TECHNICAL SPECIFICATIONS

DIVISION 1 - GENERAL REQUIREMENTS

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SECTION 01010

SUMMARY OF WORK

PART 1 – GENERAL

1:01 LOCATION AND SCOPE OF WORK

The Work covered by these Specifications is at the locations shown on the Contract Drawings in New Hanover Township, Montgomery County, Pennsylvania. The overall intent of the Work to be performed under this Contract is to provide the necessary materials, equipment and labor to demolish and replace existing water treatment system equipment and plumbing from the point of connection with Cold Water distribution system upstream to the well source, including removal and replacement of the well pump. Installation of new water treatment system equipment from well source to distribution system connection point will include: sediment filter; ion exchange treatment units with controls; tankage; chemical feed and booster pumps with incidental power and controls; meters and backflow prevention, piping, valves, and appurtenances; and all necessary to make a complete working potable water system; as shown on the Contract drawings and as specified herein.

Bidders shall review all plans and specifications to determine the Scope of Work required for their individual contracts.

The Contractor shall bid on all items listed in the Bid Form for each Contract for which he/she submits a Bid, unless specifically noted otherwise.

1:02 CONTRACT WORK/RESPONSIBILITIES

Each successful Bidder awarded any Contract shall be responsible to provide all labor, materials, equipment, machinery, apparatus and tools to perform all operations necessary to construct, install, equip, adjust and put into satisfactory operation, the Work awarded, specified and shown on the Drawings, and shall so connect the various items or sections or the Work awarded as to form a complete and properly operating whole. Any labor, material, equipment or apparatus not specifically mentioned herein, or shown on the Drawings, which may be necessary for the proper completion of the entire Work awarded or of the individual items thereof within the intent of these Specifications and Drawings, shall be furnished by the Bidder without additional compensation.

All Bidders shall perform the Work as outlined in the Contract description as follows and in the Contract Documents to provide a complete installation of the Water Treatment System Replacement. Work will be conducted under one General/Mechanical contract.

A. **New Hanover Upper Frederick Elementary School – Water Treatment System Replacement**

The Work to be completed under the Contract is as described as follows:

1. Provide a complete **potable water treatment system** for the Elementary School Building as described below.

2. Perform all work to demolish and remove the existing water system from the point of disconnection/reconnection to the Cold Water Distribution system (as shown on the Contract Drawings) then upstream to the well source. Remove existing hydropneumatic tanks and connecting pipes and drains. Remove sediment filter, water softener units and brine tank, remove sodium hypochlorite chemical feed pump, remove meters and other appurtenances as necessary.

3. Furnish and install all new equipment listed in Division 11. Construct all connecting plumbing and instrumentation to make a complete operational system. **All materials used shall be NSF-61 certified for contact with potable water.**

4. Conduct all incidental electrical work to make equipment operational.

5. All testing and disinfection of the water supply system to PA DEP standards.

6. Minimum of one (1) year guarantees for all Contract work, or longer if specified.

7. Provide Owner with all Operation and Maintenance Manuals for all treatment units and pumps.

1:03 SPECIAL REQUIREMENTS

A. Work will be accomplished while School District is on summer break (June 2 to August 15).

B. The Contractor shall coordinate the shut off of the water system with School District Director of the Facilities and Operations. Contractor shall provide temporary portable sanitary facilities for Contractor's workers.

C. The Contractor is responsible for obtaining and paying for all other permits, licenses, Township inspection fees and inspections required to perform and complete all Work in accordance with all federal, state and local regulations and requirements.

D. The Contractor shall **note** that all Contract Work shall **only** be performed during daylight hours, 7:00 AM to 5:00 PM, Monday through Friday. No other hours of operation will be permitted unless prior approvals by the Owner and/or Engineer have been obtained.

PART 2 – PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION

9ECTION 01011

GENERAL TECHNICAL SPECIFICATIONS

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PART 1 – GENERAL

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GENERAL TECHNICAL SPECIFICATIONS

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SECTION 01011

GENERAL TECHNICAL SPECIFICATIONS

PART 1 – GENERAL

1:1 CONTRACT DRAWINGS

The Contract Drawings herein referred to bear the general title:

NEW HANOVER ELEMENTARY SCHOOL
WATER TREATMENT SYSTEM REPLACEMENT

Drawing Number	Description	Latest Revision
B-19-1382-0001-M101	Water Treatment Process Schematic	04/13/23
B-19-1382-0001-M102	Equipment Layout Schematic	04/13/23
B-19-1382-0001-M103	Existing Conditions/Demolition Plan	04/13/23
B-19-1382-0001-E100	Electrical Floor Plan	04/13/23

1:2 INTENT OF DRAWINGS AND SPECIFICATIONS

A. Any drawings accompanying the Specifications are herein designated Contract Drawings (Drawings) and are diagrammatic, the purpose of which is to illustrate the general character and extent of the Work and are subject to such modifications as may be found necessary or advisable either before or during the prosecution of the Work. The Contractor shall conform to and abide by whatever supplementary drawings and explanations may be furnished by the Engineer for the purpose of illustrating the Work. The Contractor shall check the Drawings and verify all dimensions prior to the start of Work. The Owner with the Engineer shall decide as to the meaning or intention of any portion of the Specifications and Drawings where the same may be found obscure or in dispute and the Owner shall have the right to correct any errors or omissions therein.

B. All Work that may be called for in the Specifications and not shown on the Drawings or shown on the Drawings and not called for in the Specifications shall be executed and furnished by the Contractor as if described in both. Should any incidental Work or materials be required which is not denoted either on the Drawings or in the Specifications, either directly or indirectly, but which is necessary for the carrying out of the intent of the Specifications or Drawings, the Contractor agrees to perform all such Work and furnish and install all such materials as if the same were fully indicated or specified. The Contractor shall carry out all Work and furnish all materials necessary to complete the project as intended and implied by the Drawings and Specifications.

C. References to “Contractor” in these Specifications shall apply to the specific Contractor or Contractors for all sections of the project included in their Scope of Work unless specifically noted. Other references to “Contractor” in the remainder of these Specifications shall apply to all of the individual Contractors.

1:3 ERRORS AND DISCREPANCIES ON THE DRAWINGS OR IN THE SPECIFICATIONS

If the Contractor, in the course of the Work, finds any discrepancy between the Drawings or Specifications and the physical condition of the locality, or any errors on the Drawings, in the Specifications, or in the layout, it shall be his duty to immediately inform the Engineer and Owner in writing; the Engineer will promptly clarify the discrepancy and notify the Contractor in writing. Any Work undertaken after the discrepancy has been discovered and prior to clarification by the Owner and the Engineer will be done at the Contractor's risk without compensation.

1:4 PENNSYLVANIA PREVAILING WAGE ACT

Pursuant to the Pennsylvania Prevailing Wage Act of August 15, 1961, Act No. 442, the workmen employed in the performance of the Contract shall be paid not less than the minimum wage as established by the Bureau of Labor Law Compliance, and proper payroll records shall be kept and maintained by the Contractor and each of his Subcontractors in accordance with the Act, which shall be available at all reasonable hours to the inspection of the Owner and to the Bureau. The Contractor shall familiarize himself with all provisions of the Act and shall comply with all rules and regulations thereof.

The full Prevailing Wages Act can be found at 43 P.S. Sections 165-1 through 165-17.

1:5 PENNSYLVANIA STATUTES AND REGULATIONS

The Clean Streams Law, Act of June 22, 1937, P.L. 1937, as amended 35 P.S., 691 et seq. And Chapter 73, 91, 93, 95, 97, 101, and 104 Department of Environmental Protection regulations promulgated thereunder.

1:6 VERBAL INSTRUCTIONS

Although the Contractor may request from the Engineer, or Engineer may give verbal instructions to Contractor concerning the manner in which the Work is carried out, such verbal instructions shall in no event be binding upon the Owner. Upon request by the Contractor, a written confirmation of such verbal instructions is to be given and confirmation requested. Any Work performed or omitted by Contractor in accordance with verbal instruction of Engineer and not confirmed in writing as above provided, shall be at the sole risk of the Contractor and shall not obligate the Owner in any manner whatsoever.

1:7 QUALITY OF WORK

It is understood that the Work shall be done in a first class manner and best new materials used. If the Specifications or Drawings admit of a doubt as to meaning, the interpretation which calls for the best Work shall be followed.

1:8 BRAND NAMES

Brand names are given only for the purpose of establishing standard type and quality for estimating purposes. Similar approved material will be acceptable provided samples (or other appropriate information) are submitted to the Engineer for approval as equal to that listed, in accordance with the Instructions to Bidders Article 11; and General Conditions, paragraph 7.04, as applicable.

1:9 MATERIAL ACCEPTABILITY

All materials used for the Work shall be subject to the review of the Engineer, who shall be the sole judge of their quality and efficiency. He shall be notified in advance whenever the preparation or manufacture of any material for the Work is to be commenced at any place.

No material shall be shipped to the Work before it has been reviewed and accepted, unless review has been authorized by the Engineer to be made at the site or has been waived.

1:10 REMOVAL AND REPLACEMENT OF REJECTED MATERIAL OR WORK

If any material selected or brought on the site for use in the project is condemned by the Engineer as unsuitable or not in conformity with the Specifications, the Contractor shall forthwith remove such material from the project site.

All material or Work of whatever kind which shall become damaged from any cause or be rejected by the Engineer, shall be removed from the premises within 48 hours, and replaced by good materials or Work at the Contractor's expense.

1:11 REMOVAL AND SALVAGE

The Contractor is responsible to remove all existing related items of construction necessary to provide the Work under this Contract. He is to protect all surfaces and items of material and construction that are to remain and become part of the finished project. All materials and items so removed shall become the property of the Owner. It is expected that any benefit expected or realized from the sale of any items of demolition will reflect as a credit to the Owner in the proposal cost items submitted to the Owner. Any materials removed that the Owner decides to salvage shall become the property of

the Owner. The Contractor shall deliver such materials to a place as determined by the Owner.

The Contractor shall legally dispose of any and all materials, refuse, debris, and other unwanted material from the site.

1:12 OBSERVANCE OF LAWS

The Contractor at all times shall observe and comply with all Federal, State and local laws, by-laws, ordinances, codes and regulations, in any manner affecting the conduct of the Work or applying to any employees on the project, as well as all orders or decrees which have been promulgated or enacted, or which may be promulgated or enacted during the progress of the Work, by any legal bodies or tribunals having authority or jurisdiction over the Work, materials, employees, or the Contract. By executing the Contract, the Contractor agrees to indemnify and save harmless the Owner and all its officers, employees and agents, from all suits, actions, or claims of any character or description brought forth, made on account of, or arising from the violation of any such law, by-law, ordinance, regulation, order or decree.

1:13 PUBLIC SAFETY

A. This project is being constructed for the benefit of the public, and therefore, the safety of the public is of prime importance. No road or portion thereof shall be opened for traffic unless it is in safe condition for travel. Such warning sign(s) directing or controlling traffic shall be erected and maintained. Such sign shall be lighted during the hours of darkness and be clearly visible at all times.

B. All fire hydrants adjacent to the Work shall be kept readily accessible at all times to fire apparatus, and no materials or obstructions shall be placed within fifteen (15) feet of any fire hydrant. Local fire companies serving the area shall be notified in advance, in writing, of the path of construction and/or road closures and detours. **A copy of said notice shall be submitted to the Engineer.**

C. The Contractor shall erect and maintain such barricades or railings and display on the Work such lights, signals, or warnings as may be necessary to safeguard the public and those employed about the Work. At all times during the progress of the Work, the Engineer may order increasing, moving, or replacing of barricades for the safety of the public.

1:14 PROTECTION OF PROPERTY AND STRUCTURES

A. The Contractor shall, at his own expense, sustain in their places, and protect from direct or indirect injury, all pipes, tracks, walls, buildings, and other structures or property in the vicinity of his Work, whether above or below the ground. He shall

at all time have a sufficient quantity of timber and plank, chains, ropes, etc., on the ground and shall use them as necessary for sustaining or supporting any structures that are uncovered, undermined, endangered, threatened, or weakened.

B. The Contractor shall take all risks attending the presence or proximity of pipes, poles, tracks, walls, buildings, and other structures and property, of every kind and description, in or over his Work, or in the vicinity of his Work, whether above or below the surface of the ground; and he shall be responsible for all damages and assume all expenses for direct or indirect injury, caused by his Work, to any of them, or to any person or property by reason of injury to them, whether such structures are or are not shown on the Drawings.

C. The Contractor shall be responsible for the replacement of any property pins or monuments that are moved, removed, damaged or otherwise altered during the course of the Work.

D. The accuracy of the replacement of any property pins or monuments that are moved, removed, damaged or otherwise altered during the course of the Work shall be certified by a registered surveyor of the state of Pennsylvania.

Any and all costs associated with the above shall be the responsibility of the Contractor and shall be included in his Total Bid Price.

E. The Contractor shall be responsible for all Work until completion and final acceptance thereof. No payments will be allowed for damage to the Contractor's materials or equipment. Except as herein provided, damage to all Work, utilities, materials, equipment, and other properties, etc. shall be repaired to the satisfaction of the Owner at the Contractor's expense. The Contractor shall, at his own expense, restore to a condition similar to the condition that existed prior to the damage, any direct or indirect damage to public or private property caused by the Work or in consequence of any act or omission on the part of the Contractor, his employees, agents, or Subcontractors. Should any property require repair, replacement or rebuilding by the Owner as a result of damage due to fault or neglect on the part of the Contractor, the cost thereof will be deducted from any money due or to become due to the Contractor under this Contract; or the Owner may deduct from any money due the Contractor a sum sufficient to reimburse the owner of the property so damaged. When applicable, the Unit or Lump Sum Price set forth in the Contract shall be used.

F. Any cause for damage to private property outside of the existing Owner’s right-of-way/easement shall be borne by the Contractor.

G. The Contractor shall take all necessary precaution to protect the trees within the right-of-way that are adjacent to existing homeowners land. Any trees located within the right-of-way that are damaged, removed or die within the one (1) year guarantee period shall be replaced at the adjacent home owners request with a minimum 6' (height) sapling of the same species. The sapling shall be placed a minimum of 5' outside the right-of-way in the adjacent homeowners property only at his/her request. It is the intent of this specification for the Contractor to appease the homeowner's request for tree replacement. If the homeowner does not desire to have a replacement sapling the Contractor need not provide one. Under no circumstance shall a replacement sapling be planted back inside the right-of-way.

H. The Engineer reserves the right under such conditions to stop the excavation or any other part of the Work, and to require the Contractor to complete the sewer and the backfilling up to such a point as the Engineer may direct before proceeding further with the excavation; and the Contractor shall not thereby become entitled to demand or to receive any allowance or compensation, other than an extension of the Contract time for as many days as the Engineer may determine that the Work was delayed by such stoppage.

I. Where necessary, in order to keep one side of the street or roadway free from any obstruction or to keep the material piles alongside of the trench from falling on private property outside the right-of-way, a safe and suitable fence shall be placed alongside the trench. .

J. In the event of encountering quicksand, subsurface streams or similar dangerous contingencies, or where passing especially heavy buildings or any structures where by their construction or position might bring a great pressure upon the trenches, the right is reserved by the Engineer to direct that such buildings or structures, shall be underpinned, or supported and protected, or that special sheeting shall be driven in such a manner and to such depth, as may be directed, or that only a short length of trench shall be open at one time; and furthermore, if necessary, that the trench shall be securely sheeted and braced on all sides, after the manner of a shaft, and that the permanent Work shall be constructed in the same and the shaft backfilled before another opening is made. Any Work done as above directed shall be at the cost and expense of the Contractor.

1:15 PROTECTION AND SAFEGUARDS

A. Contractor shall protect all trees, shrubs, lawns and landscaping from damage and shall provide such guards and covering as is necessary. Contractor shall take proper and necessary precautions to protect all public and private roads, and walks, in and near the area of the project. All damaged items shall be repaired or replaced at the Contractor's expense.

B. It will be the responsibility of the Contractor at all times to protect all excavation, trenches, installations, structures, and all Work performed under his Contract from water damage of every kind, including damage by rainwater, or surface water, and the backing up of drains, rain conductors or sewers and to repair any such damage immediately and at his own expense.

C. The Contractor shall at all times protect, maintain and support, in an entirely safe condition, for the usual service all surface, subsurface and overhead structures and their appurtenances which might be affected by the prosecution of his Work. Blasting is not allowed without written permission of the Owner/Engineer.

D. Contractor shall provide for dust control as may be required for the proper protection and prosecution of the Work under the Contract.

E. Contractor shall furnish, erect and maintain such barricades, fencing, railings, enclosures, guard lights, danger signals and warnings, and take such precautions in and around the area of the Work, as are necessary to insure the safety of the public prevent trespassing and to avoid damage or injury to all persons and property.

F. All underground utilities, service lines, and other facilities uncovered or exposed by the operations under this Contract shall be protected by the Contractor. Services and utilities in and to existing buildings must not be interrupted without first obtaining the consent and approval of respective owners. General locations of utilities that are known to exist are indicated on the drawings. However, it is the responsibility of the Contractor to make his own investigation of utilities in the project area to ascertain their correct location and extent to which they will interfere with his Work. He shall protect and maintain existing active services in accordance with standard procedures or instructions from the owner of the utility. Should relocation of active utilities not shown on the drawings or included in the Specifications be necessary, the Contractor shall proceed in accordance with the regulations and wishes of the owner of the utility to be relocated.

1:16 CONTRACTOR TO PREPARE SITE

The Contractor shall do everything necessary to prepare the site for construction operations, including the demolition and removal of any portions of structures and obstacles located thereon at or below the elevation of the grade.

1:17 USE OF PRIVATE LAND

A. The Owner will provide the right of the Contractor to enter upon the right-of-way for the prosecution of the Work. If additional area is required for storage of

materials or equipment, the Contractor shall provide such space at his own expense.

B. The Contractor shall confine his operations to the area within the existing Owner's right-of-way and easements of the roads and/or construction site as indicated on the Drawings. All additional land required for the erection of temporary construction facilities, storage of material, dumping of excavated material, together with the right of access thereto, shall be provided by the Contractor. No use of any private land will be permitted until written permission from the owner of the land is furnished to the Engineer.

1:18 MAINTAINING PROJECT AREA / STORAGE YARD

The Contractor is required to maintain the Project area and his field office and storage yard in a neat and orderly fashion, and provide for the protection of the general public by a fence or other protective device. The Contractor shall remove from the site all surplus and discarded materials. At the conclusion of Work, all field office, temporary parking and storage yard areas shall be restored to the satisfaction of the Owner/Engineer and/or property owner, as applicable, to their pre-construction conditions, unless specified otherwise in the Contract Documents or authorized by the property owner.

1:19 CONSTRUCTION SIGNS

Subject to local regulations, the Contractor and his Subcontractors may erect temporary signs for purposes of identification and controlling traffic. The Contractor shall furnish, erect, and maintain such signs as may be required by safety regulations and as necessary to safeguard life and property. .

1:20 OTHERS TO WORK ON SITE

The Contractor shall give every facility to the Owner or other corporations to lay and relay or repair any pipes or conduits within the area before backfilling. The Contractor shall arrange with the proper authorities for the relocation, and/or replacement, lowering, or raising of any underground pipes, conduits, manholes, manhole covers, access covers, etc., in the line of the Work. The cost of any such relocation, and/or replacement, lowering or raising of any underground pipes, conduits, manholes, manhole covers, access covers, etc. in the line of the Work shall be paid for by the Contractor.

1:21 CONSTRUCTION

The Work of construction shall be started at such points as may be directed or approved by the Engineer.

1:22 UTILITIES: LOCATION AND COORDINATION

It shall be the responsibility of the Contractor to exactly locate, as necessary, all existing utilities on the project site and to avoid all unnecessary conflicts therewith.

The Contractor shall cooperate with all utility companies involved in this project, and shall, within one (1) week after Notice to Proceed, provide each utility company with a copy of the approved project schedule. The Contractor shall be required to notify the affected utility company not less than three (3) nor more than ten (10) business days in advance of beginning excavation or demolition Work in any area of conflict.

The Contractor will be held responsible for all damage to utility facilities and/or drainage structures, caused by the Contractor, and such damage will be repaired at the expense of the Contractor in accordance with applicable utility specifications.

1:23 PROTECTION OF UTILITIES – PENNSYLVANIA ACT 287

It shall be the responsibility of the Contractor to comply with all requirements of the Pennsylvania One Call System (POCS), PA Act 287 of 1974, as amended by PA Act 121 of 2008.

1:24 START OF WORK NOTIFICATION

Unless specifically directed otherwise, the Contractor shall notify the Owner and Engineer in writing a minimum of one (1) week prior to the start of Work.

1:25 CLEANING UP AFTER WORK

The Contractor shall be responsible for a clean job throughout the construction. The cost for daily cleanup of the project area and final cleaning of the project site shall be included in the Total Bid Price.

1:26 DAMAGE CLAIMS BY CONTRACTOR

Contractor agrees that if, by failure to perform his Work hereunder with due diligence, he shall delay another contractor having a contract on the project directly with the Owner, who shall suffer additional expense or damage resulting from such delay, the Owner shall not be a party to disputes or actions between contractors concerning such additional expenses or damages, and such disputes shall not be subject to arbitration.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 – GENERAL

1:01 DESCRIPTION

A. Contractor shall be responsible for all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:

1. Make its several parts fit together properly.

2. Uncover portions of the work to provide for installation of ill-timed work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of contract documents.

5. Remove samples of installed work as specified for testing.

6. Provide routine penetrations of nonstructural surfaces for installation of ductwork, piping and electrical conduit.

1:02 RELATED REQUIREMENTS

A. Summary of Work. Section 01010.

B. Submittals. Section 01300.

C. Plumbing. Division 22.

D. Electrical Requirements. Division 26.

1:03 SUBMITTALS

A. Submit a written request to Engineer well in advance of executing any cutting or alteration which affects:

1. The work of the Owner or any separate Contractor.

2. The structural value or integrity of any element of the project.

3. The integrity of effectiveness of weather-exposed or moisture-resistant elements or systems.
4. The efficiency, operational life, maintenance or safety of operational elements.

5. The visual qualities of sight-exposed elements.

B. The request shall include:

1. Identification of the project.

2. The reason for cutting, alteration or excavation.

3. The effect of the work on the Owner or any separate Contractor, or on the structural or weatherproof integrity of the project.

4. Written permission of any separate Contractor whose work will be affected.

5. Description of the proposed work.

a. The scope of cutting, patching, alteration or excavation.

b. The trades who will execute the work.

c. Products proposed to be used.

d. The extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. Cost proposal, when applicable.

C. Should conditions of the work or the schedule indicate a change of products from the original installation, Contractor shall submit a request for substitution as specified in Section 01600, Material and Equipment.

D. Submit a written notice to Engineer designating the date and the time the work will be uncovered.

1:04 ASBESTOS ALERT

A. If friable asbestos is discovered during the project, the Contractor shall, after informing the Engineer and the Owner, notify:

B. The Owner shall enter in a separate contract for the removal of friable asbestos. Removal procedures are specified in the federal National Emission Standards for Hazardous Air Pollutants (NESHAP) which can be found in the Code of Federal Regulations, 40 CFR Part 61, Subpart M - National Emission Standard for Asbestos and may be found in the Federal Register for Thursday, April 5, 1984, Volume 49, No. 67, pages 13657-13665.

PART 2 – PRODUCTS

Comply with specifications and standards for each specific product involved.

PART 3 – EXECUTION

3:01 INSPECTION

A. Inspect existing conditions of the project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect the conditions affecting the installation of products or performance of the work.

C. Report unsatisfactory or questionable conditions in writing; do not proceed with the work until the Engineer has provided further instructions.

3:02 PREPARATION

A. Provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the work.

B. Provide devices and methods to protect other portions of the project from damage.

C. Provide protection from the elements for that portion of the project which may be exposed by cutting and patching work, and maintain excavations free from water.

3:03 PERFORMANCE

A. Execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

C. Employ the original installer or fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements.

2. Sight-exposed finished surfaces.

D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

E. Restore work which has been cut or removed; install new products to provide completed work in accord with requirements of contract documents.

F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

END OF SECTION

SECTION 01105

WORK ON EXISTING STRUCTURES

PART 1 – GENERAL

1:01 WORK INCLUDED

This work includes demolition of portions of existing construction and all new construction and patching required by the renovations and additions to the existing structure.

1:02 RELATED WORK

A. Cutting and Patching for Mechanical and Electrical Work. Division 15 and 16.

1:03 SCHEDULING OF WORK

No existing facility, equipment or service shall be interrupted or removed until it has been replaced by a permanent substitute or until agreed to by the Owner.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3:01 DEMOLITION

All demolition required shall be done as carefully as possible to create a minimum of noise, dust and debris and to minimize the need for later patching and repair. Every precaution shall be taken to prevent damage to existing construction that is to remain or interruption of existing utility services. This requirement includes necessary temporary shoring and bracing. At all times the existing construction shall be completely protected from exposure to the weather by all necessary means such as temporary partitions, flashing, roofing, etc. All removed equipment, fixtures, etc., that are not scheduled for reuse shall become the property of the Owner and shall be stored as directed on the premises.

3:02 RENOVATION

All new work required in existing construction such as partitions, closing of openings, patching, etc., shall be done in such a manner as to fully integrate new materials with existing similar materials by bonding, lapping, mechanical ties, anchoring or other effective means that will prevent cracks and will not show evidence of patching. The intent of these requirements is that the completed work shall conceal all effects of demolition and patching and shall provide new construction that blends with existing adjacent or abutting surfaces without obvious breaks, joints or changes of surface appearance unless specifically shown otherwise.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 – GENERAL

1:01 SECTION INCLUDES

A. Submittal procedures.

B. Action on submittals.

C. Construction progress schedules.

D. Shop Drawings.

E. Product data.

F. Samples.

G. Manufacturers' instructions.

H. Manufacturers' certificates.

I. Construction photographs.

1:02 RELATED REQUIREMENTS

A. Schedule of Values. Section 01370.

B. Material and Equipment. Section 01600.

C. Close-out Submittals. Section 01700.

1:03 SUBMITTAL PROCEDURES

A. Number each submittal. Number shall consist of the following parts, each separated by a dash:

1. Five-digit Specification Section number, if applicable.

2. Two-digit sequence number starting for each Specification Section with 01 and continuing with 02, 03, etc., for subsequent submittals with the same Specification Section number.

3. Use the fourth part of the number only for resubmittals. For the first resubmittal of a previous submittal, add -R1 to the previous number. For the second resubmittal, change to -R2, and so on.

   As an example of the numbering process for Contract 1, the third submittal under Section 03300 would be numbered 1-03300-03 and the second resubmittal of this same submittal would be numbered 1-03300-03-R2.

B. Identify Project, Contractor, Subcontractor, or supplier. Identify pertinent Drawing sheet and detail number(s) and letter(s), and Specification Section and Subsection numbers, as appropriate.

C. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, all are in full accordance with the requirements of the Work and Contract Documents. Stamp shall have the following format:

Approved for Contract Requirements

The Contractor's signature below indicates that he has checked this Submittal with the Drawings, Specifications, and site conditions and found it to meet all requirements of same including dimensions.

RE: Project _____

Submittal Number _____

Drawing Sheet Number _____ Detail Number _____

Deviations from Contract Documents? No. _____ Yes _____
(letter(s) attached)

By _____
Signature (Contractor)

Contractor's Name _____

D. Schedule submittals to expedite the Project, and deliver to Engineer at business address. Coordinate submission of related items.

E. Submit letter which clearly and specifically identifies deviations from Contract Documents. Identify product or system limitations which may be detrimental to successful performance of the completed Work.

F. Where deviations from Contract Documents may affect the Work of another Contractor, the Contractor making the submittal shall attach a letter from the other Contractor(s) stating that the deviation will either:

1. Have no effect on his Work; or

2. Have an effect on his Work and that the Contractor making the submittal has agreed to pay all extra costs associated with the deviation.

G. Provide space for Contractor and Engineer review stamps.

H. Revise and resubmit submittals as required, identify all changes made since previous submittal.

I. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

J. All submittals shall be completely legible.

K. All submittals shall be entirely printed or in ink, not pencil.

L. Neither facsimiles, nor copies from facsimiles, shall be submitted.

1:04 ACTION ON SUBMITTALS

A. Engineer's Action: Where action and return is required or requested, Engineer will review each submittal, mark with the action taken, and return. Where submittal must be held for coordination, Contractor may be so advised by Engineer.

B. Submittals returned with "APPROVED" action indicates that the information submitted was found to be in conformance with the design concept and in compliance with the requirements of the Contract Documents. The Contractor remains responsible for work-related errors, deviations, and discrepancies in the submittal, but may proceed with performance of the work covered by the submittal.

C. Submittals returned with "APPROVED AS NOTED" action indicates that the information submitted was found to be in conformance with the design concept and in compliance with the requirements of the Contract Documents, provided

the noted clarifications or corrections are incorporated in the submitted information for Record Document purposes. The Contractor remains responsible for work-related errors, deviations, and discrepancies in the submittal, but may proceed with performance of the work covered by the submittal. Resubmission of information is not required.

D. Submittals returned with "RETURNED FOR CORRECTION" action indicate that: (1) information submitted is at least partially not in conformance with the design concept, (2) information submitted is at least partially not in compliance with the requirements of the Contract Documents, (3) submittal is incomplete and does not include all items required by the individual Specification Sections, or (4) certifications or computations required by the individual Specification Sections have not been included with the Shop Drawings and product data. Engineer will note the deficiencies or corrections required, and return the submittal to the Contractor. Performance of the work covered by the submittal shall not proceed until corrected information is submitted and approved

E. Submittals returned with "NOT AS SPECIFIED" action indicates that the Engineer interprets the information submitted to be not in conformance with the design concept or not in compliance with the Contract Documents. This action may also indicate non-compliance with the Contractor's responsibility to review information and submit notification of deviations and discrepancies for the Engineer's review. Performance of the work shall not proceed until new information is submitted and approved.

F. Review Action does not establish submitted information as a Contract Document, a Change Order, or authorization to deviate from the Contract Documents.

1:05 CONSTRUCTION SCHEDULES

A. Submit initial construction schedule in triplicate within 10 days after date of "NOTICE TO PROCEED". Revise and resubmit as required.

B. Submit revised schedules as required by Engineer, identifying changes since previous version.

C. Submit a horizontal bar chart with separate line for each section of work, identifying first work day of each week.

D. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities.

E. Submit a narrative report with each updated construction schedule; highlight significant activities planned for the next month and, if the project is behind schedule, list the actions which are planned to return the work to the schedule.

F. Indicate estimated percentage of completion for each item of work at each submission.

1:06 PROPOSED PRODUCT LIST

A. Within 10 days after date of Notice to Proceed, submit in triplicate complete list of major products proposed for use, with name of manufacturer, trade name and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1:07 SHOP DRAWINGS

A. Submit the number of opaque reproductions which Contractor requires, plus three (3) copies which will be retained by Engineer. Electronic submittals shall be acceptable if approved by Engineer.

B. Submittals describing structural and mechanical items shall be drawn to scale.

C. Data shall be explicit with regard to details of the products being furnished and complete enough to enable the Engineer to readily determine that the products submitted conform to the requirements of the Specifications. If a submittal indicates more than one (1) style, size, capacity, etc., of a product on a sheet, the Contractor shall clearly indicate by specifically marking exactly which product type is being submitted for approval. Failure to indicate exactly which product is being submitted shall be cause for rejection of the submittal. Catalog data shall bear the name of manufacturer of the product.

D. All Shop Drawings (and product data) covering related items of equipment or material or integrated systems of equipment or material shall be submitted at the same time in order that their integrated use can be adequately reviewed. No partial submissions will be considered.

1:08 PRODUCT DATA

A. Submit the number of copies which the Contractor requires, plus three (3) copies which will be retained by the Engineer.

B. Mark each copy to identify applicable products, models, options and other data. Delete inapplicable portions or use arrows to indicate applicable portions. Supplement manufacturers' standard data to provide information applicable to this project.

C. All product data (and shop drawings) covering related items of equipment or material or integrated systems of equipment or material shall be submitted at the same time in order that their integrated use can be adequately reviewed. No partial submissions will be considered.

1:09 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturers' standard colors, textures and patterns for Engineer's or Owner's selection.

C. Include identification on each sample, with full product information.

D. Large, bulky samples may be submitted to the Resident Project Representative at the project site. Whenever a sample is submitted at the project site, immediately notify the Engineer of this submittal in writing.

1:10 MANUFACTURER'S INSTRUCTIONS

A. Submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, and operations and maintenance in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and contract documents.

1:11 MANUFACTURER'S CERTIFICATES

A. When specified in individual Specification Sections, submit manufacturers' certificates in quantities specified for Product Data, to Engineer.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

D. When Supplementary Conditions specify certain regulatory restrictions concerning origin of materials (for example, that any steel used on the Project must be a product of the United States), submit a certificate from equipment or material manufacturer that products supplied to the Contractor are in conformity with the regulatory requirements.

PART 2 - PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 – EXECUTION

3:01 SUBMITTAL SCHEDULE

A. Within 10 days of the effective date of Notice to Proceed, submit a schedule showing the date by which each submittal will be made. Allow at least 15 days for review and approval of each submittal. Schedule submittals so that approved submittals will be in the Contractor's hands before the work is scheduled to be done.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 – GENERAL

1:01 INTENT

Within 15 days after award of the Contract, the Contractor shall prepare and submit to the Engineer a proposed construction schedule for the work, with subschedules of related activities which are essential to its progress.

