Flanges: _____ or

_____

F. Application: Potable Water _____ Raw Water _____

Sewage _____, or Other _____

G. Valve Disc Seal Material; Natural Rubber _____

Neoprene _____or Other _____

H. Valve Disc Shaft; Single Unit _____, or Stub Type _____

I. Remote Valve Position Indication; Mirror Image on Another Valve _____,

for Panel Mount _____, or _____

J. Type of Operator; Standard Manual _____ Extended Manual _____

(Bury Depth _____), Electric Power _____ (_____ Volts _____a.c., single

phase, _____ d.c., _____ amps), Hydraulic Power _____ (_____ psig,

Max.) , or Other _____

K. Operational Rate: _____

L. Tests Required; on all units _____, (Number Required) _____ Samples From

Purchase Lot, or _____

M. Type of Tests:

1. Material; Physical _____ and _____

2. Proof: Hydrostatic pressure on the line valve body _____ psig max. and Hydrostatic pressure on hydraulic cylinder _____ and _____

3. Leakage: Hydrostatic pressure of _____ psig to _____ psig on closed valve gate disc, hydrostatic pressure of _____ psig on hydraulic cylinder lines and fittings, or _____

4. Rate: Time rate of closure against in-line pressures up to and including _____ psig Max., Time rate of opening against in-line pressures up to and including psig Max., or _____

N. Certified Test Reports required; on all tests specified _____ or _____

END OF ITEM

SPECIAL EQUIPMENT SPECIFICATIONS

ITEM 573
PLUG VALVES

573.1 GENERAL

Plug valves six (6) inches and smaller shall be wrench operated, unless otherwise shown on the Plans; valves eight (8) inches and larger shall have worm gear operators. For wrench operated valves furnish one wrench for each size and type of valve in each of the various buildings or areas in which valves are located.

All plug valves in horizontal lines shall be installed with the plug in the upper part of the body when in the open position. All plug valves in lines from tanks shall be installed so that the plug is in the upstream position when closed.

573.2 ECCENTRIC PLUG VALVES

Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with flanged end connections unless otherwise shown on the Plans. Flanged valves shall be faced and drilled to the ANSI 150 lb. standard.

Port areas for valves equal to or less than twenty (20) inches shall be at least 80% of full pipe area. Port areas of twenty-four (24) inches and larger valves shall be at least 70% of full pipe area.

Valve bodies shall be of ASTM A126, Class “B” cast iron in compliance with AWWA Standard C507, Section 5.1 and AWWA Standard C504, Section 6.5. All exposed nuts, bolts, springs, washers, etc., shall be corrosion resistant. Resilient plug facings shall be of nitrile rubber for valves six (6) inches and smaller and neoprene for valves larger than six (6) inches.

Valves shall be furnished with corrosion resistant seals which comply with AWWA Standard C507, Section 7, Paragraph 7.2, and with AWWA Standard C504, Section 9, Paragraph 9.4.

Valves shall be furnished with replaceable, sleeve-type bearings in the upper and lower journals. These bearings shall comply with AWWA Standard C507, Section 8, Paragraphs 8.1, 8.3, and 8.5, and with AWWA Standard C504, Section 10.

Valve shaft seals shall comply with AWWA Standard C507, Section 10 and with AWWA Standard C504, Section 11.

573.3 MANUALLY OPERATED PLUG VALVES

Manually operated eccentric plug valves shall be operated by means of lever or gear operators and tee wrenches, extension stems, floor stands, etc., as indicated on the Plans.

For all valves equipped with worm gear operators, gearing shall be enclosed in a semi-steel housing and shall run in a lubricant with seals provided on all mating surfaces to make the assembly weather-tight.

The actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuator shall clearly indicate valve position. Actuator or worm gear shaft shall turn clockwise to close the shaft.

All exposed nuts, bolts, and washers shall be zinc plated. Valves and worm gear operators for buried or submerged service shall have seals on all shafts, gaskets on the valve, and worm gear opertor covers to prevent the entry of water. Worm gear operator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs and washers shall be type 316 stainless steel.

END OF ITEM