1:02 RELATED REQUIREMENTS

A. Summary of the Work. Section 01010.

B. Submittals. Section 01300.

C. Shop Drawings, Product Data and Samples. Section 01340.

1:03 FORM OF SCHEDULES

A. Prepare schedule in the form of a horizontal bar chart.

1. Provide separate horizontal bar for each trade or operation.

2. Horizontal Time Scale. Identify first work day of each week

3. Scale and Spacing. To allow space for notations and future revisions.

1:04 CONTENT OF SCHEDULES

A. Construction Schedule.

1. Show complete sequence of construction by activity.

2. Show dates of beginning and completion of each major element of construction. Specifically list:

3. Show projected percentages of completion for each item, as of the first day of each month.

4. Indicate the critical path for completion of the entire project.

B. Schedule for Submittals of Shop Drawings, Product Data and Samples. Show:

1. The dates for Contractor's submittals.

2. The dates submittals will be required for Owner-furnished products.

3. The dates reviewed submittals will be required back from the Engineer.

C. Products Delivery Schedule. Show delivery dates for:

1. Products furnished by Owner, Section 01010.

2. Products specified under Allowances, Section 01020.

D. Provide subschedules to define critical portions of prime schedules.

1:05 PROGRESS REVISIONS

A. Indicate progress of each activity to date of submission.

B. Show changes occurring since previous submission of schedule.

1. Major changes in scope.

2. Activities modified since previous submission.

3. Revised projections in progress and completion.

4. Other identifiable changes.

C. Provide a narrative report as needed to define:

1. Problem areas, anticipated delays and the impact on schedule.

2. Corrective action that will be taken by the Contractor to get the project back on schedule. This item is required whenever the progress of the job is behind the original progress schedule.

3. The effect of changes on schedules or on other prime contractors.

1:06 SUBMISSIONS

A. Submit initial schedules within 15 days after award of contract.

1. Engineer will review schedules and return review copy within 10 days after receipt.

2. If required, resubmit within 7 days after return of review copy.

B. Submit revised progress schedules with each application for payment.

C. If size is greater than 11 x 17 inches, submit one reproducible transparency and two opaque reproductions; otherwise, submit two copies.

1:07 DISTRIBUTION

A. Distribute copies of reviewed documents to concerned parties.

B. Instruct recipients to report promptly to Contractor, in writing, any problems anticipated by the projections shown in the schedules.

PART - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 – GENERAL

1:01 RELATED REQUIREMENTS

Submittals. Section 01300.

1:02 SHOP DRAWINGS

A. Submit shop drawings, product data and samples for each item on or before the date given by the Contractor in the Schedule for Submittals that is required by Section 01310, Construction Schedules. Shop drawings which are not required will not be reviewed.

B. Preparation by a qualified detailer is required.

C. Where necessary for clarity, identify details by reference to sheet and detail numbers, schedule or room numbers as shown on the contract drawings.

D. Field dimensions shall be clearly indicated as such.

E. Prepare a reproducible transparency and two opaque prints of each shop drawing.

1:03 PRODUCT DATA

A. Modify the manufacturer's standard schematic drawings to delete or supplement information as applicable.

B. For manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts, illustrations and other descriptive data:

1. Clearly mark each copy to identify materials, products or models which are being submitted for review.

2. Show dimensions and clearances required.

3. Show performance characteristics and capacities.

4. Show wiring diagrams and controls.

C. Submit the number of copies which the Contractor requires, plus three (3) copies to be retained by the Engineer. Total number of copies shall not exceed six (6).

1:04 SAMPLES

A. Submit samples of sufficient size and quantity to clearly illustrate functional characteristics of product or materials including integrally related parts and attachment devices, and full range of available colors.

B. Erect field samples and mock-ups at the project site in an acceptable location. Construct each sample complete, including work of all trades required in finished work.

C. Submit two samples unless greater quantity is specified in technical section. One sample will be retained unless noted otherwise.

1:05 SUBMISSION REQUIREMENTS

A. Accompany each submittal with a dated transmittal letter (AIA document G810) which includes:

1. Submittal number. Number submittals sequentially beginning with "001".

2. Project title and number.

3. The names of:

a. Contractor.

b. Subcontractor.

c. Supplier.

d. Manufacturer.

4. Identification of product or material.

5. Relation to adjacent structure or materials.

6. Specification section number and/or drawing number.

7. Applicable standards, such as ASTM number or Federal Specification.

8. Identification of deviations from the contract documents.

B. Provide a blank space on each shop drawings, approximately 5” by 5”, for the Engineer’s stamp.

C. Contractor’s stamp, dated and initialed or signed, certifying review of submittal, verification of field measurements and compliance with contract documents shall be placed on each submittal item. Any submittal items that do not have the Contractor’s stamp will be returned without review.

D. Insofar as practical, make all submittals for each of the following categories (where applicable) at one time.

1. Roofing, roof insulation, flashing and roof accessories.

2. Doors, frames and hardware, furnishings.

3. Mechanical.

4. Plumbing.

5. Electrical.

6. Site work materials.

1:06 ENGINEER’S DUTIES

A. Review and return submittals with reasonable promptness.

B. Review will be only for conformance with the design intent and with the contract documents.

C. Affix stamp and initials or signature, and indicate approved or requirements for resubmittal.

D. Return submittals to Contractor for distribution or for resubmission.

1:07 RESUBMISSION REQUIREMENTS

A. Assign a submittal number that is the same as the original submittal number plus a sequential letter suffix beginning with “A”.

B. Revise documents as required and resubmit as specified for initial submittal. Indicate on drawings any changes which have been made, including those requested by the Engineer.

1:08 DISTRIBUTION AFTER REVIEW

A. Distribute copies of shop drawings and product data which carry the Engineer's stamp to:

1. Contractor's file.

2. Job site file.

3. Record document file.

4. Subcontractors.
5. Supplier.

6. Fabricator.

B. Distribute returned samples as needed.

PART 2 - PRODUCTS

Products which require shop drawings, product data and samples are listed in Section 01300.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES AND APPLICATIONS FOR PAYMENT

PART 1 – GENERAL

1:01 SECTION INCLUDES

A. Schedule of Values.

B. Application for Payment.

C. Payment for Tests and Inspections.

1:02 SCHEDULE OF VALUES

A. Paragraph 14.01 of the General Conditions requires submission of a Schedule of Values for lump sum contracts. Prepare this Schedule as follows:

1. Use format that can later be used as Application for Payment.

2. Set up the following as separate line items:

a) Contract bonds and insurance.

b) Maintenance and final preparation of Record Documents.

3. Use Table of Contents for Divisions 2 through 28 to establish line items for Schedule of Values. Provide values for, at least, every Section in Divisions 2 through 28.

4. When a Section covers several different but related items, provide a value for each separate item. For example, if a pump section covers several different sizes of the same type pump, provide a value for each size pump.

5. Set up each unit price item as a separate line item at the extended price amount shown on the Bid Form.

6. Include within each line item a directly proportional amount of Contractor's overhead and profit. Total of all items on Schedule of Values shall equal the Contract Price.

7. Schedule shall be balanced, and will not be used until it is accepted by the Engineer.

1:03 APPLICATIONS FOR PAYMENT

A. Submit three (3) copies of Application for Payment at times specified in Paragraph 14.02 of the General Conditions.

B. Submit Application for Payment on form which has been used for the Schedule of Values and accepted by the Engineer.

1:04 PAYMENT FOR TESTS AND INSPECTIONS

A. Include the costs of shop tests and shop inspections in the price of the manufactured Products, and no separate or extra payment will be made for such tests and inspections.

B. Contractor shall employ and pay for the services of an independent firm(s) to perform laboratory and field testing and inspection as required in the various Specification Sections. Obtain acceptance of the proposed testing and inspection forms from Engineer. Cost of such tests and inspections shall be included in the Bid prices and separate or extra payment will be made.

PART 2 – PRODUCTS

NOT APPLICABLE TO THIS SECTION

PART 3 – EXECUTION

NOT APPLICABLE TO THIS SECTION

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 – GENERAL

1:01 RELATED REQUIREMENTS

A. Inspections and Tests Required by Regulatory Agencies. The responsibility for compliance lies with the Contractor. See General Conditions.

B. Specific Product Testing. Tests to be performed by an independent testing laboratory are described in the various specification sections.

1:02 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Exercise quality control over suppliers, manufacturers, products, services, site conditions and workmanship to produce work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence. Should manufacturers' instructions conflict with contract documents, request clarification from Engineer before proceeding.

C. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.

D. Perform work by persons qualified to produce workmanship of specified quality.

E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1:03 REFERENCE STANDARDS

A. Conform to reference standard by date of issue current on date of contract documents.

B. Should specified reference standards conflict with contract documents, request clarification from Engineer before proceeding.

C. The contractual relationship of the parties to the contract shall not be altered from the contract documents by mention or inference otherwise in any reference document.

D. Abbreviations for the various reference standard organizations, which may be cited in these Specifications, are as follows:

Abbreviation	Organization
AA	Aluminum Association
AASHTO	American Assoc. of State Highway and Transportation Officials
ACI	American Concrete Institute
ACS	American Chemical Society
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGC	Associated General Contractors of America
AGMA	American Gear Manufacturers Association
AHDGA	American Hot Dip Galvanizers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AICE	American Institute of Chemical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
BIA	Brick Institute of America
CBRA	Copper and Brass Research Association
CLFMI	Chain Link Fence Manufacturer's Institute
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (U.S. Dept. of Commerce)
DEP	Pennsylvania Department of Environmental Protection
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
EEI	Edison Electric Institute
EJCDC	Engineers' Joint Contract Documents Committee
EPA	U.S. Environmental Protection Agency
FM	Factory Mutual System
FTI	Facing Tile Institute
FS	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association

Abbreviation	Organization
MBE	Minority Business Enterprise
MBMA	Metal Building Manufacturers Association
MIL	Military Specification
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers
NBFU	National Bureau of Fire Underwriters
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OFCCP	Office of Federal Contracts Compliance Program
OSHA	Occupational Safety and Health Act of 1970
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PennDOT	Pennsylvania Department of Transportation
SAE	Society of Automotive Engineers
SCPI	Structural Clay Products Institute
SDI	Steel Deck Institute
SFPA	Southern Forest Products Association
SIGMA	Sealed Insulating Glass Manufacturer Association
SJI	Steel Joist Institute
SPIB	Southern Pine Inspection Bureau
SMACNA	Sheet Metal and Air Conditioning National Association
SMSA	Standard Metropolitan Statistical Area
SSPC	Steel Structures Painting Council
TCA	Tile Council of America, Inc.
TEMA	Tabular Exchanger Manufacturers Association
UL	Underwriters' Laboratories, Inc.
USGS	United States Geological Survey

1:04 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications sections for review.

B. Acceptable samples represent a quality level for the work.

C. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by Engineer.

1:05 TESTING LABORATORY SERVICES

A. Contractor shall retain the services of an independent qualified firm(s), approved by the Engineer, to perform inspection and testing as specified in Section 01370. Each such firm shall have a documented favorable record for skill and experience in the type of work it proposes to do for this project.

B. The independent firm will perform inspections, tests and other services specified in individual specification sections and as required by the Engineer.

C. Reports will be submitted by the independent firm to the Engineer, in duplicate, indicating observations and results of tests and indicating compliance or noncompliance with contract documents. Reports will be submitted to Engineer within 48 hours after completion of test.

D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.

1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.

2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

E. All specified testing shall be at the Contractor's expense.

F. Retesting required because of nonconformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor.

1:06 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions; conditions of surfaces and installation; quality of workmanship; start-up of equipment; testing, adjusting and balancing of equipment; and installation as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions. Submit report in duplicate within 10 days of observation.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 – GENERAL

1.01 INTENT

A. The facilities and controls specified in this section are considered minimum for the project. The Contractor may provide additional facilities and controls which he considers necessary for the proper execution of the work and to meet his responsibilities for protection of persons and property.

1.02 REGULATORY REQUIREMENTS

A. Comply with applicable laws and regulations of authorities having jurisdiction, including but not limited to building codes, health and safety regulations, utility company regulations, and environmental protection regulations.

B. Provide electrical equipment which is UL listed.

1.03 RESPONSIBILITIES UNDER SEPARATE CONTRACTS

A. Construction Coordinator (General Contractor) shall, as specified in the Supplementary Conditions, be responsible for all Construction Facilities and Temporary controls.

B. The Contractor shall furnish, install, and pay for its own field office(s), facilities within its own field office(s), and storage facilities, and shall be responsible for removing these facilities upon completion of the Work. General Contractor shall be responsible for coordinating and establishing the locations of these field offices and storage facilities.

1.04 BUILDINGS

A. Field Office. Field office is not permitted at the project site.

B. Storage. Storage area must be coordinated with School District Director of Facilities and Operations.

C. Other Buildings. The location or building of structures and the erection of tents are not permitted at the project site.

1.05 UTILITIES

A. Underground Utilities. At least 2 days prior to commencing any underground excavation, notify the PA One-Call System (PA One-Call), (800) 242-1776. Utility companies will be notified by the PA One-Call and will mark the location of underground utilities on the site. The time of notification and the serial number assigned by the PA One-Call shall become part of the project records.

B. Temporary Water. Contractor shall provide potable water for drinking on-site for Contractor's workers. Temporary water is not necessary for the entire school.

1.06 SANITATION

A. Provide and maintain sanitary conveniences to satisfy requirements of local, state and federal authorities, ordinances and laws.

1.07 PARKING

A. If parking is not permitted on adjacent streets, provide adequate stable, mud-free off-street parking for the maximum number of anticipated employees on the site at any given time, including additional spaces for Engineer, Owner, suppliers, etc.

1.08 SECURITY

A. Provide security and facilities to protect the Work from unauthorized entry, vandalism or theft.

1.09 CONTROLS

A. Water Control

1. At all times during the construction of Work of this Project, maintain the flow of storm water, naturally occurring water, and wastewater in existing facilities and channels affected by the Work.

2. Contractor assumes risk from flood damages done to the Work in progress or to Work completed. Make repairs and replacements to the satisfaction of the Engineer.

3. Contractor assumes responsibility for damages to property caused by flooding due to blocking or restriction of storm water passages, natural waterways, wastewater facilities.

4. Do not at any time permit wastewater to flow into nearby waterways or to flow on surface areas.

5. See other water control requirements under “Soil Erosion and Sedimentation Control”.

B. Protection of Installed Work

1. Protect installed Work and provide special protection where specified in individual Specification Sections.

2. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

3. Prohibit traffic from landscaped areas.

C. Security

1. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

2. Protect existing Owner’s facilities and operations from unauthorized entry, vandalism, or theft.

1.10 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris and rubbish on a daily basis and place such materials in a suitable container. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Remove waste materials, debris and rubbish from site weekly and dispose of same off-site in a manner consistent with state and local laws and ordinances.

1.11 EXTERIOR MUD AND DUST, ETC.

A. Clean mud, dust, and construction debris from any public roads and streets used by Contractor's vehicles and construction equipment. Such cleaning will be required on at least a daily basis.

1.12 SAFETY EQUIPMENT

A. First Aid Supplies: Comply with governing regulations.

B. Fire Extinguishers

1. Provide wall-mounted fire extinguishers for temporary offices and for work spaces.

2. Comply with NFPA 10 and 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.13 SECURITY

A. Provide security and facilities to protect the Work from unauthorized entry, vandalism or theft.

1.14 BARRIERS

A. Provide barriers to prevent unauthorized entry to the construction area and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide protection of vegetation designated to remain undisturbed. Replace damaged vegetation.

C. Protect vehicular traffic, stored products, structures and other site features from damage.

1.15 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual Specification sections.

B. Provide temporary and removable protection of installed Work. Control activity in immediate work area to minimize damage.

1.16 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.17 ADDITIONAL REQUIREMENTS

A. Traffic Control. Any traffic control that may be required will be provided by the Contractor in accordance with PennDOT Publication 213M. All traffic control measures will be incidental to the project.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 – GENERAL

1:01 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1:02 RELATED SECTIONS

A. Section II - Instructions to Bidders: Paragraph 2:15 Alternate Products or Materials.

B. Summary of Work - Section 01010.

C. Submittals - Section 01300.

D. Cleaning and Adjusting - Section 01710.

1:03 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

1:04 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1:05 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Provide mixing with foreign matter.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1:06 PRODUCTION OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for "Approved Equal": Submit a request for substitution for any manufacturer not named.

1:07 SUBSTITUTIONS

A. Contractor shall follow provisions of General Condition Paragraph 6.05 as amended by Supplementary Condition Paragraph SC-6.05 for any and all desired substitutions. Contractor shall use the "Substitution Request Form" provided at the end of this Section for any and all requests.

B. Contractor's Representation. A request for a substitution constitutes a representation that Contractor:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.

2. Will provide the same warranties or bonds for the substitution as for the product specified.

3. Will coordinate the installation of an accepted substitution into the work, and make such other changes as may be required to make the work complete in all respects.

4. Waives all claims for additional costs, under his responsibility, which may subsequently become apparent.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

SUBSTITUTION REQUEST

TO:_____

PROJECT:_____

SPECIFIED ITEM:

_____	_____	_____	_____
Section	Page	Paragraph	Description

The undersigned request consideration of the following:

PROPOSED
SUBSTITUTION:_____

Attached data includes product description, specifications, drawings, photographs, performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

Fill in blanks below:

A. Does the substitution affect dimensions shown on Drawings? _____ Yes _____ No

B. Will the undersigned pay for changes to the building design, including engineering and investigation and redesign which may be necessitated by the requested substitution? _____ Yes _____ No

C. What effect does substitution have on other trades and on construction schedule?
_____

D. Differences between proposed substitution and specified item?
_____

E. Manufacturer's guarantees of the proposed and specified items are:
_____ Same _____ Different (explain on attachment)

F. Use subject to any license fee or royalty? _____ Yes _____ No

G. Adjustment in the contract sum due to substitution: $_____

The undersigned further states that the function, appearance and quality of the proposed substitution are equivalent or superior to the specified item.

Submitted by:

Signature: _____ For use by the A/E

Firm: _____ ☐ Approved ☐ Approved as noted

Address _____ ☐ Not Approved ☐ Received too late

_____ By _____

Date _____ Date_____

Telephone _____ Remarks _____

Attachments

SECTION 01700

CONTRACT CLOSEOUT

PART 1 – GENERAL

1:01 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

1:02 RELATED SECTIONS

A. General and Supplementary Conditions.

B. Starting of Systems - Section 01650.

1:03 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.

B. Provide submittals to Engineer that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Owner will occupy all portions of the building as specified.

1:04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition.

D. Replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1:05 ADJUSTING

Adjust operating Products and equipment to ensure smooth and unhindered operation.

1:06 PROJECT RECORD DOCUMENTS

A. Maintain on site, one set of the following record documents; record actual revisions to the Work:

1. Contract Drawings: As a condition of final payment, each Contractor, during construction shall maintain one record set of contract drawings and shall record on this set, in red pencil or crayon, all construction deviations from the original. Record final installed locations of conduit, equipment sizes, locations of underground lines by depth from finished grades and offset distances in feet and inches to surface improvements such as building, curbs, edge of walks and other pertinent details. At the completion of the work, each Contractor shall forward these marked prints to the Engineer. Compliance with this requirement is a prerequisite for approval of final payment to the Contractor.

2. Specifications.

3. Addenda.

4. Change Orders and other Modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separate from documents used for construction.

C. Record information concurrent with construction progress.

D. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.

3. Changes made by Addenda and Modifications.

E. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish main floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.

5. Details not on original Contract Drawings.

F. Delete Engineer title block and seal from all documents.

G. Submit documents to Engineer with claim for final Application for Payment.

1:07 OPERATION AND MAINTENANCE DATA

A. Submit five sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, 3-ring binders with durable plastic covers.

B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below, with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents:

1. Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 24-pound white paper.

2. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.

3. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

    a. Significant design criteria.

    b. List of equipment.

    c. Parts list for each component.

    d. Operating instructions.

    e. Maintenance instructions for equipment and systems.

    f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

4. Part 3: Project documents and certificates, including the following:

    a. Shop drawings and product data.

    b. Air and water balance reports.

    c. Certificates.

    d. Photocopies of warranties and bonds.

E. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Engineer comments. Revise content of documents as required prior to final submittal.

F. Submit final volumes revised, within ten days after final inspection.

1:08 WARRANTIES

A. Provide duplicate notarized copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in 3-ring binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1:09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

SECTION 01710

CLEANING AND ADJUSTING

PART 1 – GENERAL

1:01 RESPONSIBILITY

A. Each Contractor is responsible for cleaning and adjusting their own work. If the Contractor(s) fail to clean and adjust the work, the Owner may do so and charge the resulting costs to the appropriate Contractor.

B. Detailed cleaning and adjusting requirements for specific work are specified in sections pertaining to that work.

1:02 REQUIREMENTS OF REGULATORY AGENCIES

A. Fire Protection. Store volatile waste in covered metal containers and remove from premises daily.

B. Pollution Control. Conduct cleaning and disposal operations in compliance with local ordinances and antipollution laws.

1. Burning or burying of rubbish and materials on the project site is not permitted.

2. Disposal of volatile fluid wastes and other chemical wastes in storm or sanitary sewer systems or into streams or waterways is not permitted.

C. Safety Standards. Maintain the project in accordance with insurance and safety standards.

PART 2 – PRODUCTS

2:01 MATERIALS

Use only cleaning materials approved by the manufacturer of the surface to be cleaned. Employ cleaning materials in the manner recommended by the cleaning material manufacturer.

PART 3 – EXECUTION

3:01 DURING CONSTRUCTION

A. Oversee cleaning and ensure that the premises are maintained free from accumulations of waste material and rubbish. Do not allow waste materials, rubbish and debris to accumulate and become unsightly or create a hazard. Provide containers and locate on site for collection of waste material, rubbish and debris.

B. At reasonable intervals during progress of the work, collect and disposal of waste material, rubbish and debris. Handle waste in a controlled manner; do not drop or throw materials from heights.

C. Remove waste materials, rubbish and debris from the site and legally dispose at public or private dumping areas off the project site.

D. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning as needed until the building is ready for acceptance or occupancy. Schedule cleaning operation so that resulting dust and other contaminants will not fall on wet, newly painted surfaces.

3:02 FINAL CLEANING AND ADJUSTING

A. Use experienced workmen or professional cleaners for final cleaning.

B. Remove grease, dust, dirt, stains, paint, oil, labels, fingerprints and other foreign materials from interior and exterior surfaces. Repair, patch and touch-up marred surfaces to match adjacent finishes.

C. Broom clean paved surfaces; rake clean other surfaces of grounds.

D. Clean and service all air filters and pipe strainers. Replace disposable filters if dirty. Clean ducts, blowers and coils if air conditioning units were operated without filters.

E. If installed features of the work fail to operate or operate improperly, make the necessary adjustments to prevent damage and ensure proper operation. Remove and repair or replace adjusted items if necessary for proper adjustment.

F. Remove all waste material and rubbish from the project area, as well as all tools, construction equipment, machinery, surplus materials and temporary facilities.

G. Clean all glazed areas as provided in Section 08800.

H. Immediately prior to acceptance or occupancy, conduct a final inspection of exposed interior and exterior surfaces to verity that the work is properly cleaned. Maintain cleaning until the premises are occupied by the Owner.

3:03 ADJACENT AREAS

To the Engineer's satisfaction, clean or repair adjacent areas affected by the construction. Remove dust and debris in the adjacent area. Repair, patch and touch-up marred surfaces to match adjacent finishes.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 – GENERAL

Prepare and maintain record documents for the project to reflect accurately the construction as built. Documents must be submitted at work completion as a condition of final acceptance.

1:01 MAINTENANCE OF RECORD DOCUMENTS

A. Maintain at the job site, one copy of the following as Project Record Documents:

1. Contract drawings.
2. Project Manual.
3. Addenda.
4. Reviewed shop drawings.
5. Approved samples.
6. Change orders and field orders.
7. Field test records.
8. Correspondence.

B. Store record documents in an approved location apart from documents used for construction. Do not use record documents for construction purposes. Provide files and racks for orderly storage. Maintain documents in clean, dry, legible condition. Make documents and samples available at all times for inspection by the Engineer.

1:02 MARKING DEVICES

Mark all changes legibly in a contrasting color.

1:03 RECORDING

A. Keep record documents current. Do not permanently conceal any work until required information has been recorded.

B. Label each document “PROJECT RECORD” in neat, large, printed letter. Legibly mark contract drawings to record actual construction, showing:

1. Depths of various elements of foundation in relation to finished floor.

2. Horizontal and vertical location of underground and underslab utilities and appurtenances referenced to permanent surface improvements.

3. Location of internal utilities and appurtenances referenced to permanent surface improvements.

4. Field changes of dimension and detail.

5. Changes made by change order or field order.

6. Details not on original contract drawings.

C. Legibly mark specifications and addenda to record:

1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.

2. Changes made by change order or field order.

3. Other matters not originally specified.

D. Legibly annotate the following shop drawings to record changes made after review:

1. Project Record Copy

2. Engineers/Owners Copy

E. Delete Engineer’s seals from record documents.

1:04 SUBMITTAL

A. At project completion, submit record documents as required in Section 01300. Place all letter-sized material in a 3-ring binder, neatly indexed. Bind contract drawings and shop drawings in rolls of convenient size for each of handling.

B. Accompany the submittal with a transmittal letter in duplicate, containing:

1. Date.

2. Project title and number.

3. Contractor’s name and address.

4. Title and number of each record document.

5. Certification that each document as submitted is complete and accurate.

6. Signature of Contractor.

PART 2 – PRODUCTS

NOT USED.

PART 3 – EXECUTION

NOT USED.

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 – GENERAL

1:01 RELATED REQUIREMENTS

A. General Warranty of Construction. Conditions of the Contract.

B. Contract Closeout. Section 01700.

C. Warranties and Bonds and Duration Required for Specific Products in Sections. Project Checklist in Section 01300.

1:02 SUBMITTALS

A. Requirements

1. Assemble two original signed copies of all warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.

2. Provide complete information for each item, including, but not limited to, the following information:

   a. Product or work item.

   b. Firm, with name of principal, address and telephone number.

   c. Scope.

   d. Date of beginning and duration of warranty, bond, or service and maintenance contract.

   e. Proper procedure for Owner's personnel in case of failure.

   f. Instances which might affect validity of warranty or bond.

3. Provide a table of contents, neatly typed, in orderly sequence.

4. Place a copy of the equipment warranties in the Operations and Maintenance Manual for the equipment.

B. Form

1. Prepare submittals in duplicate packets bound in 3-ring binders of commercial quality with cleanable plastic covers.

2. All materials should be 8-1/2" x 11" (larger sheets shall be folded to fit binders), punches to fit the 3-ring binders.

3. Include a cover sheet identifying each packet with the title: "WARRANTIES AND BOND". Also list the project title and name of Contractor.

C. Time of Submittals.

1. For equipment or component parts of equipment put into service during progress of construction, submit documents within 10 days after inspection and acceptance.

2. Make submittals within 10 days after date of substantial completion, and prior to final request for payment. For items of work where acceptance is delayed materially beyond the date of substantial completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

D. Required Submittals. Submit warranties, bonds, service and maintenance contracts as specified.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

DIVISION 11 - EQUIPMENT

11902 Co-Current Regeneration Ion Exchange System

11910 Equipment Basis of Design – Equipment Cut Sheets

1. Well Pump – Franklin Model 35 FH2S4-PECV
2. Backflow preventer – Watts Series LF719
3. Pressure Switch and WellXTrol tank
4. Water Meter – Carlon Model 1000SSM and Carlon Model 1000SSMRS
5. Sediment Filter – Harmsco Hurricane Filter HUR 40 HP
6. Ion Exchange Treatment Units (Twin Alternating)
   a. Purolite SSTC60 Resin
   b. Pentair Composite Pressure Tank x 2
   c. Brine Tank 30”
   d. Clack Control Valve with SS meter x 2
   e. Clack Motor Alternating Valve with Flow Diagram
   f. Clack SS Flow Controller 20 gpm
7. Disinfection
   a. Stenner Fixed Rate Pump – 45 Series
   b. Stenner Pump Control Module
   c. Stenner Flow Indicator
   d. Buckman’s Chlorine NSF Certificate
   e. Chlorine Solution Tank
8. Flow Control Valves – Dole GT10 x 2
9. Chlorine Contact Tanks with vacuum breaker – Clack Max Contact Tank 120 gallon x 8 and CashAcme VR 20 Vacuum Breaker x 8
10. Atmospheric Storage Tanks – Norwesco 750 gallon x 4 with level controls
11. Booster Pumps – Penn Pump PB-750 Posi-Boost Duplex

SPECIFICATION FOR

CO-CURRENT REGENERATED ION EXCHANGE SYSTEM

PART 1 – DESCRIPTION

1:01 This section of the specifications provides for a co-current ion exchange system utilizing cation resin rated for 20 gpm, complete and operable as indicated on the drawings and as specified herein. The system shall be installed as shown on the plans, as recommended by the Manufacturer / Supplier, and in compliance with all OSHA local, state, and federal codes and regulations.

1:02 This project is for the furnishing and installation of one twin alternating ion exchange system for iron, manganese, and hardness removal, complete with necessary controllers and appurtenances.

1:03 The following items shall be included in this section and shall be furnished by the water treatment equipment manufacturer or contractor.

A. Ion Exchange Vessels
B. Brine Regeneration Equipment and Plumbing
C. Cation Exchange Resin
D. Plumbing to Sanitary Sewer System
E. Accessories

1:04 All interconnecting wiring and conduit, motor starters, and appurtenant electrical work associated with the ion exchange system shall be furnished and installed by the mechanical contractor as incidental work of the project in accordance with the specifications and the Contract Drawings.

PART 2 – GENERAL REQUIREMENTS

2:01 MANUFACTURERS

A. The ion exchange system shall be in compliance with the specifications and plans and shall be supplied:

1. Twin Alternating Ion Exchange System (Basis of Design)

2:02 The treatment system shall be furnished by an Original Equipment Manufacturer (OEM) who is an established manufacturer/assembler of ion exchange systems.

2:03 The successful bidder shall:

A. Furnish proof of successful operating experience during the last 5 years on 4 commercial, institutional, or industrial installations, comparable in size and flow rate using co-current regeneration as specified herein.

B. Accept responsibility for satisfactory operation of the entire system and equipment.

C. Guarantee for one (1) year from the date of acceptance that all equipment is free from defects in design, materials and workmanship and furnish replacement parts for any defective component at no additional cost to the owner.

2:04 The Base Bid shall be for an ion exchange system all in accordance with the following detailed specification and as shown on the drawings.

2:05 It is the intention of these specifications that the ion exchange system specified in this section shall be furnished as part of a coordinated system supplied by a single contractor so that undivided responsibility for a complete and operable system is assured. The ion exchange system shall include the equipment and accessories specified herein.

PART 3 – SUBMITTALS

3:01 The ion exchange equipment supplier shall submit to the engineer a complete sets of shop drawings, details, data sheets, and other descriptive drawings and material as may be required to fully describe the equipment proposed and to verify compliance with the contract documents.

3:02 All submittals shall be complete, neat and orderly. The submittals shall include the following, as applicable:

A. Detailed description of each piece of equipment specified with NSF/ANSI 61 certifications included with manufacturer literature.

B. Description of the operation and control of the equipment.

C. Two (2) copies of operation and maintenance requirements for the overall system.

D. Written Standard Operation Procedure (SOP) for operation and maintenance of ion exchange system.

PART 4 – PERFORMANCE AND DESIGN REQUIREMENTS

4:01 The ion exchange system shall be specifically designed to reduce the iron, manganese, and hardness level from groundwater supplies.

4:02 Design requirements are as follows:

A. The ion exchange system shall be designed in accordance with the following requirements:

1.	System Design Flow Rate	20 gpm (maximum)
2.	Minimum iron and manganese reduction rate	92%

3. Ability to consistently produce total iron concentrations from 1.5 mg/L to less than 0.25 mg/L, total manganese concentrations from 0.5 mg/L to 0.04 mg/L or lower if capable.

4. Must meet or exceed the following Purolite Shallow Shell SSTC60 strong acid cation resin Specification:

Ion Exchange Specifications:

System Capacity (Kgr)	300 (each unit, alternating duplex)
Number of Tanks	2
Tank Dia. Ft.	2
Resin, Cu Ft per tank	10
Resin Depth, Ft	3.2
Total Service Flow Rate, gpm	20 (not to exceed)
Design Flow Rate, gpm/sq ft	6.37

Raw Water Chemistry

Total Fe mg/l (raw)	1.5
Total Mn mg/l (raw)	0.5
Fe + Mn mg/l (raw)	2.0
Total Hardness as CaCO3 mg/l	340
Total Adjusted Hardness gr/gal	27

System Settings (based on PWS Manual Part II Design Standards)

Exchange Capacity Basis (not to exceed)	20,000 gr/cu ft with 0.3 lb salt per kgr of Hardness removed.
System Capacity setting (Kgr)	200
Gallons treated/ regen/ unit.	7,400
Salt Dosage, lb/cu ft	6
Salt Usage, lb/regen/unit	60

B. The source of backwash and rinse water shall be the softened water prior to sodium hypochlorite addition. Soft water is required for brine regeneration and slow rinse.

4:03 Public Water Supply System Effluent Guarantee

The ion exchange removal system manufacturer shall review the system's influent raw water quality and the specific requirements of these specifications, and shall guarantee in writing that the equipment supplied hereunder will consistently produce a public water supply system effluent having a total iron concentration, total manganese concentration, and hardness as noted below:

Total Iron	Not to Exceed:	0.25 mg/L
Total Manganese	Not to Exceed:	0.04 mg/L
Total Hardness as CaCO3	Not to Exceed:	100 mg/L of CaCO3

4:04 The ion exchange system shall treat 20 gpm (maximum) to reduce the total iron, total manganese, and total hardness level maximum concentrations listed in Section 4:03 consistently or lower if capable.

PART 5 – EQUIPMENT DESIGN – (OR APPROVED EQUAL)

5:01 ION EXCHANGER VESSELS

The ion exchanger system shall consist of two (2) 24" outside diameter x 72" pressure tanks and one (1) brine tank sized 30" x 50". The pressure tanks shall be made of polyethylene shell and shall be reinforced with fiberglass wrapping.

The tanks shall be designed for a pressure range of 35-150 psi and shall be NFS/ANSI 61 certified. Tanks shall have minimum 6" diameter top flange.

5:02 PLUMBING SYSTEM

All drain ports from the ion exchange system shall be piped to a 4" floor drain and provided with a minimum 6" air gap.

5:03 ION EXCHANGE MEDIA

The system will use a cation resin with a maximum exchange capacity of 30,000 grains removed per cubic foot of media when regenerated with a dose of 15 lbs. of salt per cubic feet of media. Each tank shall have a media capacity of 10 cubic feet. Media shall be Purolite Shallow Shell SSTC60 strong acid cation resin (or approved equal) and shall be of proper particle size and contain no plates, shells, agglomerates, or other shapes that might interfere with the normal function of the water.

5:04 VALVING

The ion exchange system shall be furnished with a motorized alternating valve, two fully automated control valves, manually operated bypass valves, and all other necessary valves to produce a complete operating iron, manganese, and hardness removal system.

The regeneration control valve, manufactured from non-corrosive materials, shall be top mounted (on top of the media tank). The control valve shall operate using a minimum outlet pressure of 50 psi. The control valve shall incorporate five operational cycles including: service (downflow), backwash (upflow), brine inject (downflow), slow rinse (downflow), fast rinse (downflow). The service cycle operates in a down-flow direction; the brine cycle shall be down-flow, providing co-current regeneration. The control valve shall contain a fixed orifice eductor nozzle and a backwash flow control. Control Valve shall be certified to standard NFS/ ANSI 61. The control valve shall have valves inside that automatically take the valve offline while the system regenerates.

5:05 BRINE SYSTEM

A. Brine Piping/ System

All ion exchange brine piping is to be constructed of PE tubing.

A combination of salt storage and brine production tank shall be manufactured of corrosion-resistant, molded high density polyethylene. The brine tank shall be an internal brine well chamber to house the brine valve assembly. The brine assembly with adjustable salt settings shall provide for a shut-off to the brine refill. The brine tank shall include a safety overflow connection that is plumbed to a suitable drain.

Plastic Brine Grid plates shall be provided as accessory to the tank.

B. General Notes

1. All pipe supports for face and interconnecting piping are to be furnished by the equipment installer.

2. All system face and interconnecting flanged piping are to be furnished with the required bolts, studs, nuts and gaskets.

5:06 AUXILIARY EQUIPMENT

A. Water Meter

Each control valve shall have an internal totalizing meter with flow range of 0.5-75 gpm rating.

B. Controllers

Control valves shall be Clack WS1.5EE or approved equal and Clack V3071 NPT motorized alternating valve or approved equal.

PART 6 – ELECTRICAL REQUIREMENTS

One (1) duplex 110V 15 Amp receptacle is required for the ion exchange system. This powers the alternator control and start controller of the ion exchange system.

END OF SECTION

SECTION 11910

EQUIPMENT BASIS OF DESIGN

PART 1 – GENERAL

1:01 Equipment

A. Equipment chosen for this system is provided in the cut sheets provided. Contractor may provide equal equipment for consideration and approval by the Engineer 5 days prior to bid.

B. Contractor must submit Substitution Request Form for each piece of equipment that differs from the Basis of Design equipment specified.

PART 2 – PRODUCTS

1. Well Pump – Franklin Model 35 FH2S4-PECV
2. Backflow preventer – Watts Series LF719
3. Pressure Switch and WellXTrol tank
4. Water Meter – Carlon Model 1000SSM and Carlon Model 1000SSMRS
5. Sediment Filter – Harmsco Hurricane Filter HUR 40 HP
6. Ion Exchange Treatment Units (Twin Alternating)
    a. Purolite SSTC60 Resin
    b. Pentair Composite Pressure Tank x 2
    c. Brine Tank 30”
    d. Clack Control Valve with SS meter x 2
    e. Clack Motor Alternating Valve with Flow Diagram
    f. Clack SS Flow Controller 20 gpm
7. Disinfection
    a. Stenner Fixed Rate Pump – 45 Series
    b. Stenner Pump Control Module
    c. Stenner Flow Indicator
    d. Buckman’s Chlorine NSF Certificate
    e. Chlorine Solution Tank
8. Flow Control Valves – Dole GT10 x 2
9. Chlorine Contact Tanks with vacuum breaker – Clack Max Contact Tank 120 gallon x 8 and CashAcme VR 20 Vacuum Breaker x 8
10. Atmospheric Storage Tanks – Norwesco 750 gallon x 4 with level controls
11. Booster Pumps – Penn Pump PB-750 Posi-Boost Duplex

PART 3 – EXECUTION - Not used.

END OF SECTION

SUBMERSIBLE PUMPS

4" TRI-SEAL HIGH CAPACITY PUMPS

FEATURES

- Four performance ranges: 35, 45, 60, and 90 gpm
- 2" NPT discharge, with and without an internal stainless steel wafer-style check valve
- Stainless steel discharge head and motor bracket
- High flow hydraulic staging allows for maximum pump output, exceeds all energy efficiency standards, and provides increased product longevity
- Ceramic shaft sleeve and rubber discharge bearing eliminates sand wear
- Intermediate bearing for increased shaft stability when pump lengths dictate on high horse, high performance constructions
- Impeller eye and hub seals for improved performance and efficiency
- Stainless steel hex pump shaft, shell, and shaft coupling
- High capacity upthrust assembly for protection during start-up and operation (35, 45, 60, and 90 gpm models)
- Designed for optimal performance when powered by Franklin's corrosion-resistant 4" submersible motors

CSA CERTIFIED
PUMP END ONLY

C SA US 151236

NSF/ANSI 61
Drinking Water

MODEL NO. EXPLANATION

Example: 60FH10S4-PE

- 60 = gpm
- FH = Franklin Electric Brand
- 10 = 10 hp
- S = Stainless
- 4 = 4" Submersible
- PE = Pump End

Franklin Electric

SUBMERSIBLE PUMPS

4" TRI-SEAL HIGH CAPACITY PUMPS

Franklin Electric

ORDER INFORMATION — 35-90 GPM PUMP ENDS

1 - 10 HP 4" High Capacity Pump Ends									
GPM	HP	Stages	Model	Order No.	Check Valve in 2" NPT Discharge	Basic Model	PEI_{CL} Number	Dimensions (in) Pump End Only	Wt. (lbs)
35	1	5	35FH1S4-PE	93653505	No	35S4	0.83	11.9	8
	1.5	7	35FH15S4-PE	93653507				14.5	9
	2	9	35FH2S4-PE	93653509				17	10
	3	12	35FH3S4-PE	93653512				20.9	11
	5	20	35FH5S4-PE	93653520				22.2	16
	7.5	29	35FH7S4-PE	93653529				44.5	23
	10	38	35FH10S4-PE	93653538				58.5	29
	1	5	35FH1S4-PECV	93663505	Yes			14.1	9
	1.5	7	35FH15S4-PECV	93663507				16.7	10
	2	9	35FH2S4-PECV	93663509				19.2	11
	3	12	35FH3S4-PECV	93663512				23	12
	5	20	35FH5S4-PECV	93663520				35.5	17
	7.5	29	35FH7S4-PECV	93663529				47	24
	10	38	35FH10S4-PECV	93663538				60.7	30
45	1.5	5	45FH15S4-PE	93654505	No	45S4	0.89	14.2	8
	2	7	45FH2S4-PE	93654507				17.6	9
	3	10	45FH3S4-PE	93654510				22.8	10
	5	16	45FH5S4-PE	93654516				35.3	14
	7.5	23	45FH7S4-PE	93654523				47.4	22
	10	31	45FH10S4-PE	93654531				63.3	28
	1.5	5	45FH15S4-PECV	93664505	Yes			16.3	9
	2	7	45FH2S4-PECV	93664507				19.8	10
	3	10	45FH3S4-PECV	93664510				25	11
	5	16	45FH5S4-PECV	93664516				37.4	15
	7.5	23	45FH7S4-PECV	93664523				49.5	23
	10	31	45FH10S4-PECV	93664531				65.5	29
60	2	7	60FH2S4-PE	93656007	No	60S4	0.94	23.5	10
	3	10	60FH3S4-PE	93656010				33.3	12
	5	16	60FH5S4-PE	93656016				48.8	18
	7.5	23	60FH7S4-PE	93656023				68.8	25
	10	30	60FH10S4-PE	93656030				86.9	31
	2	7	60FH2S4-PECV	93666007	Yes			25.7	11
	3	10	60FH3S4-PECV	93666010				35.4	13
	5	16	60FH5S4-PECV	93666016				50.9	19
	7.5	23	60FH7S4-PECV	93666023				71	26
	10	30	60FH10S4-PECV	93666030				89	32
90	2	6	90FH2S4-PE	93659006	No	90S4	0.92	23.4	10
	3	8	90FH3S4-PE	93659008				31.4	12
	5	13	90FH5S4-PE	93659013				46.3	17
	7.5	19	90FH7S4-PE	93659019				66.2	23
	10	25	90FH10S4-PE	93659025				84.2	29
	2	6	90FH2S4-PECV	93669006	Yes			25.6	11
	3	8	90FH3S4-PECV	93669008				33.6	13
	5	13	90FH5S4-PECV	93669013				48.5	18
	7.5	19	90FH7S4-PECV	93669019				68.4	24
	10	25	90FH10S4-PECV	93669025				86.3	30

NOTES: Maximum diameter across cable guard is 3.90" on all models.

ORDER INFORMATION — 35-90 GPM PUMP & MOTOR

1 - 1.5 HP Single-Phase Units (2-Wire PMA)									
GPM	HP	Stages	Volts	Model	Order No.	Check Valve in 2" NPT Discharge	Basic Model	PEI_{CL} Number	Wt. (lbs)
35	1	5	230	35FH1S4-2W230	93673505	No	35S4	0.83	32
	1.5	7		35FH15S4-2W230	93673507				40
	1	5		35FH1S4-2W230-CV	93693505	Yes			33
	1.5	7		35FH15S4-2W230-CV	93693507				41
45	1.5	5		45FH15S4-2W230	93674505	No	45S4	0.89	40
	1.5	5		45FH15S4-2W230-CV	93694505	Yes			41

1 - 1.5 HP Single-Phase Units (3-Wire PMA)									
35	1	5	230	35FH1S4-3W230	93703505	No	35S4	0.83	32
	1.5	7		35FH15S4-3W230	93703507				40
	1	5		35FH1S4-3W230-CV	93713505	Yes			33
	1.5	7		35FH15S4-3W230-CV	93713507				41
45	1.5	5		45FH15S4-3W230	93704505	No	45S4	0.89	40
	1.5	5		45FH15S4-3W230-CV	93714505	Yes			41

SUBMERSIBLE PUMPS

4" TRI-SEAL HIGH CAPACITY PUMPS

Franklin Electric

MODEL CROSS REFERENCE — DOE COMPLIANT VS ORIGINAL FPS PUMP ENDS

1 - 10 HP 4" High Capacity Pump Ends					
GPM	Check Valve in 2" NPT Discharge	Tri-Seal High Capacity, DOE PEI_{CL} Rated		Original FPS (Discontinued, replaced by Tri-Seal High Capacity)	
		Model	Order No.	Model	Order No.
35	No	35FH1S4-PE	93653505	35FA1S4-PE	93613506
		35FH15S4-PE	93653507	35FA15S4-PE	93613508
		35FH2S4-PE	93653509	35FA2S4-PE	93613510
		35FH3S4-PE	93653512	35FA3S4-PE	93613514
		35FH5S4-PE	93653520	35FA5S4-PE	93613522
		35FH7S4-PE	93653529	35FA7S4-PE	93613534
		35FH10S4-PE	93653538	35FA10S4-PE	93613542
	Yes	35FH1S4-PECV	93663505	35FA1S4-PE W/ Check Valve	90653506
		35FH15S4-PECV	93663507	35FA15S4-PE W/ Check Valve	90653508
		35FH2S4-PECV	93663509	35FA2S4-PE W/ Check Valve	90653510
		35FH3S4-PECV	93663512	35FA3S4-PE W/ Check Valve	90653514
		35FH5S4-PECV	93663520	35FA5S4-PE W/ Check Valve	90653522
		35FH7S4-PECV	93663529	35FA7S4-PE W/ Check Valve	90653534
		35FH10S4-PECV	93663538	35FA10S4-PE W/ Check Valve	90653542
45	No	45FH15S4-PE	93654505	45FA15S4-PE	93614506
		45FH2S4-PE	93654507	45FA2S4-PE	93614508
		45FH3S4-PE	93654510	45FA3S4-PE	93614511
		45FH5S4-PE	93654516	45FA5S4-PE	93614518
		45FH7S4-PE	93654523	45FA7S4-PE	93614526
		45FH10S4-PE	93654531	45FA10S4-PE	93614531
	Yes	45FH15S4-PECV	93664505	45FA15S4-PE W/ Check Valve	90654506
		45FH2S4-PECV	93664507	45FA2S4-PE W/ Check Valve	90654508
		45FH3S4-PECV	93664510	45FA3S4-PE W/ Check Valve	90654511
		45FH5S4-PECV	93664516	45FA5S4-PE W/ Check Valve	90654518
		45FH7S4-PECV	93664523	45FA7S4-PE W/ Check Valve	90654526
		45FH10S4-PECV	93664531	45FA10S4-PE W/ Check Valve	90654531
60	No	60FH2S4-PE	93656007	60FA2S4-PE	93616006
		60FH3S4-PE	93656010	60FA3S4-PE	93616008
		60FH5S4-PE	93656016	60FA5S4-PE	93616013
		60FH7S4-PE	93656023	60FA7S4-PE	93616017
		60FH10S4-PE	93656030	60FA10S4-PE	93616024
	Yes	60FH2S4-PECV	93666007	60FA2S4-PE W/ Check Valve	90656006
		60FH3S4-PECV	93666010	60FA3S4-PE W/ Check Valve	90656008
		60FH5S4-PECV	93666016	60FA5S4-PE W/ Check Valve	90656013
		60FH7S4-PECV	93666023	60FA7S4-PE W/ Check Valve	90656017
		60FH10S4-PECV	93666030	60FA10S4-PE W/ Check Valve	90656024
90	No	90FH2S4-PE	93659006	90FA2S4-PE	93619005
		90FH3S4-PE	93659008	90FA3S4-PE	93619007
		90FH5S4-PE	93659013	90FA5S4-PE	93619012
		90FH7S4-PE	93659019	90FA7S4-PE	93619019
		90FH10S4-PE	93659025	90FA10S4-PE	93619020
	Yes	90FH2S4-PECV	93669006	90FA2S4-PE W/ Check Valve	90659005
		90FH3S4-PECV	93669008	90FA3S4-PE W/ Check Valve	90659007
		90FH5S4-PECV	93669013	90FA5S4-PE W/ Check Valve	90659012
		90FH7S4-PECV	93669019	90FA7S4-PE W/ Check Valve	90659019
		90FH10S4-PECV	93669025	90FA10S4-PE W/ Check Valve	90659020

MODEL CROSS REFERENCE — DOE COMPLIANT VS ORIGINAL FPS PUMP & MOTOR

1 - 1.5 HP Single-Phase Units (2-Wire PMA)					
GPM	Check Valve in 2" NPT Discharge	Tri-Seal High Capacity, DOE PEI_{CL} Rated		Original FPS (Discontinued, replaced by Tri-Seal High Capacity)	
		Model	Order No.	Model	Order No.
35	No	35FH1S4-2W230	93673505	35FA1S4-2W230	93613606
		35FH15S4-2W230	93673507	35FA15S4-2W230	93613608
	Yes	35FH1S4-2W230-CV	93693505	35FA1S4-2W230 W/ CV	90653606
		35FH15S4-2W230-CV	93693507	35FA15S4-2W230 W/ CV	90653608
45	No	45FH15S4-2W230	93674505	45FA15S4-2W230	93614606
	Yes	45FH15S4-2W230-CV	93694505	45FA15S4-2W230 W/ CV	90654606
1 - 1.5 HP Single-Phase Units (3-Wire PMA)					
35	No	35FH1S4-3W230	93703505	35FA1S4-3W230	93613706
		35FH15S4-3W230	93703507	35FA15S4-3W230	93613708
	Yes	35FH1S4-3W230-CV	93713505	35FA1S4-3W230 W/ CV	90653706
		35FH15S4-3W230-CV	93713507	35FA15S4-3W230 W/ CV	90653708
45	No	45FH15S4-3W230	93704505	45FA15S4-3W230	93614706
	Yes	45FH15S4-3W230-CV	93714505	45FA15S4-3W230 W/ CV	90654706

SUBMERSIBLE PUMPS

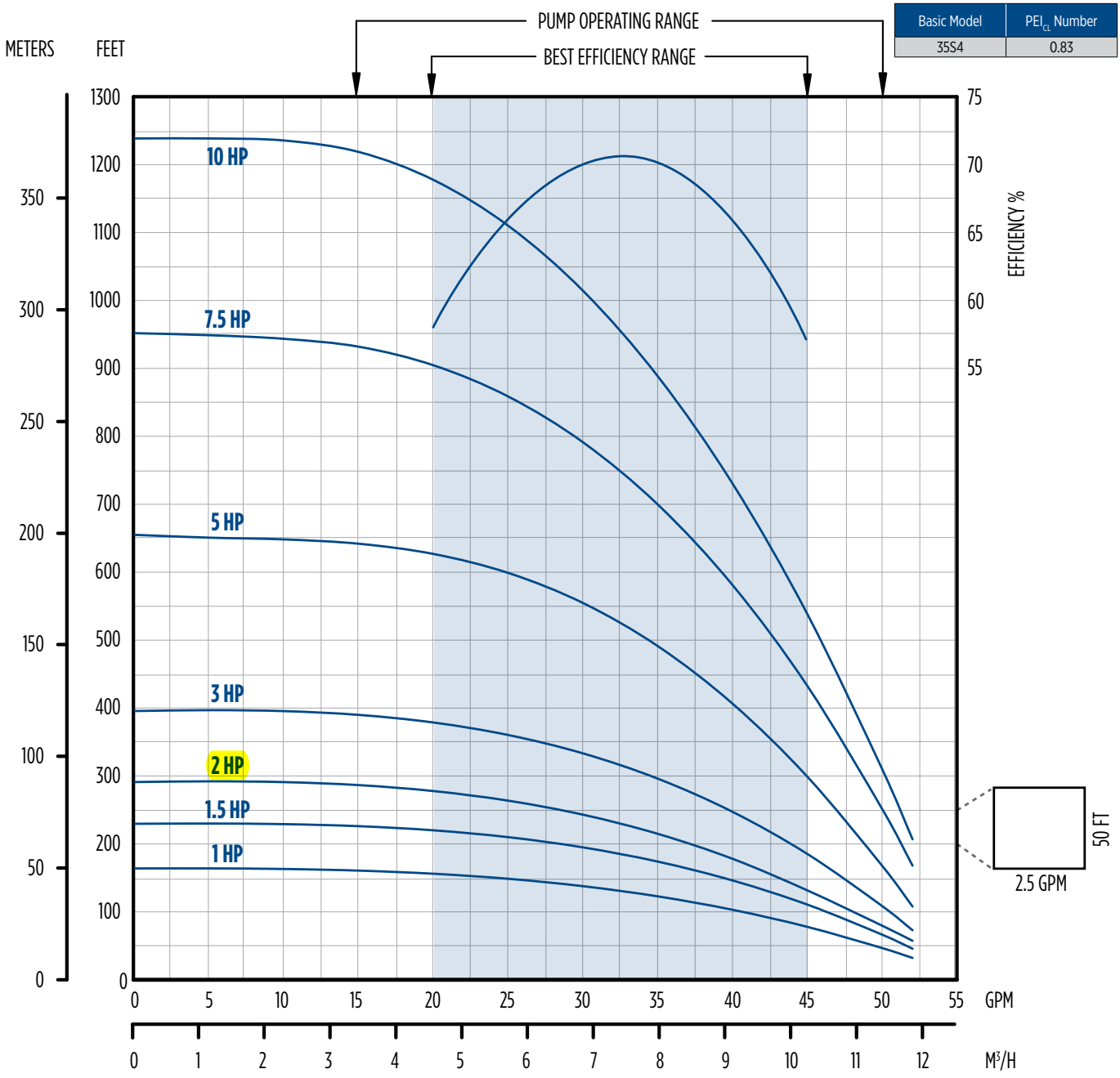
4" TRI-SEAL HIGH CAPACITY PUMPS

Franklin Electric

PERFORMANCE

35 GPM

Basic Model	PEI_{CL} Number
35S4	0.83



SUBMERSIBLE PUMPS

4" TRI-SEAL HIGH CAPACITY PUMPS

Franklin Electric

PERFORMANCE

35 GPM

HP	PSI	Depth to Pumping Water Level (Lift) in Feet. Shaded Areas Indicate Most Efficient Performance.																		
		0	20	40	60	80	100	120	140	160	180	200	240	280	320	360	400	440	480	Shut-Off (ft)
1	0					44	40	35	28											161
	10				44	39	34	27												
	20			43	39	33	25													
	30		42	38	32	23														
	40	42	37	31																
	50	36	30																	
	60	29																		
	70																			
	80																			
Shut-off PSI		70	61	52	44	35	26	18	9											
1.5	0							43	41	37	33	28								230
	10					46	43	40	37	32	27									
	20				45	43	40	36	32	26										
	30			45	42	39	35	31	24											
	40		44	42	39	35	30	23												
	50	44	41	38	34	29	21													
	60	41	37	33	28															
	70	37	33	27																
	80	32	26																	
Shut-off PSI		100	91	82	74	65	56	48	39	30	22	13								
2	0								44	42	40	37	30							300
	10							44	42	39	36	33	25							
	20					46	43	41	39	36	33	29								
	30				45	43	41	38	35	32	28	23								
	40			45	43	40	38	35	32	27	22									
	50		45	42	40	37	34	31	27	20										
	60	44	42	40	37	34	30	26												
	70	42	39	37	33	30	25													
	80	39	36	33	29	24														
Shut-off PSI		130	121	113	104	95	87	78	69	61	52	43	26							
3	0										45	44	40	37	32	25				400
	10									45	43	42	38	34	28					
	20								45	43	42	40	36	31	23					
	30							44	43	41	40	38	33	27						
	40						44	43	41	39	37	35	30							
	50				45	44	42	41	39	37	35	32	26							
	60			45	44	42	41	39	37	34	32	29								
	70		45	44	42	40	38	36	34	31	28	24								
	80	45	43	42	40	38	36	34	31	28	23									
Shut-off PSI		173	165	156	147	139	130	121	113	104	95	87	69	52	35	17				

HP	PSI	120	140	160	180	200	240	280	320	360	400	440	480	500	550	600	650	700	750	800	Shut-Off (ft)
5	0								44	42	40	38	36	34	30	24					650
	10							45	43	41	39	37	34	32	28	20					
	20							44	42	40	38	35	32	30	25						
	30						45	43	41	39	36	33	30	28	21						
	40					45	44	42	40	37	35	32	28	25							
	50				45	44	42	41	38	36	33	29	25	22							
	60			45	44	43	41	39	37	34	31	27	21								
	70		45	44	43	42	40	38	35	32	29	24									
	80	45	44	43	42	41	39	37	34	30	26										
Shut-off PSI		229	221	212	203	195	177	160	143	126	108	91	74	65	43	22					

HP	PSI	240	280	320	360	400	440	480	500	550	600	650	700	750	800	850	900	950	1000	1050	1100	1150	Shut-Off (ft)
7.5	0						45	43	43	41	39	37	35	32	29	25	20						950
	10						44	43	42	40	38	36	34	31	28	23							
	20					45	43	42	41	39	37	35	33	30	26	21							
	30				45	44	43	41	40	38	36	34	31	28	24								
	40			46	44	43	42	40	40	38	35	33	30	26	21								
	50			45	44	42	41	39	39	37	34	31	28	24									
	60		45	44	43	42	40	39	38	35	33	30	26	22									
	70		45	43	42	41	39	38	37	34	32	28	24										
	80	45	44	43	41	40	38	37	36	33	30	27	22										
Shut-off PSI		307	290	273	255	238	221	203	195	173	152	130	108	87	65	43	22						
10	0									45	43	42	41	39	38	36	35	33	31	28	25	22	1250
	10								45	44	43	42	40	39	37	35	34	32	29	27	24	20	
	20							45	45	44	42	41	40	38	36	35	33	31	28	26	22		
	30							45	44	43	42	40	39	37	36	34	32	30	27	24	20		
	40						45	44	44	42	41	40	38	37	35	33	31	28	26	22			
	50					46	45	44	43	42	40	39	37	36	34	32	30	27	24	21			
	60				46	45	44	43	42	41	40	38	37	35	33	31	29	26	23				
	70				45	44	43	42	42	41	39	38	36	34	32	30	28	25	21				
	80			46	45	44	43	42	41	40	38	37	35	33	31	29	26	23					
Shut-off PSI				403	385	368	351	333	325	303	281	260	238	216	195	173	152	130	108	87	65	43	

NOTES: Performance shown does not include friction loss in the drop pipe. All performance data is based on rated motor nameplate voltage. Performance shown is based on a pump without check valve.

4" SUBMERSIBLE MOTORS - ORDERING INFORMATION

THREE-PHASE MODELS

HP	Description	Volts	Hz	S.F.	Motor Lead	Model No.	In Stock	Thrust	Wt. (Lbs)
2	Water Well	200	60	1.25	-	2343051618GS	-	650	33
		200	60	1.25	Yes	2343059204GS	Yes	650	34
		200	60	1.25	-	2343058600G	-	1500	44
		220	50	1.0	-	2343551916GS	-	650	33
		230	60	1.25	-	2343151618GS	Yes	650	33
		230	60	1.25	Yes	2343159204GS	Yes	650	34
		230	60	1.25	-	2343158600G	-	1500	44
		460/380	60/50	1.25/1.0	-	2343251618GS	Yes	650	33
		460/380	60/50	1.25/1.0	Yes	2343259404GS	Yes	650	34
		460/380	60/50	1.25/1.0	-	2343258600G	-	1500	44
		460/380	60/50	1.25/1.0	Yes	2343258602G	-	1500	44
		575	60	1.25	-	2343351618GS	-	650	33
		575	60	1.25	Yes	2343359404GS	Yes	650	34
		575	60	1.25	-	2343358600G	-	1500	44
	Pollution Recovery	200	60	1.25	-	2343052318GS	-	650	33
		230	60	1.25	-	2343152318GS	-	650	33
		460/380	60/50	1.25/1.0	-	2343252318GS	-	650	33
	Series 600M	230	60	1.25	Yes	2343150610GS	Yes	650	29
		460/380	60/50	1.25/1.0	Yes	2343250610GS	-	650	29
	316 SS	200	60	1.25	Yes	2343058502G	-	1500	44
		230	60	1.25	Yes	2343158502G	-	1500	44
		460/380	60/50	1.25/1.0	Yes	2343258502G	-	1500	44
		575	60	1.25	Yes	2343358502G	-	1500	44
	Oil Stripper	230	60	1.25	Yes	2343158702G	-	1500	44
		460/380	60/50	1.25/1.0	Yes	2343258702G	-	1500	44
3	Water Well	200	60	1.15	-	2343062504G	-	900	41
		200	60	1.15	Yes	2343062604G	Yes	900	41
		200	60	1.15	-	2343068600G	-	1500	43
		200	60	1.15	Yes	2343068602G	Yes	1500	44
		220	50	1.0	-	2343562504G	-	900	41
		220	50	1.0	-	2343568600G	-	1500	43
		230	60	1.15	-	2343162504G	-	900	41
		230	60	1.15	Yes	2343162604G	Yes	900	41
		230	60	1.15	-	2343168600G	-	1500	43
		230	60	1.15	Yes	2343168602G	Yes	1500	44
		380	60	1.15	-	2343462504G	-	900	41
		380	60	1.15	Yes	2343462604G	Yes	900	41
		380	60	1.15	-	2343468600G	-	1500	43
		380	60	1.15	Yes	2343468602G	Yes	1500	44
		460/380	60/50	1.15/1.0	-	2343262504G	-	900	41
		460/380	60/50	1.15/1.0	Yes	2343262604G	Yes	900	41
		460/380	60/50	1.15/1.0	-	2343268600G	-	1500	43
		460/380	60/50	1.15/1.0	Yes	2343268602G	Yes	1500	44
		575	60	1.15	-	2343362504G	-	900	41
		575	60	1.15	Yes	2343362604G	Yes	900	41
		575	60	1.15	-	2343368600G	-	1500	43
		575	60	1.15	Yes	2343368602G	Yes	1500	44
	Series 600M	230	60	1.15	Yes	2343160620G	-	900	35
		230	60	1.15	Yes	2343160630G	Yes	1500	44
		460/380	60/50	1.15	Yes	2343260620G	-	900	35
		460/380	60/50	1.15	Yes	2343260630G	-	1500	44
	Sand Fighter®	200	60	1.15	Yes	2343068802G	-	1500	44
		230	60	1.15	Yes	2343168802G	Yes	1500	44
		380	60	1.15	Yes	2343468802G	-	1500	44
		460/380	60/50	1.15/1.0	Yes	2343268802G	Yes	1500	44
		575	60	1.15	Yes	2343368802G	-	1500	44
	316 SS	200	60	1.15	Yes	2343068502G	-	1500	44
		230	60	1.15	Yes	2343168502G	-	1500	44
		460/380	60/50	1.15/1.0	Yes	2343268502G	-	1500	44
		575	60	1.15	Yes	2343368502G	-	1500	44
	Oil Stripper	230	60	1.15	Yes	2343168702G	-	1500	44
		460/380	60/50	1.15/1.0	Yes	2343268702G	-	1500	44

4" SUBMERSIBLE MOTORS

These motors are built for dependable operation in 4" diameter or larger water wells.

BASIC FEATURES

- Corrosion-resistant stainless steel exterior
- Stainless steel splined shaft
- Hermetically-sealed windings
- StatorShield™ resin system
- Filter check valve
- Water lubrication
- Kingsbury-type thrust bearing
- Pressure-equalizing diaphragm
- Built-in lightning arrestors (all single-phase; 200 & 300 V three-phase)
- Removable Water-Bloc™ lead
- Franklin-manufactured control boxes available for single-phase motors
- UL 778 recognized (North American voltages)
- CSA certified
- ANSI/NSF 61 certified
- Industry standard NEMA mounting dimensions

SPECIAL FEATURES

- Flow inducer sleeve not required in water up to 86 °F (30 °C) for motors through 2 hp
- Two-wire motors are split-phase designs with integral starting components and do not require a control box; features Franklin's patented 2-wire BIAC starting switch, which provides reverse impact torque to aid starting in adverse environments and prevents extreme fast cycling (e.g. water-logged tank)
- Three-wire motors through 1 hp use Franklin's exclusive three-wire QD (Quick Disconnect) Control Box with the patented QD Relay. This relay provides the ultimate in operational life
- Single-phase motors can be used with Pumptec products to protect against dry-run and other installation conditions that can damage motors and/or pumps; see single-phase protection devices for details

POLLUTION RECOVERY OPTION

- Pollution Recovery motors are equipped for use in monitoring and recovery wells in which hydrocarbons and other chemicals may be present
- Features nitrile rubber parts and other chemical-resistant materials as listed in the construction materials chart

Engineering Specification

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

LEAD FREE*

Series LF719

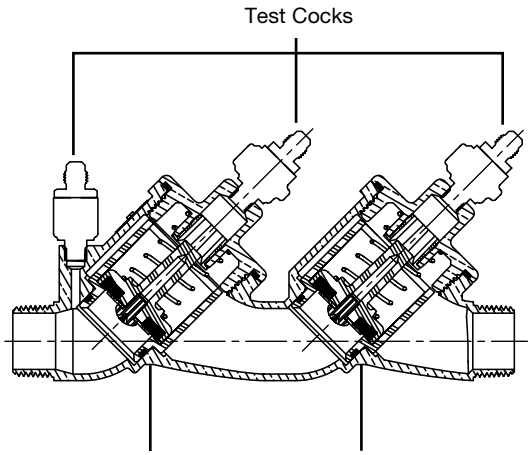
Double Check Valve Assemblies

Sizes: ½" – 2"

Series LF719 Double Check Valve Assemblies are designed to protect drinking water supplies from dangerous cross-connections in accordance with national plumbing codes and water authority requirements.

This series may be used in only those cross-connections identified by local inspection authorities as non-health hazard applications. Check with local authority having jurisdiction regarding vertical orientation, frequency of testing or other installation requirements. The LF719 features Lead Free* construction to comply with Lead Free* installation requirements. Series LF719 meets the requirements of ASSE Std. 1015 and AWWA Std. C510.

LF719QT



Features

- Manufactured from Lead Free* cast copper silicon alloy
- Separate access, top entry check valve design
- Reversible seat disc rubber, extends check valve life
- Chloramine resistant elastomers
- Replaceable seats and seat discs
- Compact design
- Top mounted screwdriver slotted ball valve test cocks
- Low pressure drop
- ½" – 1" have Tee handles
- No special tools required for servicing
- Plastic on plastic check guiding reduces potential binding due to mineral deposits

Specifications

Series LF719 Double Check Valve Assembly shall be installed at each noted location. Provide assembly with integral shutoff valves that conform to ASSE 1015 and AWWA C510. The assembly shall have top entry access points for each check assembly, screw driver slotted test cocks and require the use of no special tools for servicing. All wetted rubber parts shall be manufactured from silicone or chloramine resistant EPDM rubber. The Lead Free* Double Check Valve Assemblies shall comply with state codes and standards, where applicable, requiring reduced lead content. All valve seats and seat discs shall be replaceable. Seat discs shall be reversible to extend check valve life. Check valve guiding shall be plastic to plastic. The assembly shall be a Watts Series LF719.

Now Available
WattsBox Insulated Enclosures.
For more information, refer to literature ES-WB.

NOTICE

Inquire with governing authorities for local installation requirements

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**

WATTS®

Available Models

Suffix:

S – bronze strainer

QT – quarter-turn ball valves

Pressure-Temperature

Operating Pressure: 175psi (12.1 bar)

Operating Temperature Range: 33˚F – 180˚F (0.5˚C – 82˚C)

Materials

Body:	Lead Free* cast copper silicon alloy
Elastomers:	Chloramine resistant silicone and EPDM
Check Seats:	PPO
Disc Holders:	PPO

Standards

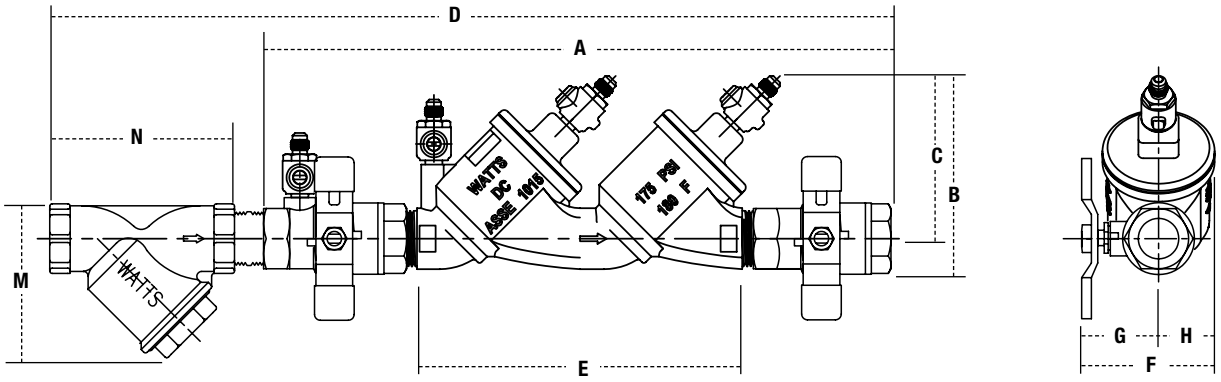
AWWA Std C510 compliant

Approvals

1015 C US ¾"-2" LF USC-FCCCHR

Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California

Dimensions/Weights



LF719QT, LF719QT-S

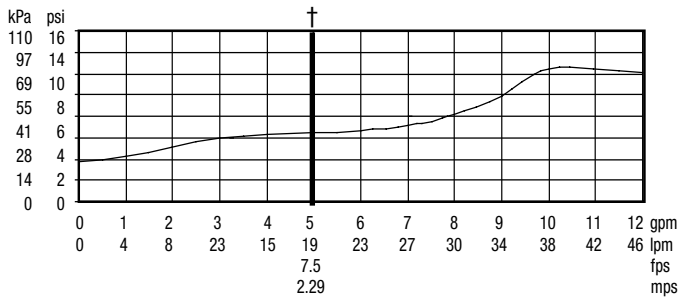
SIZE	DIMENSIONS																		STRAINER				WEIGHT			
	A		B		C		D		E(LF)		F		G		H		M		N		719QT		719QT-S	
in.	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*in.*	*mm*	*lbs.*	*kgs.*	*lbs.*	*kgs.*
1/2	9 9/16	242	3 11/16	94	2 15/16	73	12 9/16	318	5 13/16	147	2 7/16	62	1 11/16	43	3/4	19	1 3/8	35	2 3/4	70	2.8	1.3	3.8	1.7
3/4	12 1/8	307	4 1/4	108	3 1/2	88	15 7/16	393	7 11/16	195	3 1/8	79	2 1/16	52	1 1/16	27	1 5/8	41	3 3/16	81	4.7	2.1	6.4	2.9
1	14 13/16	376	4 9/16	116	3 7/8	98	19 1/2	495	9 5/8	244	3 3/4	95	2 7/16	62	1 5/16	33	2 1/8	54	3 3/4	95	7.4	3.4	9.4	4.3
1 1/4	18 15/16	480	6 1/8	156	5 1/8	129	24 1/16	610	11 11/16	297	4 1/4	108	2 5/8	67	1 5/8	41	2 1/2	64	4 7/16	113	14.0	6.3	18.0	8.1
1 1/2	18 15/16	480	6 1/8	156	5 1/8	129	25 1/4	640	11 11/16	297	4 3/4	121	3 1/8	79	1 5/8	41	3	76	4 7/8	124	16.1	7.3	19.9	9.0
2	21 3/16	538	7 1/16	179	5 5/8	142	28 15/16	735	13 3/8	340	5 3/8	137	3 7/16	87	1 15/16	49	3 9/16	90	5 15/16	151	25.7	11.6	33.4	15.2

Capacities

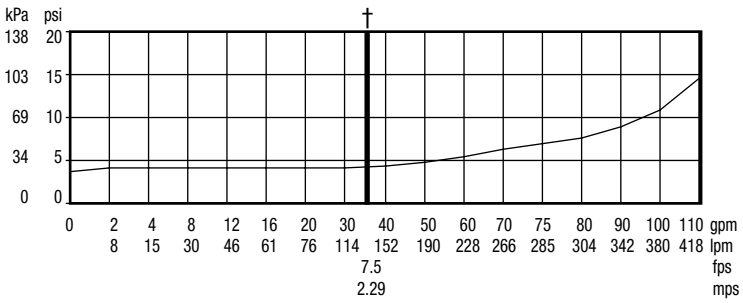
† Typical maximum flow rate (7.5 feet/sec.)

QT

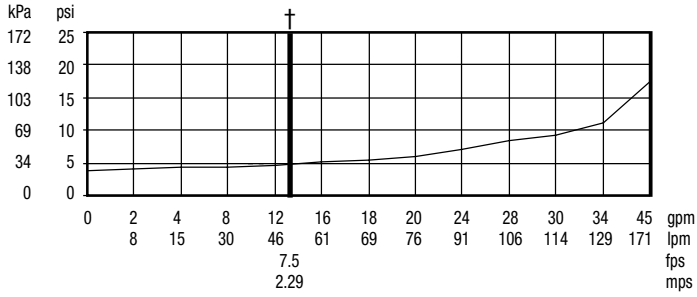
½"



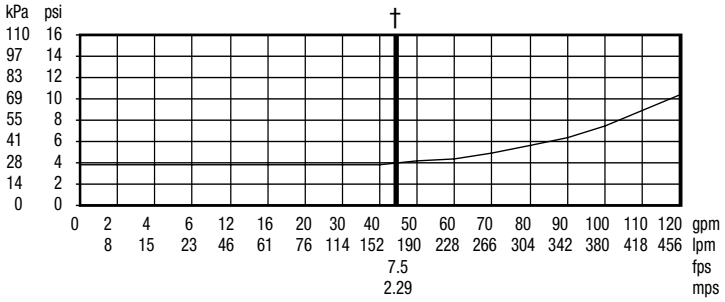
1¼"



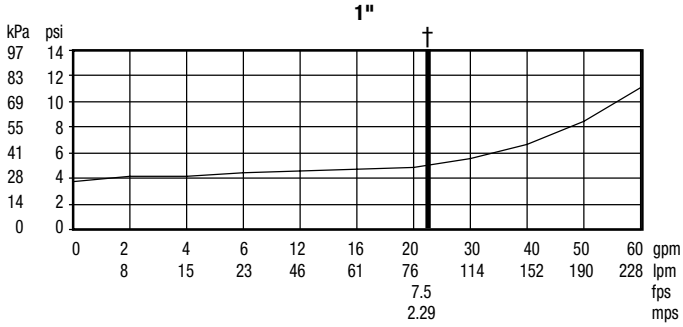
¾"



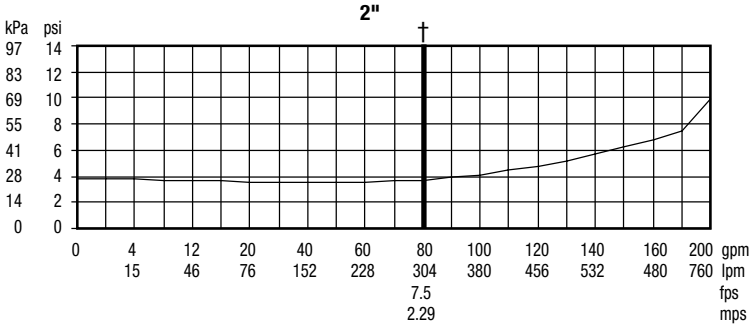
1½"



1"



2"



USA: T: (978) 689-6066 • F: (978) 975-8350 • Watts.com
Canada: T: (905) 332-4090 • F: (905) 332-7068 • Watts.ca
Latin America: T: (52) 81-1001-8600 • Watts.com

Submittal Data

Well-Rite Series

Water System Tanks

Job Name: _____ Schedule #: _____

Location: _____ Model #: _____

Engineer: _____ Representative: _____

Contractor: _____

Description

Well-Rite (WR) series tanks are diaphragm type pre-charged hydro-pneumatic tanks designed for residential and commercial water wells, pressure booster, irrigation and reverse osmosis systems.

Materials of Construction

Shell: Drawn steel w/ epoxy finish

Diaphragm: Butyl rubber w/ copolymer polypropylene lower water chamber

Connection: Stainless steel

Ratings

Max. Working Pressure: 125 PSI
Max. Working Temp: 140 F
Pre-Charge (adjustable): 38 PSI

NSF/ANSI 61
NSF/ANSI 372

Tank Specifications

Model	Diameter (inches)	Height (inches)	System Connection (inches)	Volume (gallons)	Drawdown (gallons)			Weight (lbs)
					20/40	30/50	40/60	
WR 45	16	22	1	14	5.6	4.8	4.1	28
WR 60	16	29	1	20	8.1	6.8	5.9	36
WR 80	16	34.5	1	26	10.5	8.9	7.7	41
WR 100	21	27.75	1 ¼	32	12.9	10.9	9.4	54
WR 120	16	42.75	1	33.4	13.3	11.3	9.7	49
WR 140	21	36.25	1 ¼	44	17.7	15.0	13.0	67
WR 200	21	48	1 ¼	62	25.0	21.1	18.3	82
WR 240	21	62	1 ¼	81	32.6	27.6	23.9	99
WR 260	26	44.5	1 ¼	85	34.3	29.0	25.1	121
WR 360	26	59.75	1 ¼	119	48.0	40.6	35.1	153

FLEXCON INDUSTRIES
A Swan Group Company

300 Pond St ● Randolph, MA 02368 ● 800-527-0030 ● 781-986-2029 FAX ● www.flexconind.com

SSM® SERIES METERS

NSF / ANSI 372

SSM® METER

The SSM® series have stainless steel meter bodies, tested and certified to NSF/ANSI 372 for lead-free compliance and meet or exceed AWWA specifications. The SSM® Multi-Jet series meters have a long meter life and good tolerance to contaminants. The series is well suited for industrial, commercial and residential applications. The dry sealed registers are easy to read and will retain their clear view display. The SSM® series meter is available in sizes from ⅝” x ½" to 2” with maximum flow rates up to 160 GPM and pressures up to 150 psi. Registrations are available in gallons, liters or cubic feet.

The SSM® meter is a totalizing multi-jet meter for those applications that only need to read the totalized flow at the meter. The SSMRS® meter is equipped with a reed switch for a dry contact pulse output and the SSMR® meter includes a reed switch for a dry contact pulse output and our A31UR Universal Remote® counter.

METER SELECTION CHART

METER / PIPE SIZE	MODEL	*CONTINUOUS FLOW	FLOW RANGE	WEIGHT	LENGTH	HEIGHT	WIDTH	CONNECTION LENGTH (X2)
⅝" X ½"	625SSM	8 GPM	¼ - 20 GPM	3.3 lbs.	7 ½"	4 ¼"	3 ⅝"	2"
⅝" X ¾"	6251SSM	10 GPM	¼ - 20 GPM	3.3 lbs.	7 ½"	4 ¼"	3 ⅝"	2"
¾" X ¾"	750SSM	15 GPM	½ - 30 GPM	3.4 lbs.	7 ½"	4 ⅝"	3 ⅞"	2"
1"	1000SSM	25 GPM	¾ - 50 GPM	5.7 lbs.	10 ¼"	4 ⅝"	3 ⅞"	2 ¼"
1½"	150SSM	50 GPM	2 - 100 GPM	10.6 lbs.	11 ⅞"	5 ½"	4 ⅞"	2 ½"
2"	200SSM	80 GPM	2 - 160 GPM	13 lbs.	11 ⅞"	5 ½"	4 ⅞"	2 ¾"

***Continuous Flow:** The size of meter selected should be based upon continuous flow, GPM, as opposed to pipe size. For example, if it is determined that continuous flow is 25 GPM, a 1" meter should be selected rather than a ¾" meter.

ORDERING INFORMATION: Select the meter model number from the Meter Selection Chart above.
Add a **G** for Gallon reading or a **C** for Cubic Feet reading or an **L** for Liters reading.
Example: 1½" Meter with Cubic Feet register = 150SSM-C.

Downstream of well,
Upstream of filter unit

X = AVAILABLE CONTACT SETTINGS

(All contact settings are pre-set at the factory to your specification)

GPC = Gallons Per Contact • LPC = Liters Per Contact • CFPC = Cubic Feet Per Contact

METER / PIPE SIZE	MODEL	0.1 GPC	1 GPC	10 GPC	100 GPC	.01 CFPC	0.1 CFPC	1 CFPC	10 CFPC	1 LPC	10 LPC	100 LPC	1000 LPC
⅝" X ½"	625SSMRS	X	X	X	X	X	X	X	X	X	X	X	X
⅝" X ¾"	6251SSMRS	X	X	X	X	X	X	X	X	X	X	X	X
¾" X ¾"	750SSMRS	X	X	X	X	N/A	X	X	X	X	X	X	X
1"	1000SSMRS	X	X	X	X	N/A	X	X	X	X	X	X	X
1½"	150SSMRS	N/A	X	X	X	N/A	X	X	X	X	X	X	X
2"	200SSMRS	N/A	X	X	X	N/A	X	X	X	X	X	X	X

Downstream of Softeners,
Upstream of Chlorine Injection

SSM® METER SPECIFICATIONS

Reed Switch: Dry contact type, normally open, 24V, 10mA maximum
Pressure Rating: Maximum 150 psi.
Temperature Range: 35° - 122°F. Protect the meter from freezing.
PH Level Range: 6.5 – 8.0
Accuracy: +/- 1.5% of maximum flow when operating between minimum and maximum flow range.
Register Options: U.S. Gallons, Cubic Feet and Liters

Installation Instructions:

1. Flush the line thoroughly after all plumbing changes to prevent contaminates from entering the meter.
2. Install horizontally with the register facing up and inlet port facing the water supply line.
3. For outdoor installation, protect meter from direct exposure to the elements.
4. Protect meter from backflow of water opposite of indicted flow direction.

Helpful Hints:

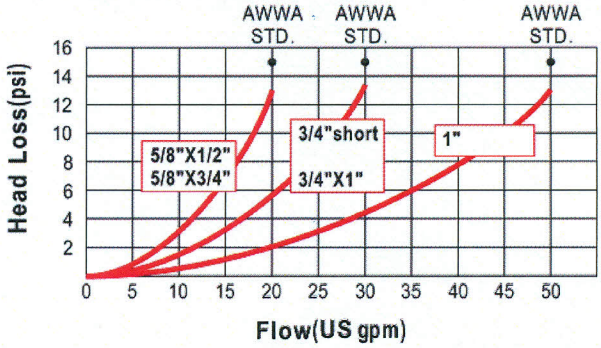
1. All values used in a water line need to be operated slowly, and all electrically actuated valves should be slow closing. This will eliminate possible meter damage from water hammer in your system. Carlon offers an excellent slow closing ball valve (SCBV).
2. Install a strainer upstream of your water meter to protect the meter and any other in-line process equipment from becoming jammed by particulate matter.

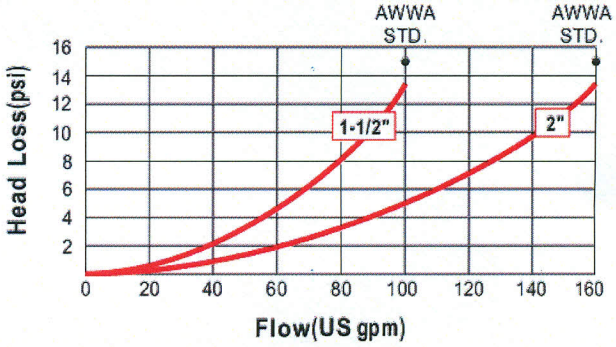
Warranty: Carlon Meter, Inc. warrants its products to be free of defect in material or workmanship for a period of twelve months from the date of purchase. Contact us to obtain a copy of our complete statement of warranty.

CARLON METER®

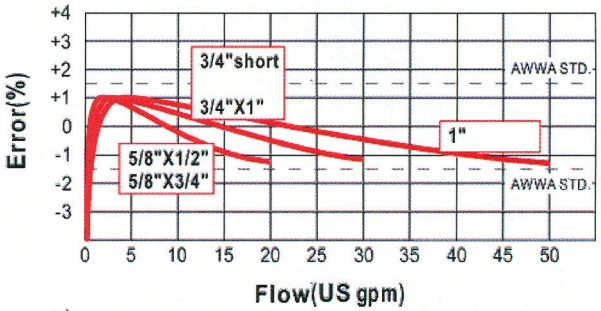
Leaders in water measurement and control

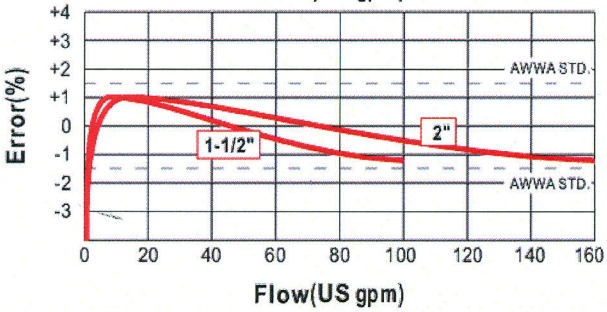
Head Loss Curve





Accuracy Curve





- **Performance curves are typical only and NOT a guarantee of performance**

Application

- Measuring the volume of cold potable water passing through the pipeline

Features

- Magnetic drive, lower transmission resistance
- Magnetic shield, for external magnetic field protection
- Sealed dry dial register ensures clear reading
- Internal strainer
- External Regulating Device

Compliance with Standard

- Technical data conforms to AWWA C708 Standard

Option

- Pulse output for selecting
- Cubic Feet,Litre,m3 for selecting

MJ-PME Pulse output choice	0.1GPC	1GPC	10GPC	100GPC	0.01CFPC	0.1CFPC	1CFPC	10CFPC
5/8"&5/8"x3/4"	√	√	√	√	√	√	√	√
3/4"SL&3/4"x1"&1-1/2"&2"		√	√	√		√	√	√
5/8"& 5/8"x3/4" &3/4"SL&3/4"x1"&1"	1LPC,10LPC,100LPC,1000LPC							
1-1/2"&2"	10LPC,100LPC,1000LPC							

HARMSCO® HP
Hurricane® Filter Housings

Three Technologies in One

Lower Operation Cost

- **Harmsco® HP Hurricane® filters provide unsurpassed performance. Our unique design separates dense solids prior to cartridge filtration for extended filter life, increased dirt holding capacity and reduced maintenance costs.**

NSF
Certified to NSF/ANSI Standard 61

Features

- Combination cyclone separator and cartridge filter in a single compact design
- Patented Up-flow design with tangential entry - prevents air entrapment
- Rotational flow "flutters" media pleats - improving loading performance
- Electropolished 304 or 316L stainless steel housing
- Fail-Safe lid closure, rated for 150 psi
- Three sizes for greater media surface area
- CPVC standpipe (standard) - stainless steel optional
- Largest selection available of cartridge micron ratings and media, including carbon block
- NSF/ANSI Standard 61 Listed

Applications

- Commercial/Residential Drinking Water
- Cooling Tower Filtration
- Desalination Pre-filtration (316 and coated options)
- Surface Water Treatment Rule (SWTR) LT2
- Process Water
- Whole House Filtration
- Industrial Waste Water Treatment
- Reverse Osmosis Pre-filtration
- Small Community Compliance LT2
- Well Water
- Ground Water Remediation
- Ground Water Under Direct Influence (GUDI)

HARMSCO® Filtration Products

Made in USA

40 90 170

Cartridge Selection

Hurricane® Cartridge Family

Polyester-Plus™ - engineered for high efficiency, low pressure drops; NSF 61 Listed

		Sediment Removal	Turbidity Reduction	Chlorine Removal	Taste & Odor Reduction	Cyst Removal	Pre-Filtration	Post-Filtration	Antimicrobial	Absolute Rated	Nominal Rated	100% Synthetic	Non Potable Use Only	Course Filtration	High Temperature	All Polypropylene	NSF Listed	Cleanable/ Reuseable
HC/40-0.35	Hur 40 Cartridge - 0.35 Micron	●	●				●				●					●		
HC/40-1	Hur 40 Cartridge - 1 Micron	●	●				●				●					●		
HC/40-5	Hur 40 Cartridge - 5 Micron	●	●			●	●				●					●	●	
HC/40-10	Hur 40 Cartridge - 10 Micron	●	●			●					●					●	●	
HC/40-20	Hur 40 Cartridge - 20 Micron	●	●			●					●			●		●	●	
HC/40-50	Hur 40 Cartridge - 50 Micron	●	●			●					●			●		●	●	
HC/40-100	Hur 40 Cartridge - 100 Micron	●	●			●					●			●		●	●	
HC/40-150	Hur 40 Cartridge - 150 Micron	●	●			●					●			●		●	●	
HC/90-0.35	Hur 90 Cartridge - 0.35 Micron	●	●				●				●					●		
HC/90-1	Hur 90 Cartridge - 1 Micron	●	●				●				●					●		
HC/90-5	Hur 90 Cartridge - 5 Micron	●	●				●				●					●	●	
HC/90-10	Hur 90 Cartridge - 10 Micron	●	●			●					●					●	●	
HC/90-20	Hur 90 Cartridge - 20 Micron	●	●			●					●			●		●	●	
HC/90-50	Hur 90 Cartridge - 50 Micron	●	●			●					●			●		●	●	
HC/90-100	Hur 90 Cartridge - 100 Micron	●	●			●					●			●		●	●	
HC/90-150	Hur 90 Cartridge - 150 Micron	●	●			●					●			●		●	●	
HC/170-0.35	Hur 170 Cartridge - 0.35 Micron	●	●				●				●					●		
HC/170-1	Hur 170 Cartridge - 1 Micron	●	●				●				●					●		
HC/170-5	Hur 170 Cartridge - 5 Micron	●	●				●				●					●	●	
HC/170-10	Hur 170 Cartridge - 10 Micron	●	●			●					●					●	●	
HC/170-20	Hur 170 Cartridge - 20 Micron	●	●			●					●			●		●	●	
HC/170-50	Hur 170 Cartridge - 50 Micron	●	●			●					●			●		●	●	
HC/170-100	Hur 170 Cartridge - 100 Micron	●	●			●					●			●		●	●	
HC/170-150	Hur 170 Cartridge - 150 Micron	●	●			●					●			●		●	●	

High Temperature - up to 200°F (93°C)*

*250°F (121°C) with metal end caps, using suffix "HTM"

HC/40-20HT	Hur 40 Cartridge - 20 Micron High Temp	●	●				●				●			●	●			●
HC/40-50HT	Hur 40 Cartridge - 50 Micron High Temp	●	●				●				●			●	●			●
HC/90-5CPHT	Hur 90 Cartridge - 5 Micron High Temp	●	●					●			●		●	●	●			●
HC/90-5HT	Hur 90 Cartridge - 5 Micron High Temp	●	●					●			●			●	●			●
HC/90-10HT	Hur 90 Cartridge - 10 Micron High Temp	●	●					●			●			●	●			●
HC/90-20HT	Hur 90 Cartridge - 20 Micron High Temp	●	●				●				●			●	●			●
HC/90-50HT	Hur 90 Cartridge - 50 Micron High Temp	●	●				●				●			●	●			●
HC/170-5CPHT	Hur 170 Cartridge - 5 Micron High Temp	●	●					●			●		●	●	●			●
HC/170-5HT	Hur 170 Cartridge - 5 Micron High Temp	●	●					●			●			●	●			●
HC/170-10HT	Hur 170 Cartridge - 10 Micron High Temp	●	●					●			●			●	●			●
HC/170-20HT	Hur 170 Cartridge - 20 Micron High Temp	●	●				●				●			●	●			●
HC/170-50HT	Hur 170 Cartridge - 50 Micron High Temp	●	●				●				●			●	●			●

Harmsco-Free - 100% synthetic composite media; NSF 61 Listed

HC/40-1W-HF	Hur 40 Cartridge - 1 Micron	●	●					●			●	●				●		
HC/40-5W-HF	Hur 40 Cartridge - 5 Micron	●	●					●			●	●				●	●	
HC/40-20W-HF	Hur 40 Cartridge - 20 Micron	●	●				●				●	●		●		●	●	
HC/90-1W-HF	Hur 90 Cartridge - 1 Micron	●	●					●			●	●				●		
HC/90-5W-HF	Hur 90 Cartridge - 5 Micron	●	●					●			●	●				●	●	
HC/90-20W-HF	Hur 90 Cartridge - 20 Micron	●	●				●				●	●		●		●	●	
HC/170-1W-HF	Hur 170 Cartridge - 1 Micron	●	●					●			●	●				●		
HC/170-5W-HF	Hur 170 Cartridge - 5 Micron	●	●					●			●	●				●	●	
HC/170-20W-HF	Hur 170 Cartridge - 20 Micron	●	●				●				●	●		●		●	●	

Poly-Pleat™ - 1 micron absolute, multi-layed media; NSF 61 Listed

PP-HC-40-1	Poly Pleat Hur 40 Cartridge - 1 Micron	●	●			●		●		●		●				●		
PPFS-HC-40-1	PP-Fail Safe Hur 40 Cartridge - 1 Micron	●	●			●		●		●		●				●		
PP-HC-90-1	Poly Pleat Hur 90 Cartridge - 1 Micron	●	●			●		●		●		●				●		
PPFS-HC-90-1	PP-Fail Safe Hur 90 Cartridge - 1 Micron	●	●			●		●		●		●				●		
PP-HC-170-1	Poly Pleat Hur 170 Cartridge - 1 Micron	●	●			●		●		●		●				●		
PPFS-HC-170-1	PP-Fail Safe Hur 170 Cartridge - 1 Micron	●	●			●		●		●		●				●		

All-Poly - 100% polypropylene media with polypropylene end caps and components; also available in 10, 20 and 50 micron ratings

HC-PP-40-0.2	Hur 40 High Purity Pleated PP - 0.2 Mic	●	●			●		●		●						●		
HC-PP-40-0.45	Hur 40 High Purity Pleated PP - 0.45 Mic	●	●			●		●		●						●		
HC-PP-40-1	Hur 40 High Purity Pleated PP - 1 Mic	●	●			●		●		●						●		
HC-PP-40-5	Hur 40 High Purity Pleated PP - 5 Mic	●	●					●		●						●		
HC-PP-90-0.2	Hur 90 High Purity Pleated PP - 0.2 Mic	●	●			●		●		●						●		
HC-PP-90-0.45	Hur 90 High Purity Pleated PP - 0.45 Mic	●	●			●		●		●						●		
HC-PP-90-1	Hur 90 High Purity Pleated PP - 1 Mic	●	●			●		●		●						●		
HC-PP-90-5	Hur 90 High Purity Pleated PP - 5 Mic	●	●					●		●						●		
HC-PP-170-0.2	Hur 170 High Purity Pleated PP - 0.2 Mic	●	●			●		●		●						●		
HC-PP-170-0.45	Hur 170 High Purity Pleated PP - 0.45 Mic	●	●			●		●		●						●		
HC-PP-170-1	Hur 170 High Purity Pleated PP - 1 Mic	●	●			●		●		●						●		
HC-PP-170-5	Hur 170 High Purity Pleated PP - 5 Mic	●	●					●		●						●		

Harmsco® manufacturers the largest selection of

40 90 170

		Sediment Removal	Turbidity Reduction	Chlorine Removal	Taste & Odor Reduction	Cyst Removal	Pre-Filtration	Post-Filtration	Antimicrobial	Absolute Rated	Nominal Rated	100% Synthetic	Non Potable Use Only	Course Filtration	High Temperature	All Polypropylene	NSF Listed	Cleanable/ Reuseable
SureSafe™ Antimicrobial - reduces growth of bacteria and mold on media																		
HC/40-20-AM	Hur 40 Cartridge - 20 Micron	●	●				●		●		●	●		●				●
HC/40-50-AM	Hur 40 Cartridge - 50 Micron	●	●				●		●		●	●		●				●
HC/90-20-AM	Hur 90 Cartridge - 20 Micron	●	●				●		●		●	●		●				●
HC/90-50-AM	Hur 90 Cartridge - 50 Micron	●	●				●		●		●	●		●				●
HC/170-20-AM	Hur 170 Cartridge - 20 Micron	●	●				●		●		●	●		●				●
HC/170-50-AM	Hur 170 Cartridge - 50 Micron	●	●				●		●		●	●		●				●
Carbon Block - includes pleated 5 micron nominal pre-filtration																		
HC/40-AC-5	Hur 40 Cart. Carbon + 5 Mic Pre-filt	●	●	●	●			●			●							●
HC/90-AC-5	Hur 90 Cart. Carbon + 5 Mic Pre-filt	●	●	●	●			●			●							●
HC/170-AC-5	Hur 170 Cart. Carbon + 5 Mic Pre-filt	●	●	●	●			●			●							●
EZ Clean - 100% synthetic composite 50 micron media																		
HC/40-EZ-CLEAN	Hur Cartridge - EZ CLEAN - 50 Micron	●	●				●				●	●		●				●
HC/90-EZ-CLEAN	Hur Cartridge - EZ CLEAN - 50 Micron	●	●				●				●	●		●				●
HC/170-EZ-CLEAN	Hur Cartridge - EZ CLEAN - 50 Micron	●	●				●				●	●		●				●
Poly-Mesh - 100% synthetic composite 250 micron media																		
HC/170-PM	Hur 170 Cartridge Poly Mesh - 250 Micron	●	●				●				●	●		●				●

Cartridge Sizing Guide

Cleanable/ Reusable Hurricane® cartridges are cleanable and reusable in most applications and micron ratings (5 micron and up).

For Harmsco® Hurricane® and WaterBetter® Single-cartridge Filter Housings

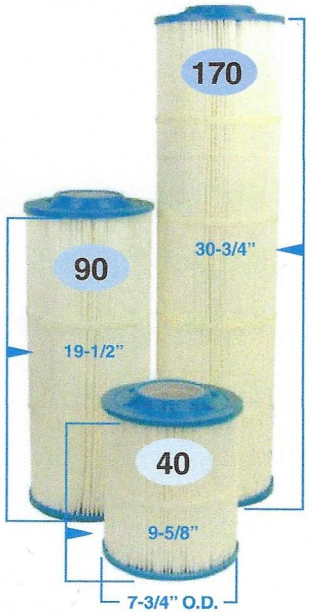
Harmsco® recommends operation at 70% of maximum flow rate for optimum performance.

Polyester, High Temperature, Harmsco Free, SureSafe, EZ Clean, Poly-Mesh

Filter Model	Pleated Media Area (sq.ft.)	Length (in.)	O.D. (in.)	Max Flow Rate (GPM)	Recommended Flow Rate (GPM)	Max Flow Rate (LPM)	Max Flow Rate (M^3/HR)	No./ Case	Carton Size
HUR 40 HP	40	9-5/8	7-3/4	Up to 50	35	Up to 189	Up to 12	1	9x9x11
HUR 90 HP	90	19-1/2	7-3/4	Up to 100	70	Up to 378	Up to 24	1	9x9x21
HUR 170 HP	170	30-3/4	7-3/4	Up to 150	105	Up to 568	Up to 36	1	9x9x32
Poly-Pleat									
HUR 40 HP	25	9-5/8	7-3/4	–	15	–	–	1	9x9x11
HUR 90 HP	50	19-1/2	7-3/4	–	25	–	–	1	9x9x21
HUR 170 HP	100	30-3/4	7-3/4	–	50	–	–	1	9x9x32
All-Poly									
HUR 40 HP	25	9-5/8	7-3/4	25	17	19	Up to 12	1	9x9x11
HUR 90 HP	50	19-1/2	7-3/4	50	35	38	Up to 24	1	9x9x21
HUR 170 HP	75	30-3/4	7-3/4	100	60 [a]	76	Up to 36	1	9x9x32
Carbon Block									
HUR 40 HP	25	9-5/8	7-3/4	–	5 [b]	–	–	1	9x9x11
HUR 90 HP	55	19-1/2	7-3/4	–	10 [b]	–	–	1	9x9x21
HUR 170 HP	90	30-3/4	7-3/4	–	15 [b]	–	–	1	9x9x32

[a] based on 1, 5, 10, 20 and 50 micron ratings

[b] recommended flow for maximum chlorine removal



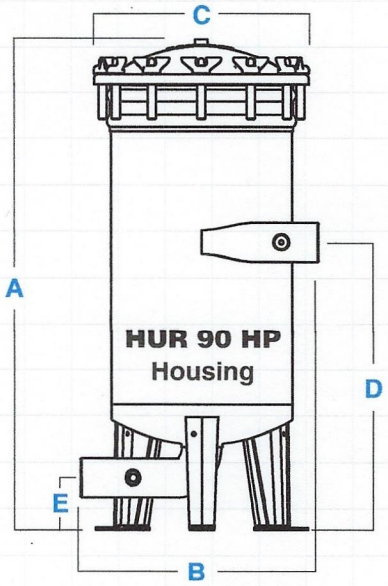
Hurricane® Cartridges
Length and O.D.

Media Options

Polyester-Plus™	High Temperature	Harmsco-Free	Poly-Pleat™ (multi-layer)	All-Poly (multi-layer)
NSF 61 Listed		NSF 61 Listed	NSF 61 Listed	
SureSafe™ (antimicrobial)	**Carbon Block (5 Micron Pleated Pre-filter)**	**EZ Clean**	**Poly-Mesh**	

cartridges in the industry for all your filtration needs.

Harmsco® Hurricane® Filter Housings HP



NSF Certified to NSF/ANSI Standard 61

HUR 40 HP

HUR 90 HP

HUR 170 HP

Ordering Information

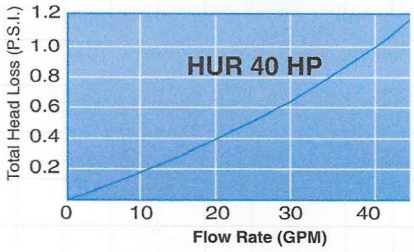
Filter Model	A Filter Height	B Width	C Diameter	D Inlet	E Outlet	Pipe Size NPT	Drain Size NPT	Floor Space	Service Ht.	Shipping Wt. Lbs.	Carton Size In.
HUR 40 HP	19-1/2"	14-3/8"	13"	12-3/4"	3-7/16"	2"	1"	15"x15"	35"	40	14x16x21
HUR 90 HP	29-7/8"	14-3/8"	13"	17-3/4"	3-7/16"	2"	1"	15"x15"	51"	52	14x16x38
HUR 170 HP	40-1/2"	14-3/8"	13"	23-5/8"	3-7/16"	2"	1"	15"x15"	72"	64	14x16x42

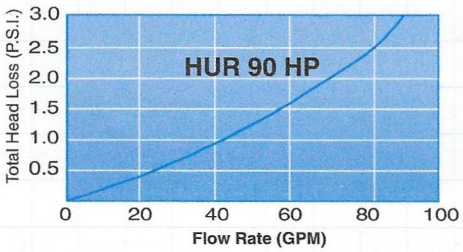
Filter Specifications

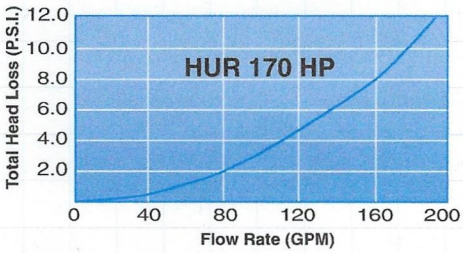
- Electropolished 304 or 316L stainless steel
- Standpipe - CPVC
- Temperature - 140˚F (60˚C) max. Up to 250˚F (121˚C) with optional stainless steel standpipe and high temperature cartridges installed
- Wing nuts - brass
- Rim gaskets - EPDM (Buna-N, Viton available)
- BSTP optional
- Gauge sample ports (1/4"), inlet and outlet
- Pressure - 150 psi (10 bar) max.

All stainless steel housings are 304; 316 available upon request. Stainless steel standpipe for high temperature also available.

Pressure Drop







The total head loss data shown above was developed by NSF International and indicates pressure drop with Hurricane® filter housings and 20 micron filter cartridges in clean water.

For additional information, please refer to the "Installation & Operation Manual" for Hurricane® Filters.

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PRODUCT INFORMATION

Shallow Shell™ SSTC60 Resin for Softening

This Product Information brochure details the advantages of SSTC60 high-performance gel strong acid cation resin for potable and non-potable softening applications.

Purolite®

SHALLOW SHELL™ SSTC60 RESIN FOR SOFTENING

This Product Information brochure explains the functionality, advantages and applications for Purolite Shallow Shell SSTC60 resin. For more detailed information on this product or to find a product for an application not mentioned, please go to www.purolite.com or contact the closest Purolite regional office to you as listed on the back cover.

INTRODUCTION

Founded in 1981, Purolite is a leading manufacturer of ion exchange, catalyst, adsorbent and specialty resins. With global headquarters in the United States, Purolite focuses 100% of our resources on the development and production of resin technology.

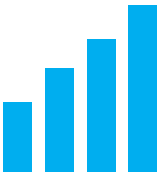
Responding to the needs of our customers, Purolite has built the largest technical sales force in the industry, the widest variety of products and five strategically located Research and Development groups. Our ISO 9001 certified manufacturing facilities in the U.S.A, Romania and China combined with more than 40 sales offices in 30 countries ensure complete worldwide coverage.

PREMIER PRODUCTS

The quality and consistency of our products is fundamental to our performance. Throughout all Purolite plants, production is carefully controlled to ensure that our products meet the most stringent criteria, regardless of where they are produced.

RELIABLE SERVICE

We are technical experts and problem solvers. Reliable and well trained, we understand the urgency required to keep businesses operating smoothly. Purolite employs the largest technical sales organization in the industry.



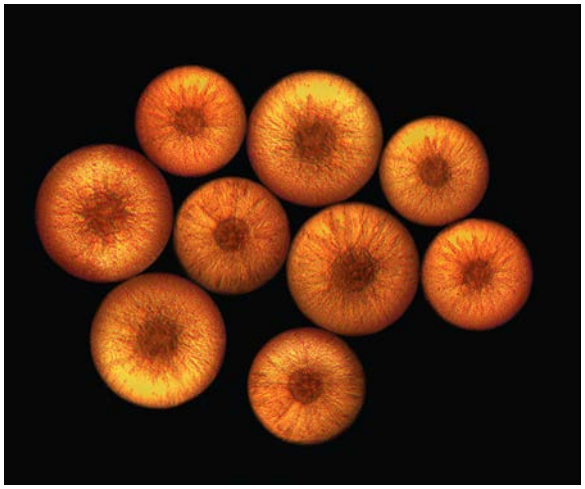
INNOVATIVE SOLUTIONS

Our continued investment in research & development means we are always perfecting and discovering innovative uses for ion exchange resins and adsorbents. We strive to make the impossible possible.

Shallow Shell™ SSTC60 is a very different polystyrenic gel strong acid cation exchange resin used in potable and non-potable water softening applications. It is supplied in the sodium form as SSTC60 or hydrogen form as SSTC60H.

Each resin bead in the Purolite Shallow Shell Technology (SST®) family of high-efficiency softening resins has an inert core and uniform depth of functionality. During the manufacturing process, each bead is functionalized (or activated) to the same degree. This means that they have a shorter diffusion path that results in more rapid softening than tradition ion exchange resin. This is particularly advantageous during regeneration since reducing the depth of penetration required to clean the resin allows for a more complete regeneration and provides higher, more efficient utilization of the regenerant. The SST resins have unsurpassed salt efficiency, lower leakage, and reduced rinse water requirements. Compared to conventional softening resins, regenerant reductions of 2 – 4 lb/ft^3 (32 – 64 g/l) of resin per regeneration, are possible without sacrificing capacity or increasing leakages. This translates to a salt savings of 700 – 1,400 lb/ft^3 (318 – 636 kg) per year based on daily regenerations.

Figure 1 – SST resin beads



Under a microscope, Purolite SST resin looks different because each bead has an inert core that resists fouling and enables more thorough regeneration of the bead.

Technical data

Table 1 – Typical physical and chemical characteristics

Polymer structure	Gel polystyrene crosslinked with divinylbenzene
Physical form	Spherical beads
Functional Groups	Sulfonic acid
Whole bead count functional groups	90% min.
Ionic form, as shipped	Na^+
Total capacity, Na^+ form	3.8 eq/kg
Moisture retention, Na^+ form	36 – 46% meq/g
Particle Size range	300 – 1200 µm
< 300 µm (max.)	1 %
Uniformity coefficient (max.)	1.7
Reversible swelling, $Na^+ \rightarrow H^+$ (max.)	6%
Specific gravity, Na^+ form	1.20
Shipping weight	775 – 825 g/l (48.4 – 51.6 lb/ft^3)
Maximum temperature limit	60°C (140°F)

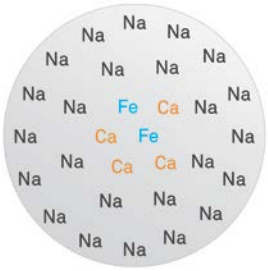
Kinetics and efficiency

As regenerant is consumed, the force of the reaction diminishes. Because of this, the core of standard resins remains unregenerated at the end of the regeneration cycle. As calcium, magnesium, iron and other elements accumulate, beads becomes fouled, leakage occurs, and excessive amounts of expensive chemical are required. The unique core of SST resin helps solve these problems, making the resin much more efficient by eliminating the sites that take the longest to exchange, are the most difficult to regenerate and are the most susceptible to fouling.

Uniform depth of functionality and diffusion path

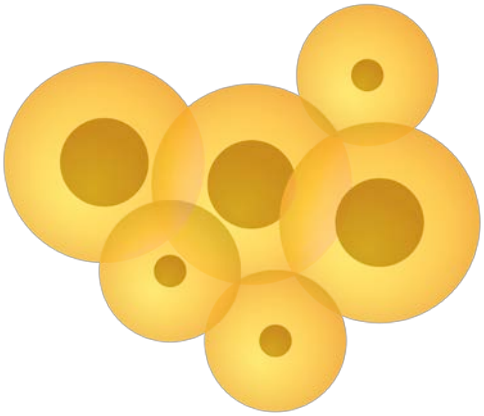
SST resins deliver better throughput with reduced chemical regenerant usage and minimal leakage. Each bead features a uniform depth of functionality so all beads react at the same rate for consistent performance. The Shallow Shell Technology structure shortens the diffusion path and creates more rapid ion exchange. The beads also exhibit superior toughness and durability and resist osmotic shock compared with conventional resin. This not only extends the life of the resin, but is important in industrial applications and portable exchange units where the resin experiences significant physical handling. These resins save water too. The shallow shell technology of Purolite SSTC60 regenerate with about 50% less water and rinse very quickly to quality.

Figure 2 – Fouling of standard bead



Standard resin beads are susceptible to fouling and leakage as the reaction force decreases as regenerant makes its way through the bead.

Figure 3 – Uniform depth of functionality



SST beads feature uniform depth of functionality so every bead reacts at the same rate.

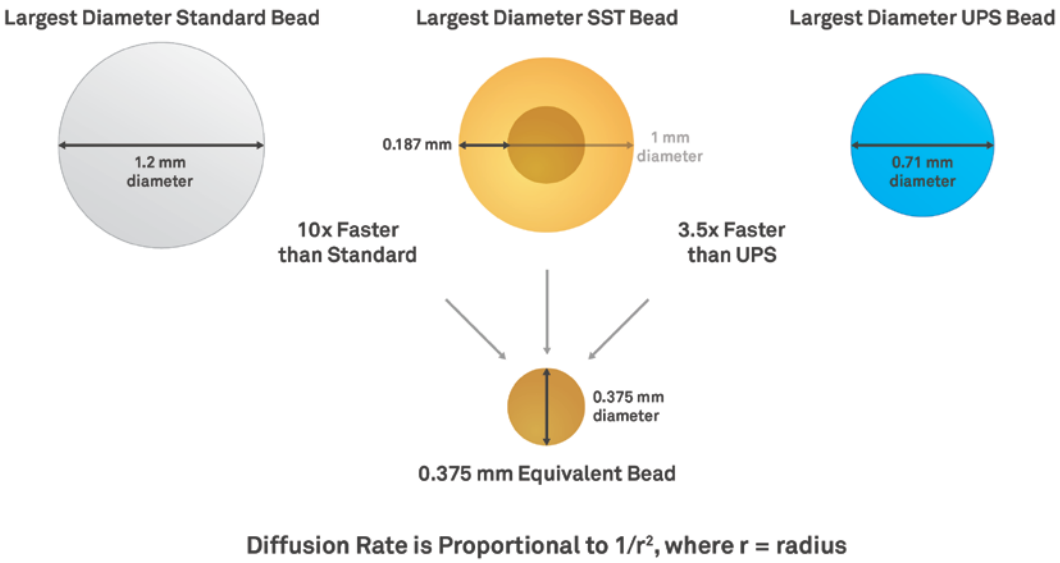
Figure 4 – Diffusion path

Where:
$\frac{S}{R}$ = Shell/Radius

Shell Radius	.5	.6	.7	.8	.9	1.0
Volume Ratio	87.5%	93.6%	97.3%	98.7%	99.9%	100%

The diffusion path of SST beads is shorter, resulting in faster reactions and more efficient, thorough regeneration.

Figure 5 – Diffusion path comparison of different resin bead types



Advantages of SST resins for softening

- Higher recovered capacity per pound (or kilogram) of salt
- Better iron removal
- Lower rinse requirements
- No equipment modifications needed; suitable for co-flow, counter-flow and packed bed systems
- Lower leakage at all regenerant levels
- Less susceptible to fouling
- Shorter regeneration cycles
- Excellent physical strength
- Non-solvent sulfonated
- More resistant to oxidation
- Meets NSF/ANSI-61 requirements for International Standard for Drinking Water Additives
- Supports ISO 14001 initiatives toward environmental management and impact

Table 2 – Standard operating conditions – Co-current water softening

Operation	Rate	Solution	Minutes	Amount
Service	8 – 60 BV/h 1.0 – 7.5 gpm/ft^3	Influent water	per design	per design
Backwash	Refer to Fig. 1	Influent water 5° – 30°C (40° – 80°F)	5 – 20	1.5 – 4 BV 10 – 20 gal/ft^3
Regeneration	2 – 7 BV/h 0.25 – 0.9 gpm/ft^3	8 – 20% NaCl	10 – 30	32 – 340 g/l 2 – 15 lb/ft^3
Rinse, (slow)	2 – 7 BV/h 0.25 – 0.90 gpm/ft^3	Influent water	12 – 60	1.5 – 2 BV 10 – 15 gal/ft^3
Rinse, (fast)	8 – 40 BV/h 1.0 – 5.0 gpm/ft^3	Influent water	6 – 30	1 – 5 BV 8 – 40 gal/ft^3
Backwash expansion	50% – 75%			
Design rising space	100%			

"Gallons" refers to U.S. Gallons = 3.785 liters

Figure 1 – Backwash expansion

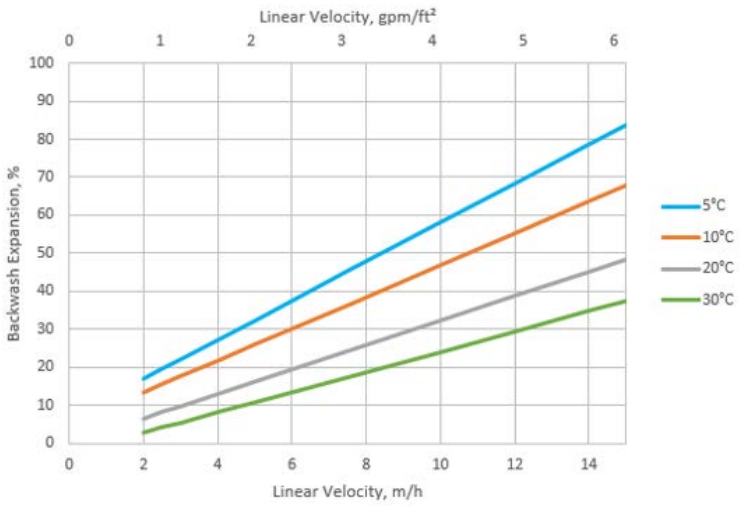
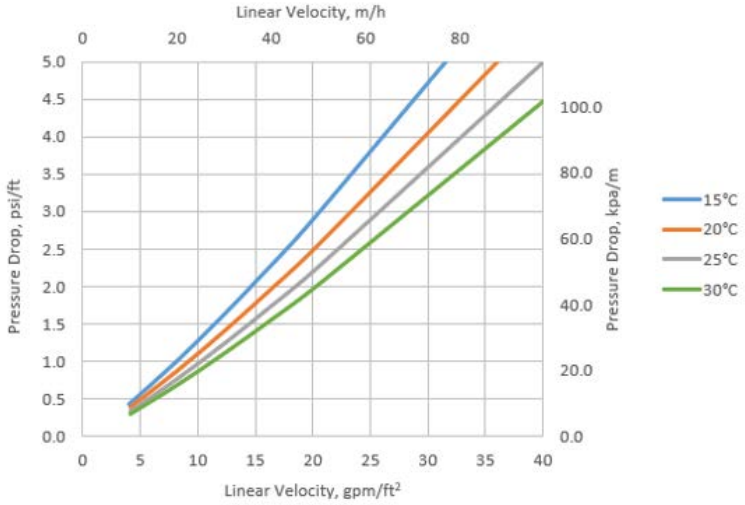


Figure 2 – Pressure drop



Capacity

Users are referred to our PureDesign software for capacity and leakage evaluations. PureDesign software is available for download from our website at www.purolite.com.

To view a video showing how Shallow Shell Technology works, go to www.bit.ly/shallow-shell.

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Uzbekistan

Purolite—the leading manufacturer of quality ion exchange, catalyst, adsorbent and specialty high-performance resins—is the only company that focuses 100% of its resources on the development and production of resin technology.

We're ready to solve your process challenges.
For further information on Purolite® products and services, visit www.purolite.com or contact your nearest Technical Sales Office.

P-000031-NPOLD-0818-R2-PCO

PENTAIR

STRUCTURAL
COMPOSITE PRESSURE VESSELS

DESIGNED FOR COMMERCIAL SOFTENING AND FILTRATION APPLICATIONS

Pentair Structural§ Composite Pressure Vessels offer reinforced fiberglass construction for outstanding performance and durability. Available in capacities up to 1,600 gallons, composite vessels are available with a variety of different configurations. ASME code available.

FEATURES/BENEFITS

For commercial and industrial water treatment and storage

100% composite fiberglass construction

Outstanding performance and durability in harsh chemical environments

Absolutely will not – and cannot – rust

Requires little or no maintenance

Capacities up to 1,600 gallons

Factory-backed five-year warranty

Commercial softening and filtration

MATERIAL OF CONSTRUCTION

Polyethylene inner shell

INSTALLATION TIPS

Bolt base to floor

Calculate height for valve and base combined

COLOR OPTIONS

AL – Almond
BL – Blue
BK – Black
GR – Gray
NA – Natural

OPERATING PARAMETERS

Maximum operating pressure – 150 psi

Maximum operating temperature – 120° F (threaded); 150°F (flanged)

PENTAIR DESIGN PARAMETERS

Safety factor: 4:1

Minimum burst at 600 psi

Tested to 250,000 cycles without leakage

NSF DESIGN PARAMETERS

Safety factor: 4:1

Minimum burst at 600 psi

Tested to 100,000 cycles without leakage

ASME DESIGN PARAMETERS

Top/Bottom Flange
- Safety factor – 5:1
- Minimum burst at 750 psi
- Tested to 33,000 cycles without leakage

Side Flange
- Safety factor – 6:1
- Minimum burst at 900 psi
- Tested to 100,000 cycles without leakage

NSF COMPONENT

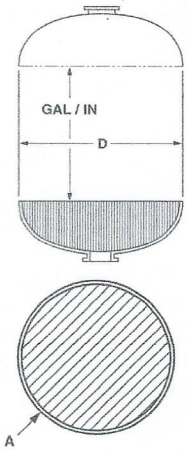
Vessels Tested and Certified by NSF International to NSF/ANSI Standard 61 for material and structural integrity requirements.

SPECIFICATIONS

VESSEL	DESCRIPTION	HEIGHT W/BASE INCHES / MM	HEIGHT W/O BASE INCHES / MM	CAPACITY GALLONS / LITERS	CUBIC FEET	BASE	SHIP WEIGHT LBS.
18" DIA.	18X65 COMP 4"T	66.25 / 1683	65.07 / 1669	64 / 242	8.56	SMC	67
	18X65 COMP 4"T 4"B	73.13 / 1858	65.6 / 1394	64 / 242	8.56	SMC EXT	67
	18X65 COMP 6"TF 6"BF	84.12 / 2137	70.5 / 1791	62 / 234	8.29	SMC EXT	92
21" DIA.	21X36 COMP 4"T	41.7 / 1059	38.2 / 970	45 / 171	6.06	SMC	46
	21X36 COMP 4"T 4"B	47.5 / 1205	38.25 / 970	45 / 171	6.06	SMC EXT	53
	21X62 COMP 4"T	67.0 / 1702	63.4 / 1610	84 / 318	11.23	SMC	95
	21X62 COMP 4"T 4"B	72.8 / 1848	63.5 / 1613	84 / 318	11.23	SMC EXT	95
24" DIA.	24X38 COMP 4"T	42.6 / 1081	38.5 / 978	61 / 231	8.15	SMC	65
	24X50 COMP 4"T	55.6 / 1412	52.9 / 1343	83.5 / 316	11.16	SMC	90
	24X50 COMP 4"T 4"B	63 / 1601	52.9 / 1343	83.5 / 316	11.16	SMC EXT	90
	24X65 COMP 4"T	65.2 / 1655	61.1 / 1552	100 / 378	13.36	SMC	109
	24X65 COMP 4"T 4"B	70.1 / 257	60 / 1524	100 / 378	13.36	SMC EXT	115
	24X65 COMP 6"TF	65 / 1651	61.2 / 1556	100 / 378	13.36	SMC	114
	24X65 COMP 6"TF 6"BF	79 / 2007	65 / 1651	100 / 378	13.36	TRIPOD	114
	24X72 COMP 4"T	74.7 / 1897	70.12 / 1781	118 / 451	15.77	SMC	109
	24X72 COMP 4"T 4"B	80.4 / 2043	70.3 / 1786	118 / 451	15.77	SMC EXT	124
	24X72 COMP 6"TF	77 / 1956	73.4 / 1864	118 / 451	15.77	SMC	137
	24X72 COMP 6"TF 6"BF	88.5 / 2248	74.5 / 1892	118 / 451	15.77	TRIPOD	137
30" DIA.	30X60 COMP 6"TF	71.6 / 1819	64.3 / 1634	151 / 572	20.2	SMC EXT	195
	30X60 COMP 6"TF 6"BF	82.5 / 2096	68.5 / 1740	151 / 572	20.2	TRIPOD	195
	30X72 COMP 4"T	78.9 / 2004	69.8 / 1772	187 / 708	24.99	SMC EXT	198
	30X72 COMP 4"T 4"B	77.2 / 1961	69.8 / 1772	187 / 708	24.99	SMC EXT	198
	30X72 COMP 6"TF	83.7 / 2126	69.9 / 1778	187 / 708	24.99	SMC EXT	195
	30X72 COMP 6"TF 6"BF	88.9 / 2258	74.9 / 1903	187 / 708	24.99	SMC EXT	211
36" DIA.	36X36 COMP 6"TBF	55.3 / 1403	41 / 1041	118 / 447	15.8	TRIPOD	148
	36X57 COMP 6"TF	68 / 1727	59.3 / 1505	205 / 776	27.4	SMC EXT	225
	36X57 COMP 6"TF 6"BF	77.3 / 1962	63 / 1600	205 / 776	27.4	TRIPOD	225
	36X72 COMP 4"T	80.5 / 2045	71.8 / 1823	264 / 999	35.2	SMC EXT	264
	36X72 COMP 4"T 4"B	80.5 / 2045	70.5 / 1791	264 / 999	35.2	SMC EXT	285
	36X72 COMP 6"TF	83 / 2108	74.3 / 1886	264 / 999	35.2	SMC EXT	285
	36X72 COMP 6"TF 6"BF	90.4 / 2296	76.1 / 1934	264 / 999	35.2	TRIPOD	285
	36X72 COMP 6"TF 6"BF 4"TBSF	89.6 / 2275	75.3 / 1913	264 / 999	35.2	TRIPOD	292
42" DIA.	42X72 COMP 6"TF	72.5 / 1842	71.1 / 1807	345 / 1306	46.1	SMC	370
	42X72 COMP 6"TF 6"BF	90.1 / 2289	73 / 1854	345 / 1306	46.1	TRIPOD	400
	42X72 COMP 6"TF 6"BF 4"TBSF	94.6 / 2403	77.5 / 1969	345 / 1306	46.1	TRIPOD	415
48" DIA	48X72 COMP 6"TF	81.5 / 2071	75.2 / 1909	463 / 1753	61.9	SMC	494
	48X72 COMP 6"TF 6"BF	92.9 / 2360	76.9 / 1953	463 / 1753	61.9	TRIPOD	494
	48X72 COMP 6"TF 6"BF 4"TBSF	96.75 / 2458	80.75 / 2051	463 / 1753	61.9	TRIPOD	504
63" DIA.	63X67 COMP 6"TF 6"BF	81.4 / 2068	67.1 / 1704.3	600 / 2271	80.2	TRIPOD	680
	63X86 COMP 6"TF 6"BF	98.5 / 2503	84.1 / 2136	900 / 3407	120.3	TRIPOD	950
	63X86 COMP 16"TMWY 6"BF	99 / 2515	84.5 / 2146	900 / 3407	120.3	TRIPOD	950
	63X86 COMP 16"TMWY 6"BF 4"TBSF	99 / 2515	85 / 2159	900 / 3407	120.3	TRIPOD	950
	63X116 16"TMWY 6'BF 4"TBSF	130 / 3302	115.9 / 2945	1250 / 4732	167	TRIPOD	1190
	63X144 16"TMWY 6'BF 4"TBSF	157.9 / 4012	143.9 / 3656	1600 / 6057	214	TRIPOD	1398

*Measurements are subject to change without notice and are for reference only.
NOTE: Flexible connections must be installed between hard piping and tank openings. Failure to install flex connection properly with the vessel will void the warranty.
NOTE: Different base options can be selected on different tank diameters. The bases selected above illustrate most common base selection.

DOME VOLUME (GALLONS) AND STRAIGHT WALL GALLON PER INCH

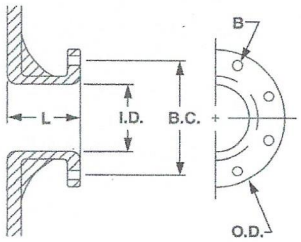


NOMINAL DIAMETER			
D (INCHES)	GALLONS* (ONE DOME)	GALLON/ INCH (APPROX.)	A (SQ. FEET)
12	1.0	0.5	0.7
13	1.4	0.5	0.9
14	1.7	0.6	1.1
16	2.7	0.8	1.3
18	3.7	1.0	1.8
21	6.2	1.4	2.4
24	9.3	1.9	3.0
30	18	2.9	4.6
36	33	4.2	6.7
42	52	5.7	9.0
48	74	7.5	12.0
63	168	13.0	20.0

*Cubic Ft. = 0.1337 x Gallons

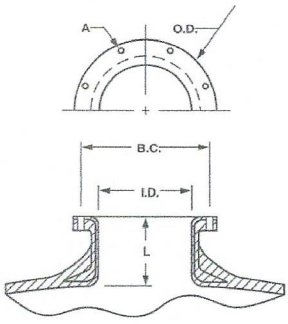
SIDE FLANGE

DIMENSIONS							
SIZE	L	I.D.	B.C.	O.D.	A BOLT DIA.	NUMBER OF HOLES	WEIGHT (LBS.)
4" ANSI	4.1"	4.0"	7.5"	9.0"	0.63"	8	6.4

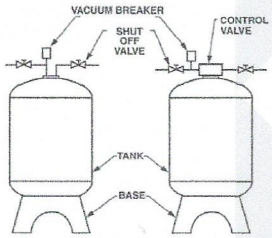


TOP AND BOTTOM OPENING FLANGES/MANWAY

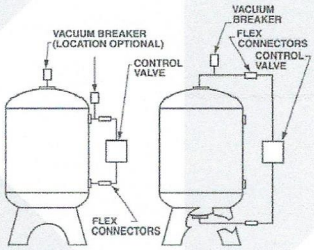
DIMENSIONS							
SIZE	L	I.D.	B.C.	O.D.	A BOLT DIA.	NUMBER OF HOLES	WEIGHT (LBS.)
6" SNA	3.6"	5.9"	8.5"	9.4"	0.31"	12	5.8
10" ANSI	3.7"	10.0"	14.3"	16.0"	0.88"	12	17.8
16" Manway SNA	4.3"	16.0"	20.4"	21.3"	0.50"	24	34.0



VACUUM BREAKER INSTALLATION



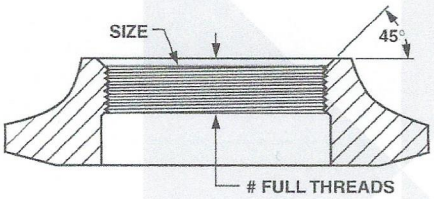
FLEX CONNECTORS INSTALLATION



NOTE: Flexible connectors must be installed between hard piping and tank openings. These pressure vessels are treated for an internal negative pressure of 5y HG (17 Pa) vacuum below atmospheric. If negative pressure could ever exceed 5y Hg (17 Pa), an adequate vacuum breaker must also be properly installed. Failure to install flex connection properly, or improper installation of a vacuum breaker when required, may void the warranty.

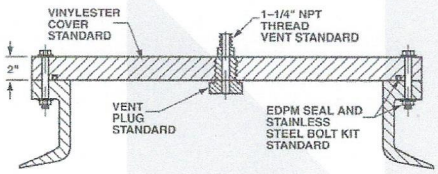
TOP AND BOTTOM OPENING THREADS

SPECIFICATIONS			
SIZE	COMPOSITE/ POLY GLASS	NUMBER OF FULL THREADS	COMPOSITE
2.5" - 8" NPSM	6	3 min	6
4" - 8" UN	7	3 min	7
4.5" - 8" Buttress	7	3 min	7

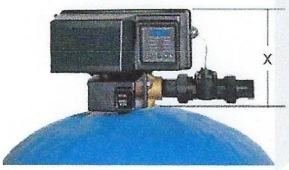


MANWAY COVER

SPECIFICATIONS		
MATERIAL	PRESSURE RATING	TAPPING
CPVC	100 psi	As requested
VE	150 psi	As shown only



ADDER DIMENSIONS



*Measurements are subject to change without notice and are for reference only.

DIMENSIONS		
FLECK VALVE	TANK DIA. (INCHES/MM)	ADDER HT. (X) (INCHES/MM)
2750	18/475	6.5/165
2850	21/533	6.5/165
2900	24, 30/610, 762	12/305
3150	42/1067	10/254
3900	48-63/1219-1600	15/381

WATER QUALITY SYSTEMS
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40846 Rev F JA16

24" and 30" Commercial/Industrial Blow Molded Brine Tanks

Clack offers both 24" and 30" round blow molded brine tanks. The introduction of the 30" diameter tank makes it the largest blow molded brine tank for commercial/industrial applications.

Like the 24" round tank, the 30" tank is molded of high density polyethylene for exceptional stress and crack resistant properties.

These tanks are ideal for industrial and commercial use and the 30" tank feature heavy wall thickness for increased durability.

Injection molded grids are available for both 24" and 30" tanks and use 1½" schedule 40 PVC pipe for leg supports.

The legs can be cut to any length for easy grid height adjustment. A precut leg kit for the 24" grid is also available, giving it an overall grid height of 10¼".

ORDER NUMBER	DESCRIPTION	LIQUID CAPACITY	SALT CAPACITY	HEIGHT W/LID	DIAMETER	SHIPPING WEIGHT	CARTON SIZE	UNITS PER CARTON
G22441CB1C00	24 x 41 Black Brine Tank	80 gal./ 303 liters	700 lbs./ 318 Kg	42.5 in/ 108 cm	24.5 in./ 62 cm	23.5 lbs./ 10.7 Kg	15 ft.^{3}	1
G22450CB1C00	24 x 50 Black Brine Tank	100 gal./ 378 liters	900 lbs./ 408 Kg	51.5 in/ 131 cm	24.5 in./ 62 cm	27.25 lbs./ 12.4 Kg	18 ft.^{3}	1
G23050CB1C00	30 x 50 Black Brine Tank	150 gal./ 579 liters	1400 lbs./ 640 Kg	52.5 in/ 133 cm	31 in./ 79 cm	49 lbs./ 22.3 Kg	30 ft.^{3}	1

Plastic Brine Grid with PVC Legs

ACCESSORY INFORMATION		
ORDER NUMBER	DESCRIPTION	QUANTITY/ CARTON
H1080	24" Plastic Brine Grid (2 plates/set)	5 Sets
H1032	30" Plastic Brine Grid (2 plates/set)	3 Sets
H1089	PVC Grid Legs for 24" Grid (7/set)	5 Sets

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Form No. 2262 • 6/16/2016

Clack®

WS1.5EE

WATER SPECIALIST CONTROL VALVE

NSF

Certified to NSF/ANSI/CAN 61 and NSF/ANSI/CAN 372.


Optional 1.5" Meter

- 1.5" top mount control valve suited for mid-size commercial/industrial applications
- Epoxy coated lead free brass valve body*
- Economical stainless steel optional meter assembly
- Service flow rate of 70 gpm, backwash 52 gpm
- Solid state microprocessor with easy access front panel settings
- Front panel display for time of day, days until next regeneration, volume remaining, current flow rate and total volume used (Totalizer)
- Four methods to initiate regeneration; meter immediate, meter delayed, time clock delayed or pressure differential
- Optional double backwash feature offers optimum regeneration, cleaning ability and efficiency
- Fully adjustable cycle times with 6-cycle control delivers controlled backwash, downflow brining or upflow brining, slow rinse, second backwash, fast rinse, refill and downflow service
- Coin Cell Lithium battery back-up with a 8 hour carry over
- Level VI 15-volt output DC power supply provides safe and easy installation
- Post treated water regenerant refill
- One piece expanding seal spacer stack assembly
- Linearly reciprocating piston operation
- Reliable and proven DC drive

Water Specialist 1.5" EE Control Specifications

Inlet/Outlet (1)	1.5" Female NPT
Cycles	Up to 6
Valve Material	Epoxy coated brass
Regeneration	Downflow

CONTROL VALVE FLOW RATES

Service @15 psi drop (includes meter)	70 gpm
Backwash @ 25 psi drop	52 gpm
Cv Service	18.1
Cv Backwash	10.4

OPERATING PRESSURES

Minimum/Maximum	20 psi – 125 psi

OPERATING TEMPERATURES

Minimum/Maximum	40° – 110° F

METER SPECIFICATIONS

Accuracy	± 5%
Flow Rate Range	0.5 – 75 GPM
Gallon Range	20 – 1,500,000 gallons
Totalizer	1 – 9,999,000 gallons

DIMENSIONS & WEIGHT

Distributor Pilot	
Valve bodies with 1.5" Female NPT Inlet & Outlet	1.90" OD (1.5" NPS)
Drain Line Connection (2)	1.25" Female NPT
Adapter Included	¾" Male NPT Elbow
Brine Line Connection	¾" Female NPT
Adapter Included	½" OD Poly Tube Compression
Mounting Base	4" - 8 UN
Height From Top Of Tank	7.5"
Shipping Weight With Meter	21 lbs.

ELECTRICAL SPECIFICATIONS

POWER SUPPLY

	U.S.	International
Supply Voltage	100VAC to 120VAC	200VAC to 240VAC
Supply Frequency	50/60 Hz	50/60 Hz
Output Voltage	15VDC	15VDC
Output Current	500 mA	500 mA

TANK APPLICATIONS

Water Softener	12" – 24" diameter
Water Filter (3)	12" – 30" diameter

CYCLES OF OPERATION

	Softener	Filter
Cycle	Range of time in minutes	
1. Backwash 1st (upflow)	1-95	Backwash 1-95
2. Regenerate Draw/Slow Rinse (downflow)	1-180	
3. Backwash 2nd (upflow)	1-95	
4. Fast Rinse (downflow)	1-95	Rinse 1-95
5. Regenerant Refill (in service with treated water)	0.1-99.0 or off	
6. Service (downflow)		

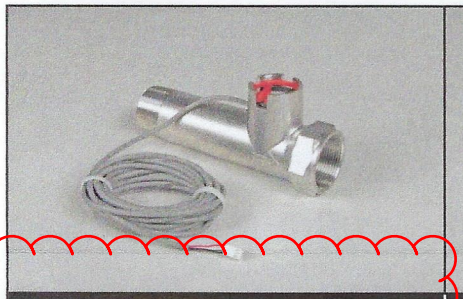
Options: Backwash Filter, Weather Cover

Compatible with the following typical concentrations of regenerants or chemicals: Sodium chloride, potassium chloride, potassium permanganate, sodium bisulfite, chlorine and chloramines

1. See Distributor Pilot.
2. Casting comes with a 1.25" Female NPT drain connection. An adapter is provided to accept existing WS1 drain line ¾" Male NPT flow controls up to 10 gpm. Other drain line flow controls are available for flow rates above 10 gpm.
3. Filter tank size calculated @ 10 gpm of backwash per square foot of bed area.

Water meters on discharge from softener unit.

Stainless Steel Inline Flow Meters

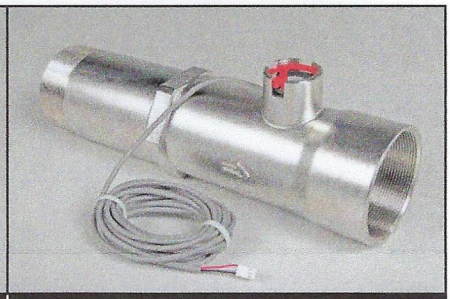


1.5” Meter
V3040-15 or V3040BSPT-15

- 1.5” Inline meter suited for commercial/industrial applications
- 316 stainless steel material
- Electro polished for improving corrosion resistance, leaving a lasting bright finish
- Service flow range 0.5 to 75 gpm (2-284 lpm)
- Meter accuracy ±5%
- Reliable and proven turbine design
- 15-foot cable included
- 1.5” Male x Female NPT or BSPT connections

2” Meter
V3094-15 or V3094BSPT-15

- 2” Inline meter suited for commercial/industrial applications
- 316 stainless steel material
- Electro polished for improving corrosion resistance, leaving a lasting bright finish
- Service flow range 1.5 to 150 gpm (5.7-568 lpm)
- Meter accuracy ±5%
- Reliable and proven turbine design
- 15-foot cable included
- 2” Male x Female NPT or BSPT connection



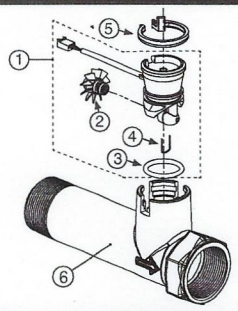
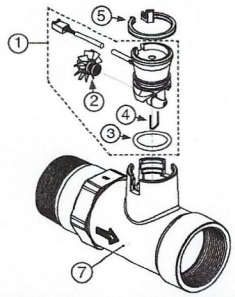
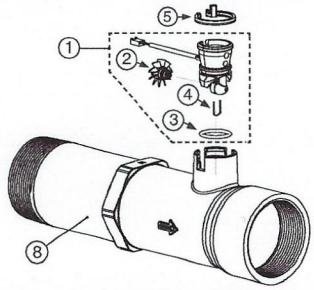
3” Meter
V3095-15 or V3095BSPT-15

- 3” Inline meter suited for commercial/industrial applications
- 316 stainless steel material
- Electro polished for improving corrosion resistance, leaving a lasting bright finish
- Service flow range 3.5 to 350 gpm (13-1,325 lpm)
- Meter accuracy ±5%
- Reliable and proven turbine design
- 15-foot cable included
- 3” Male x Female NPT or BSPT connection

NSF

Certified to NSF/ANSI/CAN 61 and NSF/ANSI 372.

Inline Flow Meters NPT or BSPT

WS1.5 Meter Assembly Order No: V3040-15 or V3040BSPT-15	WS2 Meter Assembly Order No: V3094-15 or V3094BSPT-15	WS3 Meter Assembly Order No: V3095-15 or V3095BSPT-15
		

Drawing No.	Order No.	Description	Quantity
		Common Parts	
1	V3221	WS Remote Meter Asy 15 Ft Cord (includes V3118-03, V3501 and V3105)	1
2	V3118-03	WS1.5/2 Turbine Asy	1
3	V3105	O-Ring 215	1
4	V3501	WS1.5/2 Turbine Clip	1
5	V3632	WS1.5/2/3 Meter Retaining Clip	1
		WS1.5 Meter Assembly Parts	
6	V3401-04	WS1.5 Meter Housing MxF NPT	1
	V3401BSPT-04	WS1.5 Meter Housing MxF BSPT	
Not Shown	V3437	WS1.5 Flow Straightener (located inside meter housing)	1
		WS2 Meter Assembly Parts	
7	V3754-01	WS2 Meter NPT MxF Housing	1
	V3754BSPT-01	WS2 Meter BSPT MxF Housing	
Not Shown	V3488	WS2 Flow Straightener (located inside meter housing)	1
		WS3 Meter Assembly Parts	
8	V3844-01	WS3 Meter NPT MxF Housing	1
	V3844BSPT-01	WS3 Meter BSPT MxF Housing	
Not Shown	V3602	WS3 Flow Straightener (located inside meter housing)	1

Installation:

Installation of the V3040-15 WS1.5 Meter NPT Assembly can be accomplished using 1.5" NPT pipe and fittings. For V3040BSPT-15 WS1.5 Meter BSPT use 1.5" BSPT pipe and fittings.
Installation of the V3094-15 WS2 Meter NPT Assembly can be accomplished using 2" NPT pipe and fittings. For V3094BSPT-15 WS2 Meter BSPT Assembly use 2" BSPT pipe and fittings.
Installation of the V3095-15 WS3 Meter NPT Assembly can be accomplished using 3" NPT pipe and fittings. For V3095BSPT-15 WS3 Meter BSPT Assembly use 3" BSPT pipe and fittings.

WHEN INSTALLING THE METER, YOU MUST LUBRICATE THE INTERNAL BORE OF THE METER HOUSING AND THE O-RING OF THE ADAPTER. MAKE SURE THE ARROW ON THE METER BODY IS GOING THE SAME DIRECTION AS THE WATER FLOW. THE METER CAN BE INSTALLED IN HORIZONTAL OR UPWARD WATER FLOW VERTICAL APPLICATIONS. HYDROCARBONS SUCH AS VASELINE®, PETROLEUM JELLY, KEROSENE, BENZENE, GASOLINE, ETC., WILL DAMAGE PRODUCTS THAT CONTAIN O-RINGS OR PLASTIC COMPONENTS. EXPOSURE TO SUCH HYDROCARBONS MAY CAUSE THE PRODUCTS TO LEAK. DO NOT USE CLACK CONTROL VALVE PRODUCT(S) ON WATER SUPPLIES THAT CONTAIN HYDROCARBONS SUCH AS KEROSENE, BENZENE, GASOLINE, ETC.

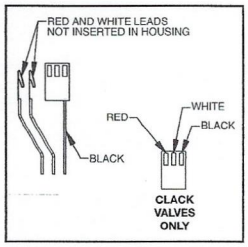
THIS WATER METER SHOULD NOT BE USED AS THE PRIMARY MONITORING DEVICE FOR CRITICAL OR HEALTH EFFECT APPLICATIONS.

OPERATING PRESSURES: 20 PSI MINIMUM - 125 PSI MAXIMUM (1.4 - 8.6 bar)

OPERATING TEMPERATURE 40°F MINIMUM - 110°F MAXIMUM (4° - 43°C)

The 22 gauge wire crimp terminals are Molex Series 41572 or 40445. The housing connector is Molex Series 2695 White Housing, P/N 22-01-3037.

The housing connector diagram shows the proper installation of the RED, WHITE and BLACK wires for CLACK CORPORATION CONTROL VALVES. When connecting to other manufacturers control valves please contact your original equipment manufacturer for proper wiring instructions.



Wiring:

- The meter must be supplied with a DC voltage between 4 and 24 volts
- The RED wire is positive
- The BLACK wire is negative
- The WHITE wire is the meter output

Programming WS1.5 WS2.0 or WS2H WS3.0	Select 1.5 in the "FL" programming parameter for the correct meter pulse reading Select 2.0 in the "FL" or "Set Meter Type" programming parameter for the correct meter pulse reading Select 3.0 in the "Set Meter Type" programming parameter for the correct meter pulse reading	
Measurement	**Imperial**	**Metric**
Meter Pulses 1.5 Inline 2.0 Inline 3.0 Inline	 37 Pulses/ Gallon 20 Pulses/ Gallon 8 Pulses/ Gallon	 9.8 Pulses/Liter 5.3 Pulses/Liter 2.1 Pulses/Liter
Meter Accuracy 1.5 Inline 2.0 Inline 3.0 Inline	 0.50 – 75 gpm ± 5% 1.50 – 150 gpm ± 5% 3.50 – 350 gpm ± 5%	 1.90 – 284 lpm ± 5% 5.68 – 568 lpm ± 5% 13.25 – 1325 lpm ± 5%
	Output Signal 0.4 Hz – 47.5 Hz NOTE: Not all flow monitors will register accurately at the specified specs of this meter. Contact your monitor manufacture for limitations.	
Pressure Drop 1.5 Inline 2.0 Inline 3.0 Inline	 2.7 PSID @ 75 gpm 3.6 PSID @ 150 gpm 7.3 PSID @ 350 gpm	 0.19 BAR ΔP @ 284 lpm 0.25 BAR ΔP @ 568 lpm 0.50 BAR ΔP @ 1325 lpm

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Form No. 2815 • 11/21/2019

Water Specialist 1.5” NPT or BSPT Motorized Alternating Valve

Order No. V3071 • NPT
Order No. V3071BSPT • BSPT

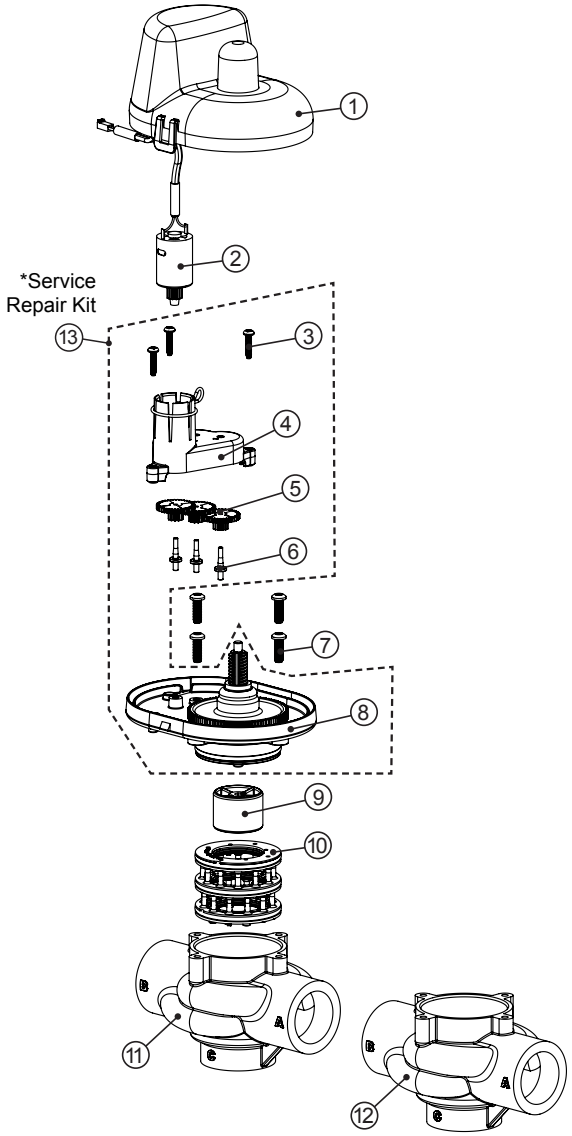
EXAMPLE OF A TWIN CONFIGURATION

- 1.5” NPT or 1.5” BSPT Available
- Epoxy coated lead free brass valve body*
- Allows for two WS1.5 Valves to be a Twin Alternating System
- Full 1.5” ports with minimal pressure loss
- Provides for no raw water bypass during regeneration
- Provides choices of treated or non-treated water regeneration
- Proven and reliable Clack DC drive assembly
- Low voltage drive assembly controlled by valve’s circuit board
- Flow from Port A to Common has a 3.74 PSI drop at 60 GPM
- Flow from Port B to Common has a 2.15 PSI drop at 60 GPM
- Hydraulically Balanced Piston Valve
- Patented Seal/Spacer Stack Assembly
- Operating Pressures:
  20 PSI Minimum
  125 PSI Maximum
- Operating Temperatures:
  40°F Minimum
  110°F Maximum

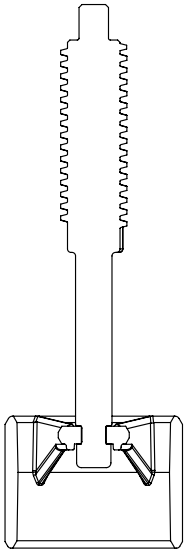
Order No. V3071 • Description: MOTOR ALT VLV 1.5 NPT REV2 or Order No. V3071BSPT • Description: MOTOR ALT VLV 1.5 BSPT REV2

Drawing No.	Order No.	Description	Quantity	
			V3071	V3071BSPT
1	V3073	MAV/NOHWBY COVER ASY	1	1
2	V3476	WS MOTOR ASY 8 FT	1	1
3	V3592	SCREW #8-3/4 PHPN T-25 SS	3	3
4	V3262-01	WS1.5&2ALT/2BY REDUCGEARCVRASY	1	1
5	V3110-01	WS1 DRIVE REDUCING GEAR PLAIN	3	3
6	V3264	WS2 BYPASS REDUCTION GEAR AXLE	3	3
7	V3527	SCREW 1/4-20 X 3/4 BHSCS SS	4	4
8	V3072	MAV/NOHWBY 1/125/15 DRIVE ASY	1	1
9	V3506-01	MAV/NOHRD 1/125/15 PISTON	1	1
10	V3074	MAV 1/125/15 STACK ASY	1	1
11	V3525-01	MAV BODY 1.5 NPT	1	N/A
12	V3525BSPT-01	MAV BODY 1.5 BSPT	N/A	1
Not Shown	V3474	WS ALT CONNECT CORD 8FT BLK	1	1

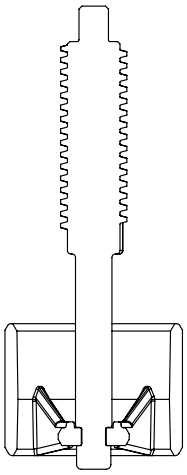
*13	V3042	WS1/1.25/1.5 MAV & NHWB SERVICE PACK



•Operating Pressures:
20 PSI Minimum / 125 PSI Maximum
•Operating Temperatures:
40°F Minimum / 110°F Maximum



Piston Orientation 1
Motorized Alternating Valve
and No Hard Water Bypass
Valve Configurations.



Piston Orientation 2
No Hard Water Bypass
Valve Configurations.

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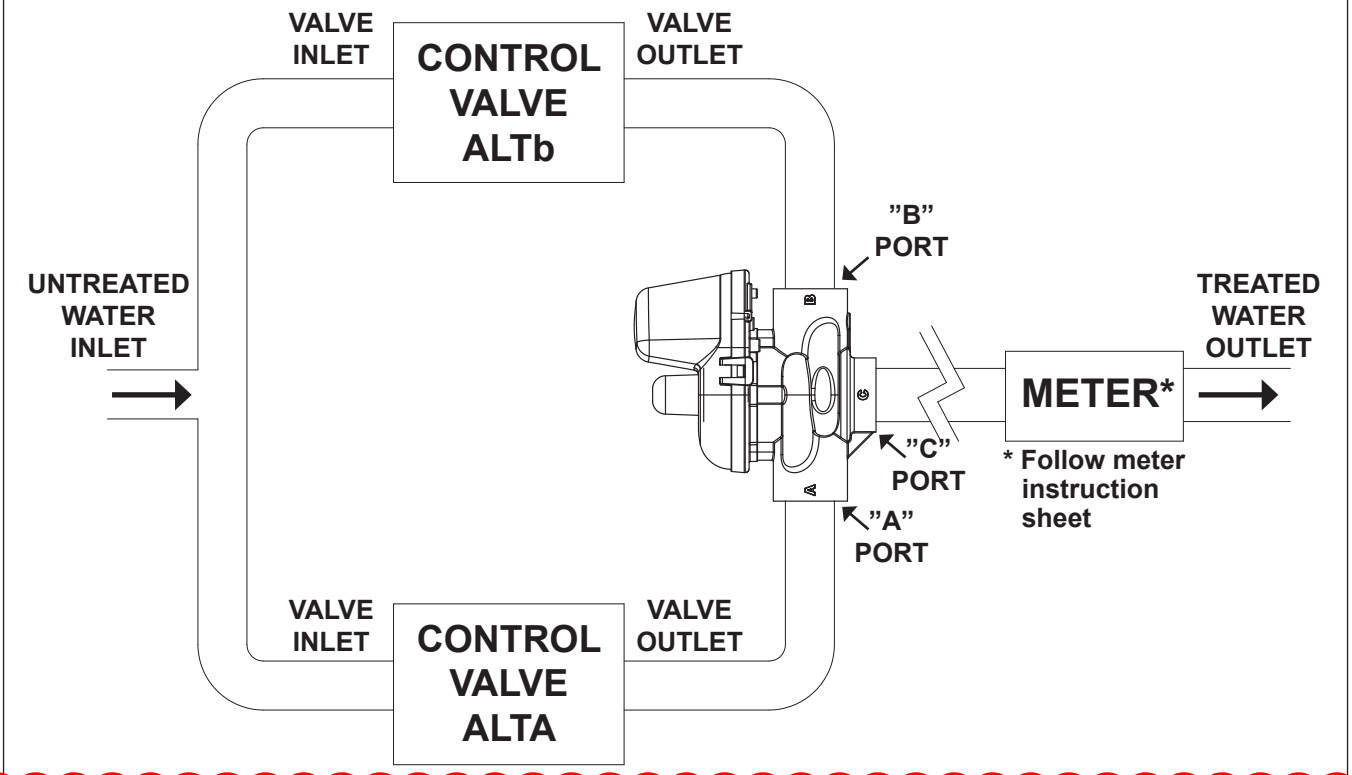
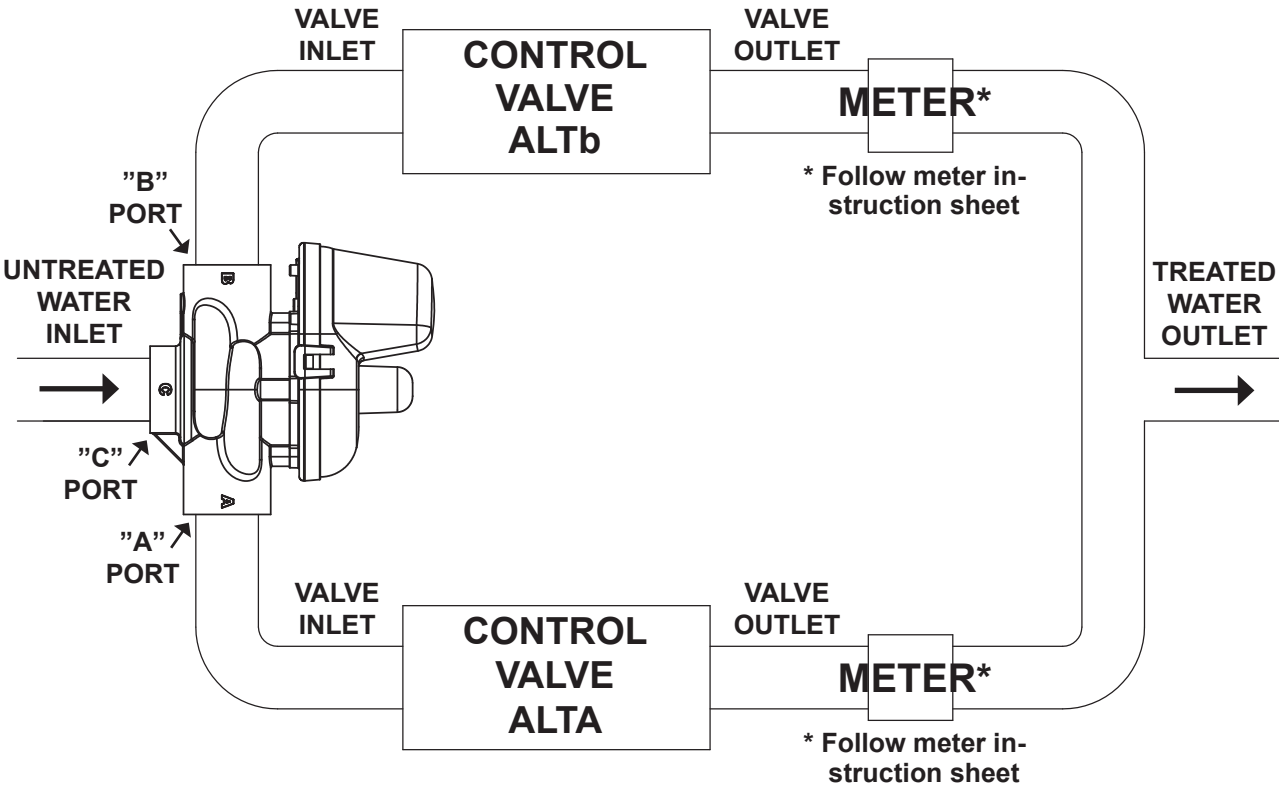
Twin Tank Alternator:
If the control valve manual does not include instructions for setting up ALTA and ALTb software, please contact your local equipment supplier for current copies of installation instructions. If the control valve is in an error state during regeneration mode, the MAV will close the B port and keep open the A port until the error is corrected and reset.

REGENERATION WITH HARD WATER

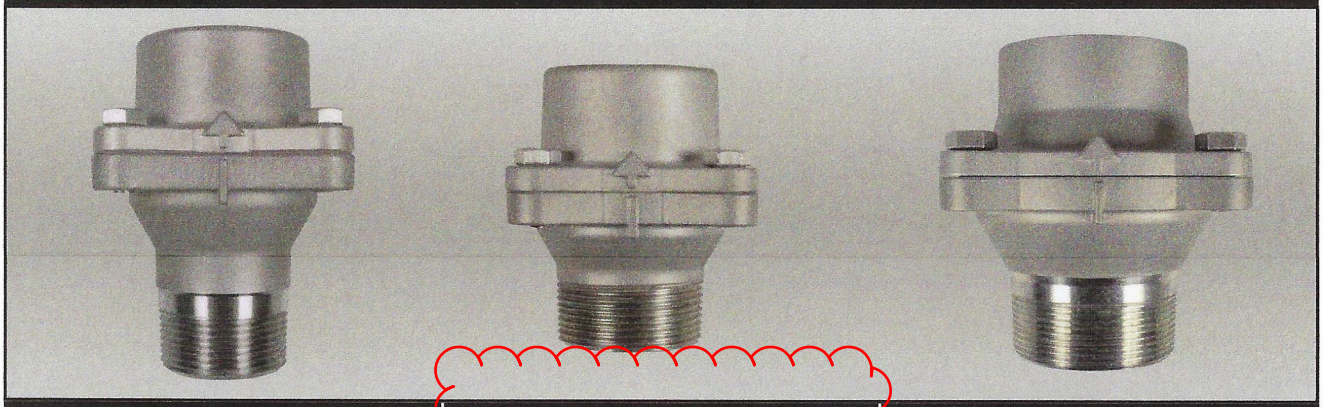


REGENERATION WITH SOFT WATER

Note: WS2 valve cannot be used in this type of installation.



1.25" / 1.5" / 2" Stainless Steel Drain Line Flow Controls NPT or BSPT



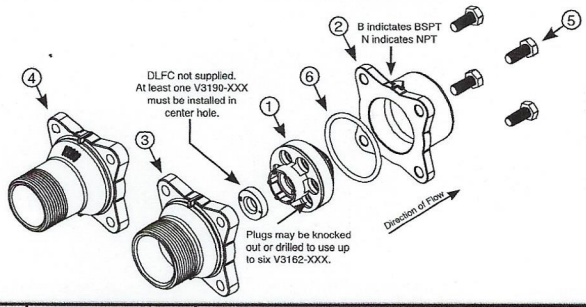
V3079 or V3079BSPT **1.25" DLFC**	V3080 or V3080BSPT **1.5" DLFC**	V3051 or V3051BSPT **2" DLFC**
• 1.25" Male NPT x 1.5" Female NPT Inline Drain Line Flow Control suited for commercial and industrial applications	• 1.5" Male NPT x 1.5" Female NPT Inline Drain Line Flow Control suited for commercial and industrial applications	• 2" Inline Drain Line Flow Control suited for commercial and industrial applications
• Stainless steel housing	• Stainless steel housing	• Stainless steel housing
• Flow rates from 9 gpm to 85 gpm	• Flow rates from 9 gpm to 85 gpm	• Flow rates from .7 gpm to 150 gpm
• Reliable and proven flow washer design	• Reliable and proven flow washer design	• Reliable and proven flow washer design
• 1.25" Male NPT inlet with 1.5" Female NPT or BSPT outlet	• 1.5" Male NPT inlet with 1.5" Female NPT or BSPT outlet	• 2" Male NPT or BSPT inlet/outlet connection
• Easily disassembled with four bolts for cleaning	• Easily disassembled with four bolts for cleaning	• Easily disassembled with four bolts for cleaning
• For use on model WS1.5 and other manufacturer controls	• For use on models WS2, WS2H, WS3 and other manufacturer controls	• For use on model WS2H, WS3 and other manufacturer controls

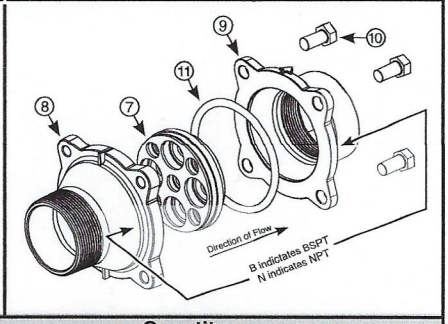
THESE DRAIN LINE FLOW CONTROLS SHOULD NOT BE USED AS THE PRIMARY FLOW CONTROL DEVICE FOR CRITICAL OR HEALTH EFFECT APPLICATIONS.
OPERATING PRESSURES: 20 PSI MINIMUM / 125 PSI MAXIMUM (1.4 - 8.6 BAR)
OPERATING TEMPERATURES: 40°F MINIMUM / 110°F MAXIMUM (4° - 43° C)

Clack®

1.25" / 1.5" / 2" Stainless Steel Drain Line Flow Controls NPT or BSPT

WS DLFC 1.25 x 1.5 Order No: V3079 or V3079BSPT	WS DLFC 1.5 x 1.5 Order No: V3080 or V3080BSPT	WS DLFC 2 x 2 Order No: V3051 or V3051BSPT





Drawing No.	Order No.	Description	Quantity			
			V3079	V3079BSPT	V3080	V3080BSPT
WS DLFC 1.25 x 1.5 and WS DLFC 1.5 x 1.5						
1	V3081	WS15 RETAINER DLFC ASY	1	1	1	1
2	V3645	WS15 DLFC FLANGE OUTLET FEMALE NPT	1	-	1	-
	V3645BSPT	WS15 DLFC FLANGE OUTLET FEMALE BSPT	-	1	-	1
3	V3646	WS15 DLFC FLANGE INLET MALE NPT	-	-	1	1
4	V3388	WS1.25 DLFC FLANGE INLET MNPT	1	1	-	-
5	V3652	BOLT HEXHD S/S HCS 5/16-18x3/4	4	4	4	4
6	V3441	O-RING 226	1	1	1	1

WS DLFC 2 x 2				
Drawing No.	Order No.	Description	V3051	V3051BSPT
7	V3052	WS2 DLFC RETAINER ASY	1	1
8	V3817	WS2 FLANGE INLET NPT	1	-
	V3817BSPT	WS2 FLANGE INLET BSPT	-	1
9	V3816	WS2 FLANGE OUTLET NPT	1	-
	V3816BSPT	WS2 FLANGE OUTLET BSPT	-	1
10	V3273	BOLT HEX HD S/S HCS 3/8-16X3/4	4	4
11	V3278	O-RING 338	1	1

Drain Line Flow Control Washers			
Not Shown	V3162-007	WS1 DLFC 0.7 gpm for 3/4	**For WS DLFC 1.25 x 1.5 and WS DLFC 1.5 x 1.5:** Install at least one V3190-XXX in center hole. Knock out plugs allow installation of up to 6 more of V3162-XXX. **For WS DLFC 2 x 2:** Install One or More DLFC washers. Up to 5 of the V3162-XXX may be installed in the small holes. Up to 4 of the V3190-XXX may be installed in the large holes.
	V3162-010	WS1 DLFC 1.0 gpm for 3/4	
	V3162-013	WS1 DLFC 1.3 gpm for 3/4	
	V3162-017	WS1 DLFC 1.7 gpm for 3/4	
	V3162-022	WS1 DLFC 2.2 gpm for 3/4	
	V3162-027	WS1 DLFC 2.7 gpm for 3/4	
	V3162-032	WS1 DLFC 3.2 gpm or 3/4	
	V3162-042	WS1 DLFC 4.2 gpm for 3/4	
	V3162-053	WS1 DLFC 5.3 gpm for 3/4	
	V3162-065	WS1 DLFC 6.5 gpm for 3/4	
	V3162-075	WS1 DLFC 7.5 gpm for 3/4	
	V3162-090	WS1 DLFC 9.0 gpm for 3/4	
	V3162-100	WS1 DLFC 10.0 gpm for 3/4	
	V3190-090	WS1 DLFC 9.0 gpm for 1	
	V3190-100	WS1 DLFC 10.0 gpm for 1	
	V3190-110	WS1 DLFC 11.0 gpm for 1	
	V3190-130	WS1 DLFC 13.0 gpm for 1	
	V3190-150	WS1 DLFC 15.0 gpm for 1	
	V3190-170	WS1 DLFC 17.0 gpm for 1	
	V3190-200	WS1 DLFC 20.0 gpm for 1	
	V3190-250	WS1 DLFC 25.0 gpm for 1	

Assembly Instructions

Assembly Instructions for 1.25" and 1.5" Drain Line Flow Controls

Assemblies are shipped without drain line flow control (DLFC) washers.

1. Determine the desired flow rate. Select one V3190-XXX for the center hole and a combination of V3162-XXX to arrive at the desired flow rate. At least one V3190-XXX must be used and up to six of the V3162-XXX may be used.
2. Using a drill or punch remove the desired knockout(s) in V3081.
3. After desired knockout(s) are removed make sure the new holes are smooth with no rough or jagged areas.
4. Install appropriate size(s) of drain line flow control washers. Play close attention to proper DLFC orientation.
5. Assemble. Properly orientate the V3081 in direction of flow.
6. Inlet threads for 1.25" Male are NPT. Inlet threads for 1.5" Male are NPT. Outlet threads for 1.5" are either Female NPT or BSPT. 1.5" Female outlet is stamped with N or B to indicate NPT or BSPT.

Assembly Instructions for 2" Drain Line Flow Controls

Assemblies are shipped without drain line flow control (DLFC) washers.

1. Determine the desired flowrate. Select a combination of V3162-XXX's and V3190-XXX's to arrive at the desired flow rate. Up to five of the smaller V3162-XXX's may be used. Up to four of the larger V3190-XXX's may be used.
2. Using a drill or punch remove the desired knockout(s) in V3052.
3. After desired knockout(s) are removed make sure the new holes are smooth with no rough or jagged areas.
4. Install appropriate size(s) of drain line flow control washers. Pay close attention to proper DLFC orientation.
5. Assemble. Properly orientate the V3052 in the direction of flow.
6. Inlet threads are 2" Male NPT or BSPT. Outlet threads are 2" Female NPT or BSPT. Female outlet is stamped with N or B to indicate NPT or BSPT.

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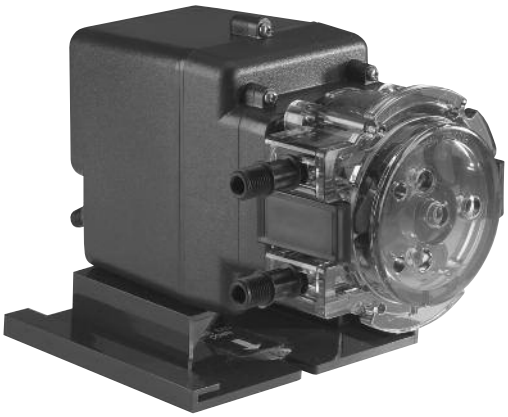
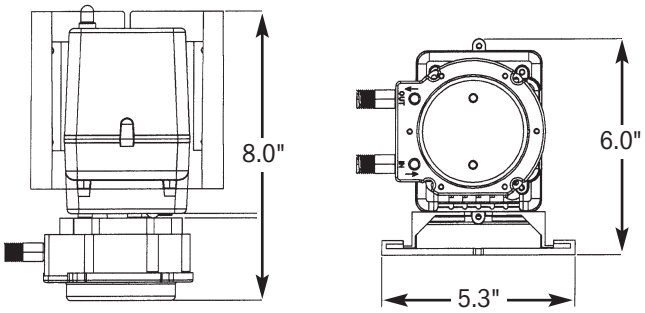
Form No. 2818 • 12/1/2011

CLASSIC - SINGLE HEAD FIXED SPECIFICATIONS

STENNER PUMPS





SHIPPING WEIGHT 8 lbs (3.6 kg)

METERING PUMP
UL LISTED
96F0

METERING PUMP
LR79585
C SA US

CE IPX4

THIS PUMP IS TESTED AND CERTIFIED BY WQA ACCORDING TO NSF/ANSI 61 FOR CONTACT WITH SODIUM HYPOCHLORITE AND WATER ONLY AND NSF/ANSI 372.
C USA

Intertek
94247
CONFORMS TO ANSI/NSF STD. 50
Equipment for swimming pools, spas, hot tubs and other recreational water facilities.
USE ONLY WITH ANSI/NSF 50 LISTED CONTROLLERS

Agency listings vary by model. Contact factory for details.

FEATURES

- 3-point roller design assists in anti-siphon protection
- Pump head requires no valves, allows for easy maintenance
- Self-priming against maximum working pressure, foot valve not required
- Pump does not lose prime or vapor lock
- Pumps off-gassing solutions and can run dry
- Output volume is not affected by back pressure
- Injection check valve included with models rated up to 100 psi (6.9 bar)
- Easy to change pump tube; lubrication is not required
- Pump tubes and pump heads interchange between models
- Models (Santoprene® only) tested by Water Quality Association to conform to ANSI/NSF STD 61
- Fixed output models (Santoprene® only) tested by ETL to conform to ANSI/NSF STD 50 only when used with ANSI/NSF STD 50 listed controllers

STENNER PUMP COMPANY
Jacksonville, Florida USA
www.stenner.com

CLASSIC - SINGLE HEAD FIXED SPECIFICATIONS

STENNER PUMPS

OUTPUT CONTROL
Fixed output

MAXIMUM WORKING PRESSURE
100 psi (6.9 bar) 45MPHP2, 45MPHP10, 45MPHP22, 85MPHP5, 85MPHP17, 85MPHP40

25 psi (1.7 bar) 45MP1, 45MP2, 45MP3, 45MP4, 45MP5, 85MP1, 85MP2, 85MP3, 85MP4, 85MP5

MAXIMUM OPERATING TEMPERATURE
125° F (52° C)

MAXIMUM SUCTION LIFT
25 ft (7.6 m) vertical lift, based on water

MOTOR TYPE
1/30 HP, shaded pole, class B

APPROXIMATE GEAR MOTOR RPM 26

DUTY CYCLE Continuous

MOTOR VOLTAGE (AMP DRAW)
120V 60Hz 1PH (1.7)
220V 60Hz 1PH (0.9)
230V 50Hz 1PH (0.9) *International*
250V 50Hz 1PH (0.9) *International*

POWER CORD TYPE SJTOW

POWER CORD PLUG END
120V 60Hz NEMA 5/15
220V 60Hz NEMA 6/15
230V 50Hz CEE 7/VII
250V 50Hz CEE 7/VII

MATERIALS OF CONSTRUCTION
All Housings Polycarbonate

Pump Tube & Check Valve Duckbill
Santoprene®*, optional Versilon®** #1, #2, #5 tubes, FDA approved

CV Duckbill with Versilon® Tube** Pellathane®†

Pump Head Rollers HDPE

Roller Bushings Oil impregnated sintered bronze

Suction/Discharge Tubing, Ferrules 1/4" & 6 mm Polyethylene, FDA approved

Tube Fittings
Gray: Type 1 Rigid PVC, NSF listed
Black: PP, NSF listed

Check Valve Fittings
Type 1 Rigid PVC, NSF listed

Connecting Nuts PP or Type 1 Rigid PVC

Suction Line Strainer PP or Type 1 Rigid PVC body with Type 1 Rigid PVC cap, NSF listed; ceramic weight

All Fasteners Stainless steel

Pump Head Latches Polypropylene

ACCESSORY KIT SHIPPED WITH EACH PUMP
3 connecting nuts 1/4" or 3/8"
3 ferrules 1/4" or 6 mm *Europe*
1 injection check valve 100 psi (6.9 bar) OR 1 injection fitting 25 psi (1.7 bar)
1 weighted suction line strainer 1/4", 3/8" or 6 mm *Europe*
1 20' roll suction/discharge tubing 1/4" or 3/8", white or UV black OR 6 mm white *Europe*
1 additional pump tube
2 additional latches
1 mounting bracket
1 manual

* Santoprene® is a registered trademark of Exxon Mobil Corporation.
** Versilon® is a registered trademark of Saint-Gobain Performance Plastics.
† Pellathane® is a registered trademark of The Dow Company.

45 Series – Fixed Output Pump

			Approximate Output @ 60Hz						Approximate Output @ 50Hz		
Single Head Model	Maximum Pressure	Pump Tube Number	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Minute	Milliliters per Minute	Liters per Day	Liters per Hour	Milliliters per Minute
45MPHP2* 45MP1	100 psi (6.9 bar) 25 psi (1.7 bar)	#1 #1	3.0	11.4	0.13	0.48	0.27	7.92	9.1	0.38	6.32
45MPHP10* 45MP2	100 psi (6.9 bar) 25 psi (1.7 bar)	#2 #2	10.0	37.9	0.42	1.58	0.89	26.32	30.3	1.26	21.04
45MPHP22* 45MP3	100 psi (6.9 bar) 25 psi (1.7 bar)	#7 #3	22.0	83.3	0.92	3.47	1.96	57.85	66.6	2.78	46.25
45MP4	25 psi (1.7 bar)	#4	35.0	132.5	1.46	5.52	3.11	92.01	106.0	4.42	73.61
45MP5	25 psi (1.7 bar)	#5	50.0	189.3	2.08	7.89	4.44	131.43	151.4	6.31	105.14

85 Series – Fixed Output Pump

			Approximate Outputs @ 60Hz						Approximate Outputs @ 50Hz		
Single Head Model	Maximum Pressure	Pump Tube Number	Gallons per Day	Liters per Day	Gallons per Hour	Liters per Hour	Ounces per Minute	Milliliters per Minute	Liters per Day	Liters per Hour	Milliliters per Minute
85MPHP5* 85MP1	100 psi (6.9 bar) 25 psi (1.7 bar)	#1 #1	5.0	18.9	0.21	0.79	0.44	13.13	15.1	0.63	10.49
85MPHP17* 85MP2	100 psi (6.9 bar) 25 psi (1.7 bar)	#2 #2	17.0	64.4	0.71	2.68	1.51	44.65	51.5	2.15	35.76
85MPHP40* 85MP3	100 psi (6.9 bar) 25 psi (1.7 bar)	#7 #3	40.0	151.4	1.67	6.31	3.55	105.14	121.1	5.05	84.10
85MP4	25 psi (1.7 bar)	#4	60.0	227.1	2.50	9.46	5.33	157.71	181.7	7.57	126.18
85MP5	25 psi (1.7 bar)	#5	85.0	321.8	3.54	13.40	7.55	223.40	257.4	10.73	178.75

*Injection check valve included with pumps rated 26-100 psi (1.8-6.9 bar).

NOTICE: The information within this chart is solely intended for use as a guide. The output data is an approximation based on pumping water under a controlled testing environment. Many variables can affect the output of the pump. Stenner Pump Company recommends that all metering pumps undergo field calibration by means of analytical testing to confirm their outputs. The information contained in this flyer is not intended for specific application purposes. Stenner Pump Company reserves the right to make changes to prices, products, and specifications at any time without prior notice.

PCM - SPECIFICATIONS

STENNER PUMPS

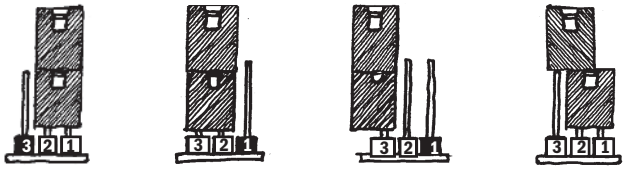
The Pump Control Module (PCM) is a time adjusted controller that powers the pump. A pulsing flow meter sends a signal to the PCM which actuates the pump to deliver the desired dose based upon water volume. The PCM has a locking feature on the adjustment knob.

TIME RANGE IN SECONDS

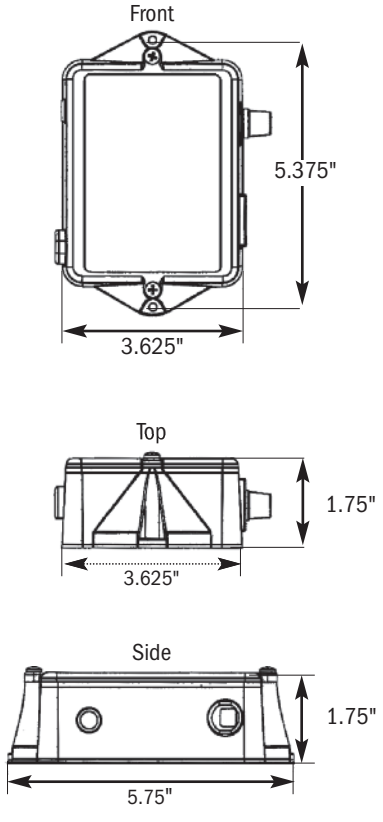
PCM1: 0.1–1.0
PCM5: 0.5–5.0
PCM10: 1.0–10.0
PCM20: 2.0–20.0

NOTE: The time range can be changed by adjusting the internal jumper setting as indicated above.

INTERCHANGEABLE TIME RANGE SETTINGS



0.1–1 second (Jumper 2 & 1)
0.5–5 seconds (Jumper 3 & 2)
1–10 seconds (Jumper 3)
2–20 seconds (Jumper 3 & 2, 2 & 1)



TIMER
Microcontroller with triac output

TURNDOWN RATIO
10:1

INPUT SIGNAL
Non-voltage dry contact, water meter

RESET TIME
Immediate

MINIMUM SIGNAL DURATIONS
10 milliseconds

INPUT ELECTRICAL
120V 60Hz

NO LOAD CURRENT
0.45mA AC maximum

OUTPUT ELECTRICAL
Maximum device load, 1.8 amp at 120V

HOUSING MATERIAL
Polycarbonate plastic

BOX DIMENSIONS: L x W x H
8 x 8 x 6 in. (20.3 x 20.3 x 15.2 cm)

SHIPPING WEIGHT
2 lbs (0.9 kg)

STENNER®

Stenner Pump Company
3174 DeSalvo Road
Jacksonville, Florida 32246 USA

Phone 904.641.1666
US Toll Free 800.683.2378
Fax 904.642.1012

www.stenner.com
sales@stenner.com

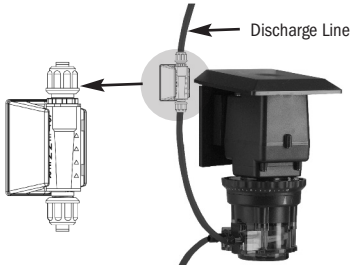
FLOW INDICATOR INSTALLATION INSTRUCTIONS

STENNER PUMPS

⚠WARNING TO BE INSTALLED AND MAINTAINED BY PROPERLY TRAINED PROFESSIONAL INSTALLER ONLY. READ MANUAL & LABELS FOR ALL SAFETY INFORMATION & INSTRUCTIONS.

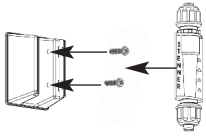
⚠CAUTION Turn off water system, disable all pumps, and depressurize the system before performing installation. The use of proper personal protective equipment is mandatory when working on or near chemical metering pumps. Adhere to all safety precautions in the pump manual. Pump manuals are available at www.stenner.com.

FLOW INDICATOR INSTALLATION



NOTE: Beveled ends of ferrules face male threads.

FLOW INDICATOR BRACKET



The bracket keeps the flow indicator in a vertical position for optimal performance.

❶ Attach screws to secure bracket to surface.

❷ Snap flow indicator onto bracket.

PARTS AND MATERIALS

1 Body: PVC (Polyvinyl Chloride)

1 Ball: PTFE (Polytetrafluoroethylene)

1 O-ring: FKM (Fluorocarbon)

2 Ferrules: PE (Polyethylene)

1 Bracket: Polycarbonate

2 Connecting Nuts
1/4" or 6 mm *EUROPE*: PVC (Polyvinyl Chloride)
3/8": PP (Polypropylene)

2 Adapters: PVC (Polyvinyl Chloride)

NOTE: User is responsible for confirming chemical compatibility with flow indicator materials of construction.

❶ Install indicator in the discharge line in an upright position and visible to the operator, see photo.

DO NOT use thread sealant tape on pump tube threads.

DO NOT use pliers.

1/4" or 6 mm Discharge Line

- Slide nut & ferrule on to the pump discharge line.
- Fully insert the line into flow indicator bottom and finger tighten nut & ferrule to flow indicator.
- Repeat this procedure on the line going to the point of injection.

3/8" Discharge Line

- Install 3/8" adapter to the flow indicator bottom and finger tighten it.
- Slide the nut on to the pump discharge line.
- Fully insert the discharge line into the adapter and finger tighten the nut to the adapter.
- Repeat this procedure on the line going to the point of injection.

❷ Re-pressurize the water system, turn the metering pump on and check all connections for leaks.

❸ Observe flow indicator. The ball will rise briefly each time a roller completes a cycle and a pulse of solution is metered into the system.

❹ No movement or reduced movement of the ball during pump operation indicates that there is no flow or a reduced flow of solution into system which could be the result of a discharge line blockage, a worn or ruptured tube, or a clogged strainer.

❺ Air bubbles in the flow indicator during operation indicate a leak in the suction line or an empty solution tank.

Limited Warranty: Stenner Pump Company will for a period of one (1) year from the date of purchase (proof of purchase required) repair or replace – at our option – all defective parts. Stenner Pump Company is not responsible for any removal or installation costs. Stenner Pump Company will incur shipping costs for warranty products shipped from our factory in Jacksonville, Florida. Any tampering with major components, chemical damage, weather conditions, power surges, or products not used with reasonable care and maintained in accordance with the instructions will void the warranty. Stenner Pump Company limits its liability solely to the cost of the original product. We make no other warranty expressed or implied.

This information is not intended for specific application purposes. Stenner Pump Company reserves the right to make changes to prices, products, and specifications at any time without prior notice.

INSFI 092220

CERTIFICATE OF COMPLIANCE

Certificate Number 20130716 – MH25704
Report Reference MH25704 - 19970729
Issue Date 2013-July-16

Issued to: BUCKMAN'S INC
105 Airport Rd
Pottstown, PA 19464 USA

This is to certify that representative samples of Drinking Water Treatment Chemicals
Buckman's Sodium Hypochlorite Solution (12.5% by weight)

Trade Dsg	Category	Max Use Level (mg/L)
Buckman`s Sodium Hypochlorite Solution (12.5% by weight)	Disinfection and Oxidation	80

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: NSF/ANSI 60 (2009a),"Drinking Water Treatment Chemicals - Health Effects."

Additional Information: See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Classification Mark for the U.S. and Canada should be considered as being covered by UL's Classification and Follow-Up Service and meeting the appropriate U.S. and Canadian requirements.

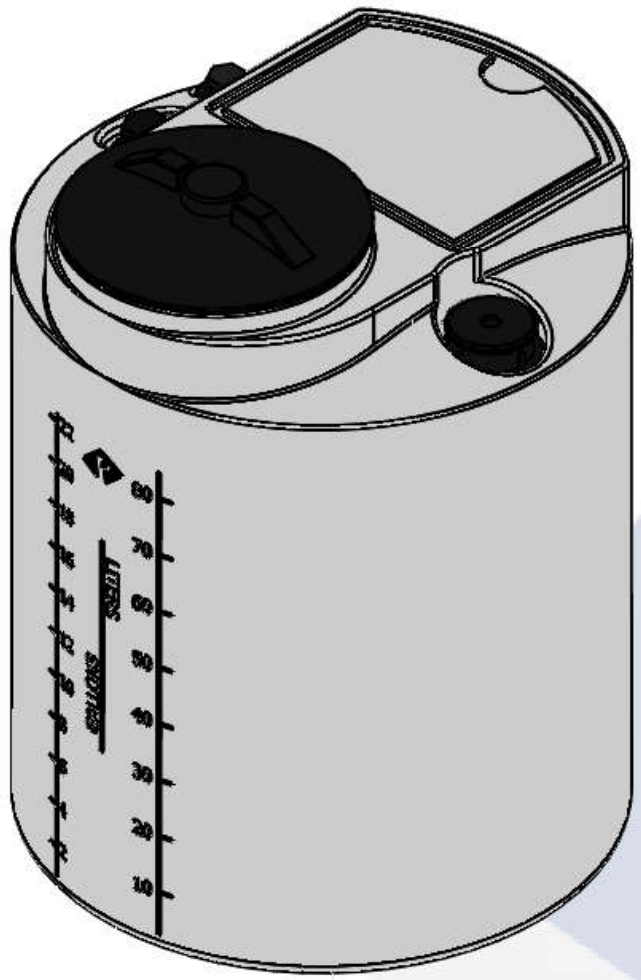
The UL Classification Mark includes: the UL in a circle symbol: with the word “CLASSIFIED” (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL’s evaluation of the product; and the product category name (product identity) as indicated in the appropriate UL Directory. The UL Classification Mark for Canada includes: the UL Classification Mark for Canada: with the word “CLASSIFIED” (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL’s evaluation of the product; and the product category name (product identity) in English, French, or English/French as indicated in the appropriate UL Directory.

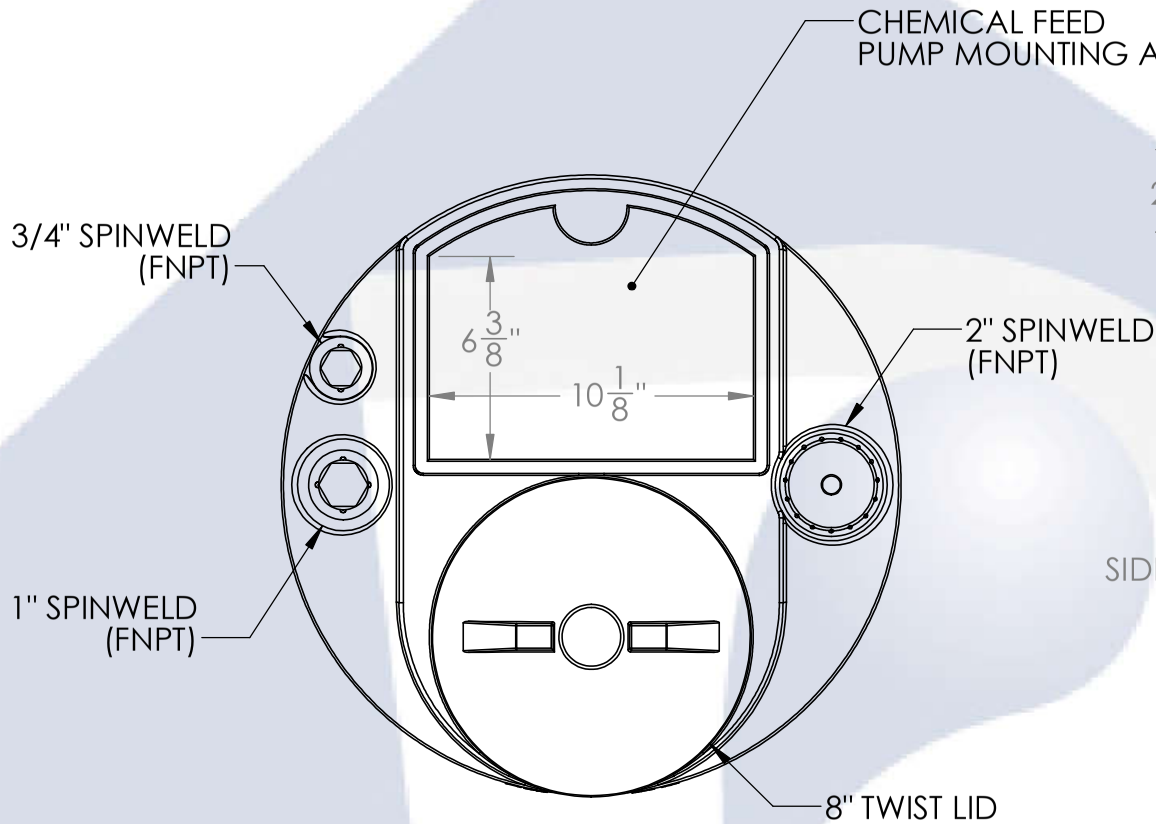
Look for the UL Classification Mark on the product

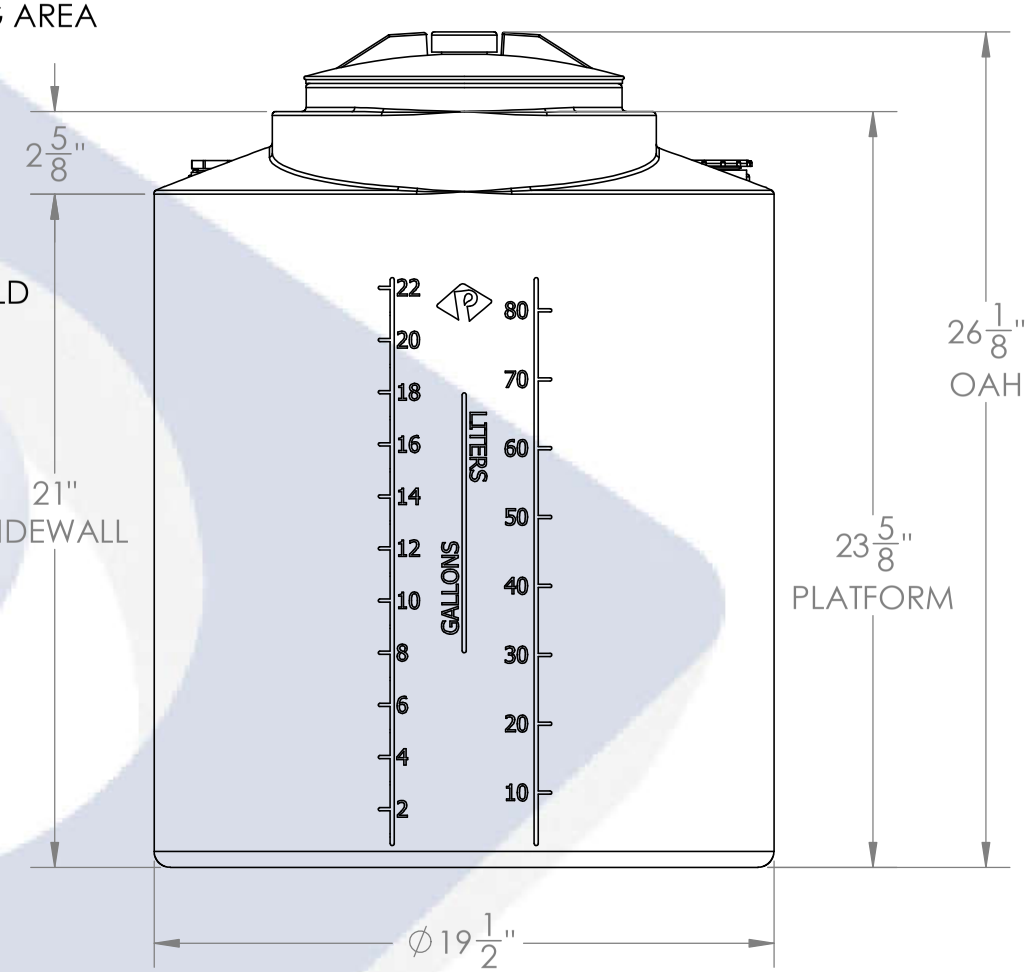
William R. Carney

William R. Carney, Director, North American Certification Programs

UL LLC







25G PROCHEM TANK	
MATERIAL	PART NUMBER
LLDPE, NATURAL, 1.9 SPG	01-31262
XLPE, NATURAL, 1.9 SPG	01-31322
LLDPE, FDA BLACK, 1.0 SPG	01-31864

NOTES:
1. CAPACITY: 25 GAL. NOMINAL
2. TANK MATERIAL OPTIONS:
   LLDPE HDLPE XLPE FDA WATER PPL PVDF
3. SERVICE PRESSURE: ATMOSPHERIC
4. NSF/ANSI STANDARD 61 CERTIFIED
5. AVAILABLE W/ FRP WRAP
   CONTACT CUSTOMER SERVICE FOR ADDITIONAL INFORMATION

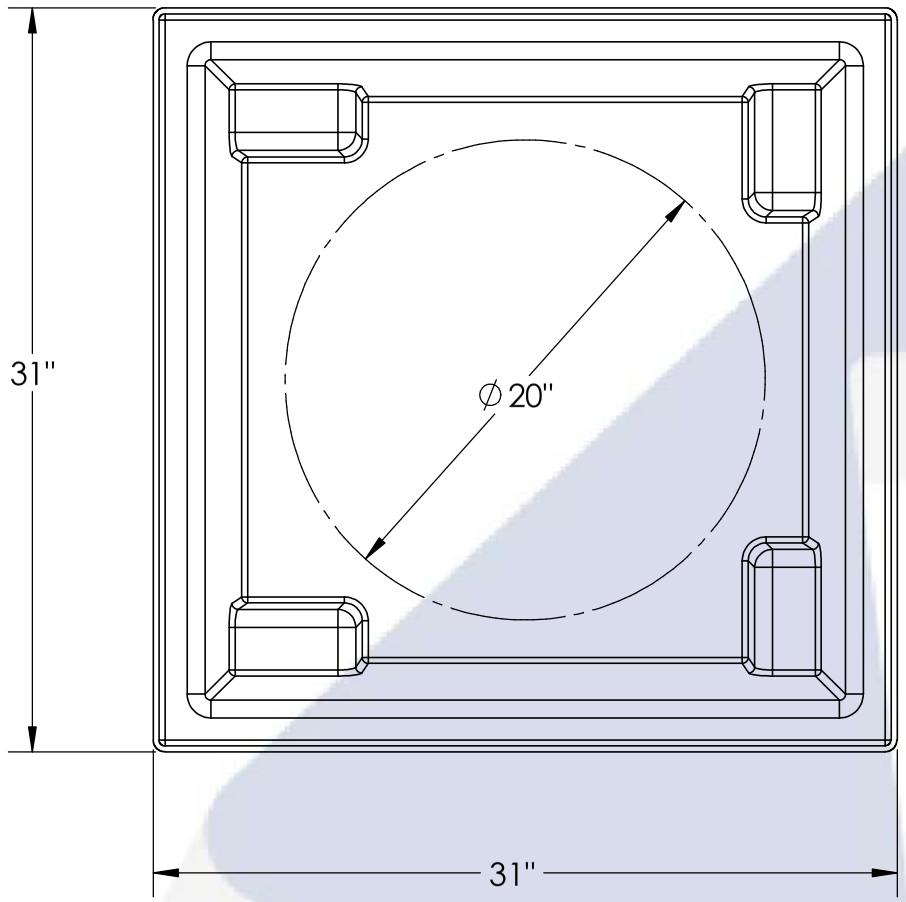
UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES TOLERANCES: ±1/4" ANGULAR: ± .5° ONE PLACE DECIMAL: ± .25 TWO PLACE DECIMAL: ± .125 THREE PLACE DECIMAL: ± .063	DRAWN	RFR	03/29/17
	CHECKED		
	ENG APPR.		
	MFG APPR.		
	Q.A.		
TANK MATERIAL: -			
INNER TANK S/N:			
OUTER TANK S/N:			
CUSTOMER PO#			
DO NOT SCALE DRAWING			

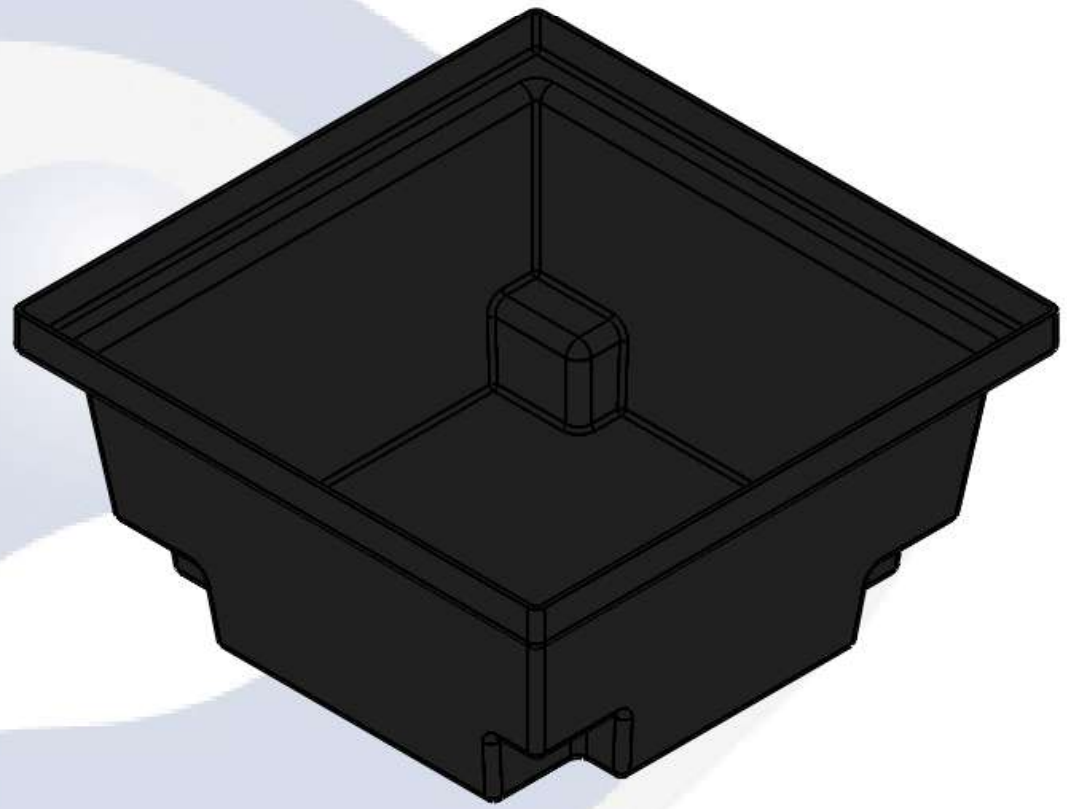
PEABODY engineering

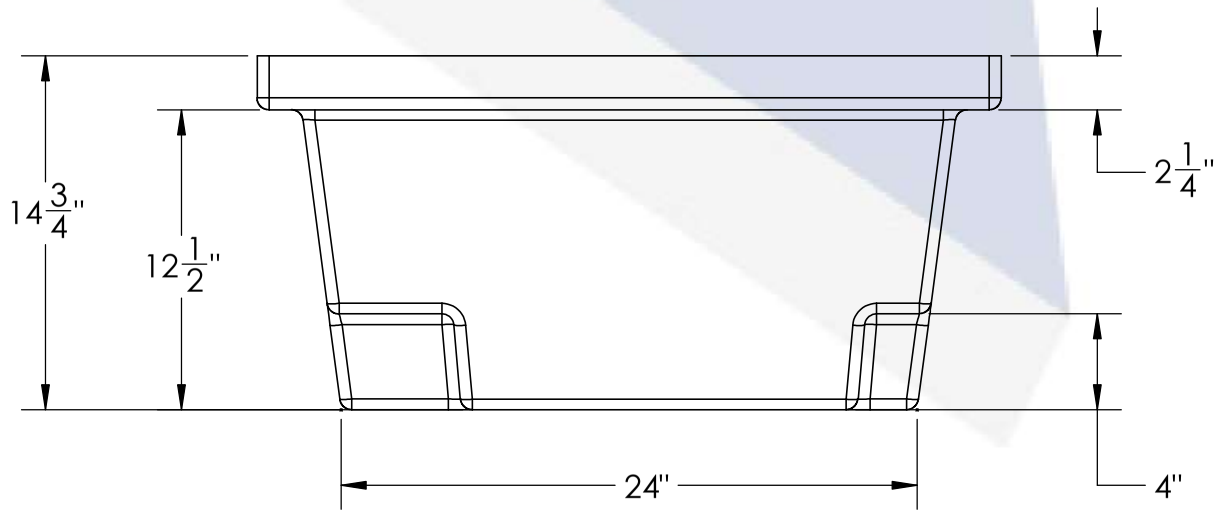
PROJECT:	PROCHEM® TANKS
CUSTOMER:	PEABODY STANDARD
SITE/LOCATION:	-
DRAWING#:	SEE TABLE

SIZE	DESC.	REV.
B	25 GAL PROCHEM® TANK, Ø19.5" x 26"	D2

SCALE: 1:6 SHEET 1 OF 1







NOTES:
1. CAPACITY: 33.5 GAL. NOMINAL
2. APPROXIMATE WEIGHT: 19.05 LBS
3. TANK MATERIAL: LLDPE W/ UV INHIBITOR
4. SERVICE PRESSURE: ATMOSPHERIC

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: ±1/4"
ANGULAR: ± .5°
ONE PLACE DECIMAL: ± .25
TWO PLACE DECIMAL: ± .125
THREE PLACE DECIMAL: ± .063

TANK MATERIAL: **LLDPE**
INNER TANK S/N:
OUTER TANK S/N:
CUSTOMER PO#
DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	**MSM**	**9/10/15**
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

ALTERNATIVE VERSIONS

MATERIALS: XLPE, PPL, PVDF
COLORS: NATURAL, BLUE OR BLACK
AVAILABLE WITH FRP WRAP

CALL FOR PART NUMBERS

PEABODY engineering

PROJECT: **25G PROCHEM BASIN**
CUSTOMER: **PEABODY STANDARD**
SITE/LOCATION: **-**
DRAWING#: **253-31629**

SIZE	DESC.	REV.
B	**CONTAINMENT BASIN FOR 25 GALLON PROCHEM TANK (66G CONTAINMENT)**	**A**

SCALE: 1:8 SHEET 1 OF 1

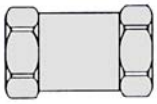
Flow Control Valves - Dole

Dole Flow Control Valve Features:

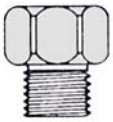
- Prevents over-pumping of low yield wells.
- Installs in the discharge line between check valve and pressure tank.
- Do not use to suspend pipe.
- Self cleaning, designed to deliver constant volume of water over wide pressure drop range.
- Flow rated maintained within +/- 15% up to a pressure drop of 125 psi.
- Maximum system pressure 200 psi.
- Lead Free.

invensys

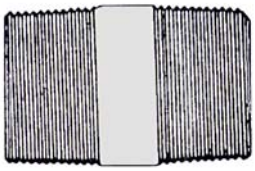
* NO LEAD < 0.25% Pb by weighted avg — Third Party Certified to NSF / ANSI 372



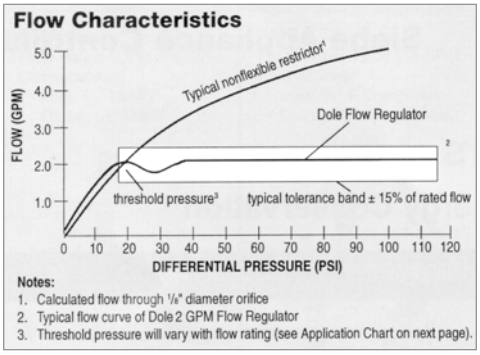
GA, GB, GC, GX Series *
3/8" - 1"fipt
Brass Housing/
Nickle Plated

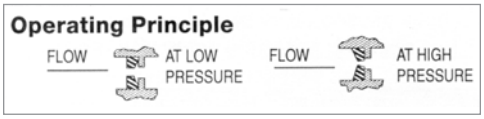


GY Series
3/4 mipt" x 3/4"fipt
Brass Housing



GP GT, GF, GH, GK
Series
1 1/4" - 3" mipt
Steel Housing/
Zinc Plated





	NEW Part Number	OLD	Flow (GPM)	Inlet/ Outlet	List Price
	Brass Housing/Nickel Plated				
*	GA.06		0.06	3/8" FIPT	$ **38.46**
	GA.13	DV.13	0.13	3/8" fipt	**38.46**
	GA.19	DV.19	0.19	3/8" fipt	**38.46**
	GA.25	DV2.5	0.25	3/8" fipt	**38.46**
	GA.35		0.35	3/8" fipt	**38.46**
	GA.50	DV5	0.50	3/8" fipt	**38.46**
	GA.75	DV75	0.75	3/8" fipt	**38.46**
	GA1.0	DV10	1.0	3/8" fipt	**38.46**
*	GB1.0	DV10-1/2	1.0	1/2" fipt	**50.89**
	GB1.5	DV15	1.5	1/2" fipt	**50.89**
	GB2.0	DV20	2.0	1/2" fipt	**50.89**
	GB2.5	DV25	2.5	1/2" fipt	**50.89**
	GB3.0	DV30	3.0	1/2" fipt	**50.89**
	GB3.5	DV35	3.5	1/2" fipt	**50.89**
	GB4.0	DV40	4.0	1/2" fipt	**50.89**
	GB5.0	DV50-1/2	5.0	1/2" fipt	**50.89**
	GB6.0	DV60-1/2	6.0	1/2" fipt	**50.89**
*	GC1	DV1.0	1.0	3/4" fipt	**65.36**
	GC1.5		1.5	3/4" fipt	**65.36**
	GC2.0	DV2.0	2.0	3/4" fipt	**65.36**
	GC2.5	DV2.5-3/4	2.5	3/4" fipt	**65.36**
	GC3.0	DV30-3/4	3.0	3/4" fipt	**65.36**
	GC3.5	DV3.5-3/4	3.5	3/4" fipt	**65.36**
	GC4.0	DV40-3/4	4.0	3/4" fipt	**65.36**
	GC5.0	DV50	5.0	3/4" fipt	**65.36**
	GC6.0	DV60	6.0	3/4" fipt	**65.36**
	GC7.0	DV70	7.0	3/4" fipt	**65.36**
	GC8.0	DV80	8.0	3/4" fipt	**65.36**
	GC9.0	DV90	9.0	3/4" fipt	**65.36**
	GC10	DV100	10.0	3/4" fipt	**65.36**
	GC11.5	DV115	11.5	3/4" fipt	**65.36**
*	GX1.0	DV10-1	1.0	1" fipt	**102.98**
	GX1.5	DV15-1	1.5	1" fipt	**102.98**
	GX2.0	DV20-1	2.0	1" fipt	**102.98**
	GX2.5	DV25-1	2.5	1" fipt	**102.98**
	GX3.0	DV30-1	3.0	1" fipt	**102.98**
	GX3.5	DV35-1	3.5	1" fipt	**102.98**
	GX4.0	DV40-1	4.0	1" fipt	**102.98**
	GX5.0	DV50-1	5.0	1" fipt	**102.98**
	GX6.0	DV60-1	6.0	1" fipt	**102.98**
	GX7.0	DV70-1	7.0	1" fpt	**102.98**

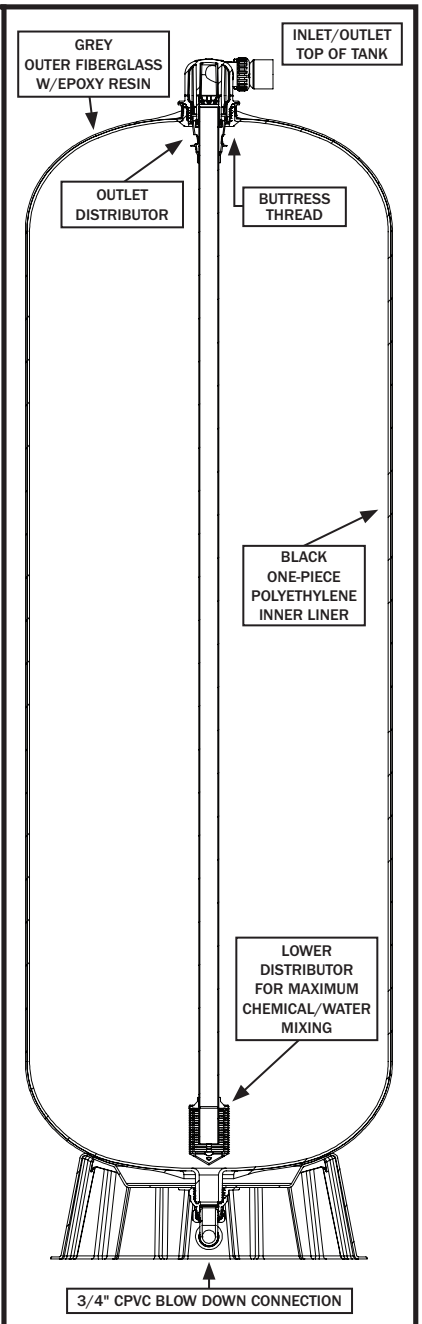
Flow Control Valves - Dole

	NEW Part Number	OLD	Flow (GPM)	Inlet/ Outlet	List Price
	GX8.0	DV80-1	8.0	1" fpt	$ **102.98**
	GX9.0	DV90-1	9.0	1" fpt	**102.98**
	GX10	DV100-1	10.0	1" fipt	**102.98**
	GX12	DV120	12.0	1" fipt	**102.98**
	GX13.5	DV135-1	13.5	1" fipt	**102.98**
	GX15	DV150	15.0	1" fipt	**102.98**
	GX20	DV200	20.0	1" fipt	**102.98**
	GX25	DV250	25.0	1" fipt	**102.98**
	GX30	DV300	30.0	1" fipt	**102.98**
*	**Brass Housing**				
	GY1.0	DV1-3/4MXF	1.0	3/4"mipt x fipt	**80.87**
	GY1.5	DV1.5-3/4MXF	1.5	3/4"mipt x fipt	**80.87**
	GY2.0	DV2-3/4MXF	2.0	3/4"mipt x fipt	**80.87**
	GY2.5	DV2.5-3/4MXF	2.5	3/4"mipt x fipt	**80.87**
	GY3.0	DV3-3/4MXF	3.0	3/4"mipt x fipt	**80.87**
	GY3.5	DV3.5-3/4MXF	3.5	3/4"mipt x fipt	**80.87**
	GY4.0	DV4-3/4MXF	4.0	3/4"mipt x fipt	**80.87**
	GY5.0	DV5-3/4MXF	5.0	3/4"mipt x fipt	**80.87**
	GY6.0	DV6-3/4MXF	6.0	3/4"mipt x fipt	**80.87**
	GY7.0	DV7-3/4MXF	7.0	3/4"mipt x fipt	**80.87**
	GY8.0	DV8-3/4MXF	8.0	3/4"mipt x fipt	**80.87**
	GY9.0	DV9-3/4MXF	9.0	3/4"mipt x fipt	**80.87**
	GY10	DV10-3/4MXF	10.0	3/4"mipt x fipt	**80.87**
	GY11.5		11.5	3/4"mipt x fipt	**80.87**
*	**Steel Housing/Zinc Plated**				
	GP1.0	DV1.0-11/4	1.0	1 1/4" mipt	**230.50**
	GP2.0		2.0	1 1/4" mipt	**230.50**
	GP2.5		2.5	1 1/4" mipt	**230.50**
	GP3.0		3.0	1 1/4" mipt	**230.50**
	GP3.5		3.5	1 1/4" mipt	**230.50**
	GP4.0		4.0	1 1/4" mipt	**230.50**
	GP5.0		5.0	1 1/4" mipt	**230.50**
	GP6.0		6.0	1 1/4" mipt	**230.50**
	GP7.0	DV75-11/4	7.0	1 1/4" mipt	**230.50**
	GP8.0		8.0	1 1/4" mipt	**230.50**
	GP9.0		9.0	1 1/4" mipt	**230.50**
	GP10	DV10-11/4	10.0	1 1/4" mipt	**230.50**
	GP12	DV12-11/4	12.0	1 1/4" mipt	**230.50**
	GP15	DV15-11/4	15.0	1 1/4" mipt	**230.50**
	GP20	DV20-11/4	20.0	1 1/4" mipt	**230.50**
	GP25	DV25-11/4	25.0	1 1/4" mipt	**230.50**
	GP30	DV30-11/4	30.0	1 1/4" mipt	**230.50**
*	GT1.0		1.0	1 1/2" mipt	**361.10**
	GT1.5		1.5	1 1/2" mipt	**361.10**
	GT2.0	DV2-11/2	2.0	1 1/2" mipt	**361.10**
	GT2.5		2.5	1 1/2" mipt	**361.10**
	GT3.0		3.0	1 1/2" mipt	**361.10**
	GT3.5		3.5	1 1/2" mipt	**361.10**
	GT4.0		4.0	1 1/2" mipt	**361.10**
	GT5.0	DV5-11/2	5.0	1 1/2" mipt	**361.10**

	NEW Part Number	OLD	Flow (GPM)	Inlet/ Outlet	List Price
	Steel Housing/Zinc Plated				
	GT6.0		6.0	1 1/2" mipt	$ **361.10**
	GT7.0	DV7-11/2	7.0	1 1/2" mipt	**361.10**
	GT8.0		8.0	1 1/2" mipt	**361.10**
	GT9.0	DV9-11/2	9.0	1 1/2" mipt	**361.10**
	GT10	DV10-11/2	10.0	1 1/2" mipt	**361.10**
	GT12		12.0	1 1/2" mipt	**361.10**
	GT13.5		13.5	1 1/2" mipt	**361.10**
	GT15	DV15-11/2	15.0	1 1/2" mipt	**361.10**
	GT20	DV20-11/2	20.0	1 1/2" mipt	**361.10**
	GT25	DV25-11/2	25.0	1 1/2" mipt	**361.10**
	GT30	DV30-11/2	30.0	1 1/2" mipt	**361.10**
*	GF10	DV10-2	10.0	2" mipt	**367.47**
	GF12	DV12-2	12.0	2" mipt	**367.47**
	GF15		15.0	2" mipt	**367.47**
	GF20	DV20-2	20.0	2" mipt	**367.47**
	GF25		25.0	2" mipt	**367.47**
	GF30	DV30-2	30.0	2" mipt	**367.47**
*	GH30		30.0	2-1/2" mipt	**694.85**
	GH35	DV350	35.0	2-1/2" mipt	**694.85**
	GH40	DV400	40.0	2-1/2" mipt	**694.85**
	GH45	DV450	45.0	2-1/2" mipt	**694.85**
	GH50	DV500	50.0	2-1/2" mipt	**694.85**
	GH55	DV550	55.0	2 1/2" mipt	**694.85**
	GH60	DV600	60.0	2-1/2" mipt	**694.85**
	GH65	DV650	65.0	2-1/2" mipt	**694.85**
	GH70	DV700	70.0	2-1/2" mipt	**694.85**
	GH75	DV750	75.0	2-1/2" mipt	**694.85**
	GH80	DV800	80.0	2-1/2" mipt	**694.85**
	GH85		85.0	2-1/2" mipt	**694.85**
	GH90	DV900	90.0	2 1/2" mipt	**694.85**
	GK30		30.0	3" mipt	693.95
	GK35	DV3500	35.0	3" mipt	693.95
	GK40	DV4000	40.0	3" mipt	693.95
	GK45	DV4500	45.0	3" mipt	693.95
	GK50		50.0	3" mipt	693.95
	GK55	DV5500	55.0	3" mipt	693.95
	GK60		60.0	3" mipt	693.95
	GK65	DV6500	65.0	3" mipt	693.95
	GK70		70.0	3" mipt	693.95
	GK75		75.0	3" mipt	693.95
	GK80		80.0	3" mipt	693.95
	GK85	DV8500	85.0	3" mipt	693.95
	GK90		90.0	3" mipt	693.95
	GK95		95.0	3" mipt	693.95
	GK100	DV1000	100.0	3" mipt	693.95
	GK105		105.0	3" mipt	693.95
	GK110		110.0	3" mipt	693.95
	GK115		115.0	3" mipt	693.95
	GK120	DV1200	120.0	3" mipt	693.95

www.americangranby.com
Ph: 800-776-2266 Fax: 800-729-3299

Maximum Contact Tank



ALL PARTS INCLUDED AS SHOWN

FEATURES:

- Convenient Inlet/Outlet piping connection at the top of the tank
- Inlet/Outlet Adapter easily accommodates the use of a vacuum breaker
- Inlet/Outlet Buttress thread for strength
- Bypass valve option available
- Full ¾" blow down drain at lowest point of tank
- 360° degree drain orientation
- Black one piece polyethylene liner for impact and corrosion resistance
- 5 year limited warranty

SPECIFICATIONS:

- Maximum Operating Pressure 75 psi/517 kPa
- Maximum Operating Temperature 120°F 49°C
- Maximum Allowable Operating Vacuum 0
- A Vacuum/Pressure Relief Valve of adequate size must be incorporated in the plumbing

FITTINGS INCLUDED:

1¼" x 1½" PVC Straight Solvent Fitting Kit and 1¼" Plastic Straight Male NPT Fittings

V3007-07 **V3317**

OPTIONAL:

Bypass

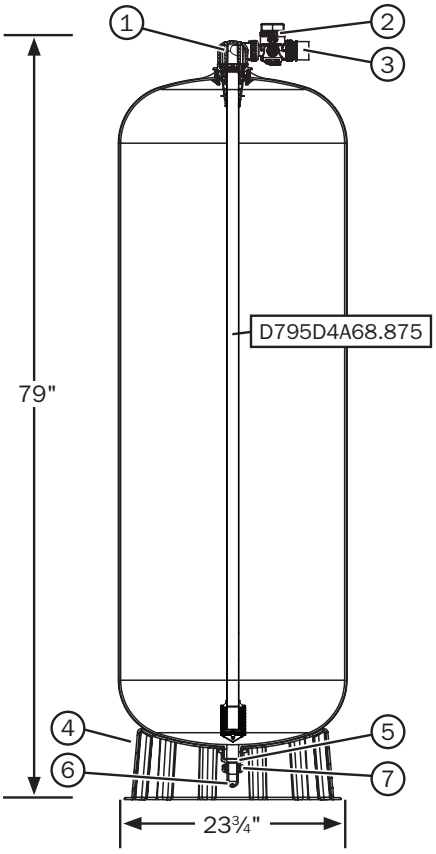
V3006

ORDER NO.	DESCRIPTION	TANK ASSEMBLY DIAMETER INCHES/MM	TANK ASSEMBLY HEIGHT INCHES/MM	CAPACITY GALLONS/LITERS	QTY/ CARTON	SHIPPING WEIGHT LBS/KG
C2253	MCT120 Max Contact Tank	24/607	78.5/1,994	120/454	1	80/36

ORDER NO.	DESCRIPTION	QTY/CARTON	SHIPPING WEIGHT LBS/KG
V3006	Bypass	24	26/12

The MCT120 is designed specifically for use as a bacteriological disinfection contact tank and is not designed for use as an oxidation contact tank. The baffle diffuser assembly mounted at the bottom of the inlet distributor piping is located at the bottom of the MCT120 tank for maximum chemical/water mixing and does not allow area for any buildup of precipitated or oxidized matter in the bottom of the tank.

Maximum Contact Tank

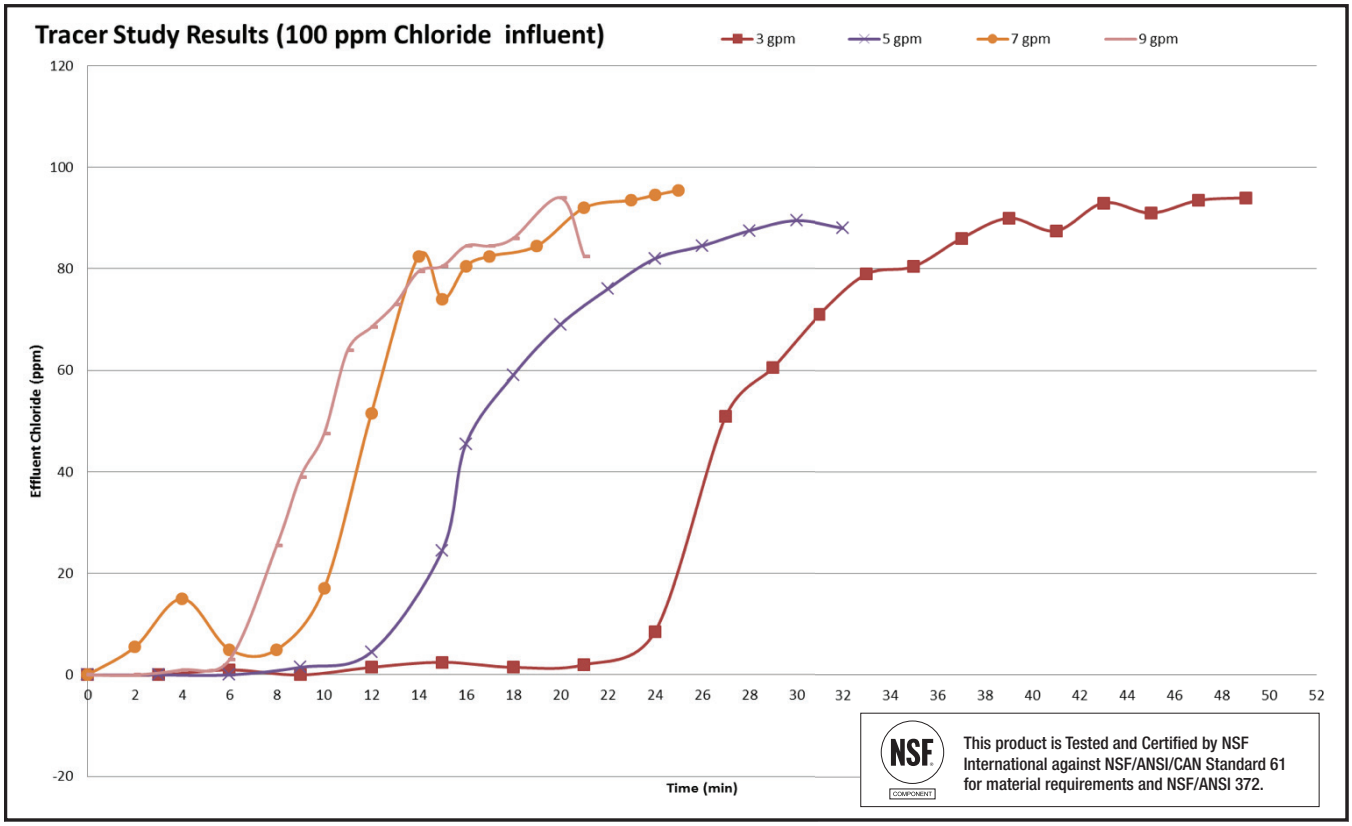


1	D1400RT • 1191RT In/Out Head
2	V3006 • WS1 Bypass Valve (optional)
3	V3007-07 • WS1 1¼" x 1½" Solvent Kit
	V3317 • WS1 1¼" Plastic Male NPT
4	C2256 • RT Tank Base
5	D1291 • RT Tank Drain Adapter
	V3417 • O-ring for Drain Adapter
6	V3790 • WS1 Elbow ¾" Quick Connect
	D1142-10 • ¾" x 10" CPVC Pipe
7	V3151 • WS1 Nut 1" Quick Connect
	V3150 • WS1 Split Ring
	V3105 • WS1 O-ring

Tank Volume (gal)	Flow Rate (gpm)	T* (min)	T10** (min)	Baffling Factor (T10/T)
120	3	40.0	24.25	0.61
120	5	24.0	13.10	0.55
120	7	17.1	9.25	0.54
120	9	13.3	6.85	0.52

* T is contact time which is tank volume divided by flow rate.

**T10 is the time at which 10% of the influent concentration is measured at the effluent of the tank.



MCT120 Average Baffle Factor: 0.56

Clack Corporation
4462 DURAFORM LANE • WINDSOR, WISCONSIN 53598-9716 USA
PHONE (608) 846-3010 FAX (608) 846-2586 SALES/CUSTOMER SERVICE FAX (800) 755-3010
www.clackcorp.com

Product Submittal	
Name	
Date	
Architect/Owner	
Contractor	
Tag	
Notes	

One vacuum breaker per tank.

VR20 Vacuum Breaker
Specification Sheet

Description

The Cash Acme® VR20 Vacuum Relief Valve is designed **to protect hot water supply systems and pressure vessels against negative pressure**. It is especially well suited for many domestic and commercial systems.

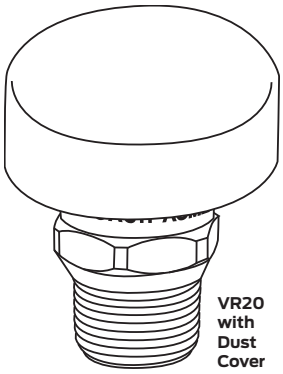
It works by preventing internal vacuum conditions that could result in burned-out heaters and/or collapsed storage tanks – especially copper.

Installed on the cold water supply line, the Cash Acme® VR20 closes tightly under pressure and opens at a 1" mercury vacuum. The atmosphere admitted to the system breaks the vacuum, preventing the collapse of the storage tank. It is recommended that the VR20 be installed in an upright position.

The Cash Acme® VR20 is **lead free[1], available in 1/2" and 3/4"** sizes and with male inlets. The VR20 also features a low profile design with a slotted vent hole. The vent hole is protected by a circular dust cover that is approx.1.75" in diameter. This valve features an all-brass body and body cap, a heat-resistant silicone seat disc, an integral body seat, and brass internal working parts.

Features And Benefits

- **Prevents internal vacuum conditions**
  Guards against siphonage, burnt-out heaters and collapsing of storage tanks and negative pressure.
- **Opens quickly in emergency situations**
  Opens on a one inch mercury vacuum.
- **Listed by CSA**
  Inspector friendly, peace of mind.
- **Every valve is tested for performance prior to shipping**
  Specify and install with confidence



Specifications

A vacuum relief valve shall be installed to protect the pressure vessel. The valve shall be CSA certified per ANSI Z21.22/CSA 4.4 and NSF/ANSI 372. The valve shall be constructed of brass with an integral body seat disc. The valve shall open on a one-inch mercury vacuum. The valve shall be a **Cash Acme® VR20 Vacuum Relief Valve**.

Specification Data

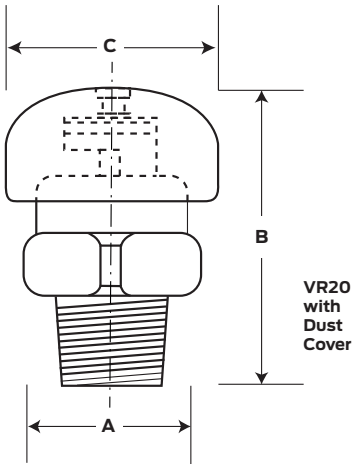
Performance:

Service	**Water**
Relief pressure (open)	1" Hg vacuum
Internal Parts	13 SCFM (@ 2" Hg)
Maximum pressure	210 psi
Maximum inlet pressure	200 psi

Materials

Body	Lead-Free[1] DZR Brass
Cap	Lead-Free[1] DZR Brass
Spring	Stainless steel
Seat Disc	Silicone
Dust Cover	Polypropylene
Guide Rod	Brass
Washer	Brass
Seat Shell	Lead-Free[1] DZR Brass
O-ring	Buna-N

[1]For all models, surfaces that are in contact with consumable water contain less than 0.25% lead by weight.



Dimensions (inches)

Part Number	A	B	c
22397LF	1.38	2.45	1.75
22398LF	1.38	2.45	1.75

Available Connections

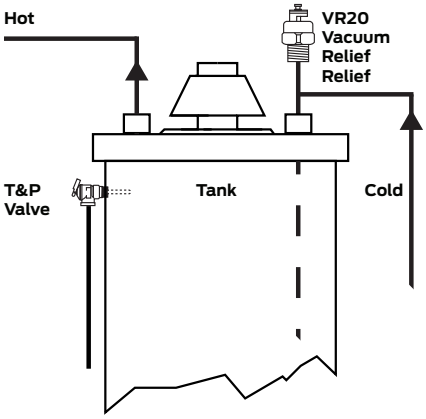
	Model	Size	Part Number
☐	VR20	1/2"	22397LF
☐	VR20	3/4"	22398LF

Codes & Standards

The Cash Acme® VR20 Relief Valve is certified to ANSI Z21.22/CSA 4.4 and NSF/ANSI 372 and is listed by CSA.

Typical Installation

It is recommended that the VR20 be installed in an upright position. For further installation information, please contact the factory.



US Contact: 1.877.700.4242 · sales@sharkbite.com · sharkbite.com
Canadian Contact 1.888.820.0120 · canadasales@rwc.com · sharkbite.ca

NORWESCO

LIQUID STORAGE TANKS / 2017

WATER

CHEMICALS

AGRICULTURE

INDUSTRY

SPECIALTY FLAT BOTTOM HAULING TANKS

The Flat Bottom Hauling tank is ideal for use on flatbed or drop deck trailers. Large ribs eliminate the need for steel support bands and assist with reducing the sloshing of fluid. The tanks may be used for liquid fertilizer and other transport applications.

GALLON CAPACITY	WIDTH	OVERALL HEIGHT	LENGTH	FILL OPENING	OUTLET/ DRAIN	PREMIUM WEIGHT PART NO. WHITE	HEAVY WEIGHT PART NO. BLUE
1600	80"	53"	126"	16"	2"	43143	43167
3180	92"	80"	145"	16"	3"/2"	44391	44393

3180 FLAT BOTTOM

SPECIALTY WATER HAULING TANKS

The low profile tanks may be used for storage or transport. They are an excellent choice when height limitations are a factor and are the perfect height for putting under your cottage or cabin.

GALLON CAPACITY	WIDTH	OVERALL HEIGHT	LENGTH	FILL OPENING	OUTLET/ DRAIN	WATER WEIGHT ONLY PART NO.
1250 Low Profile	81"	38"	130"	16"	2"	40756
1275 Low Profile	84"	36"	126"	16"	2"	43011
1500 Low Profile	81"	44"	130"	16"	2"	41392
1600 Low Profile	84"	42"	126"	16"	2"	43013
2400 Box	90"	53"	150"	16"	2"	40912

1250 LOW PROFILE

2400 BOX

FREE STANDING TANKS

These tanks have been specifically designed with residential and commercial applications in mind. The dimensions of the tanks allow them to fit through a conventional doorway. The design of the freestanding/self-support tanks eliminate the need for a steel support frame.

	GALLON CAPACITY	WIDTH	OVERALL HEIGHT	LENGTH	FILL OPENING	OUTLET/ DRAIN	WATER WEIGHT ONLY PART NO.	PREMIUM WEIGHT PART NO.
NEW	100 Slender *	22"	45"	38"	8"	1¼"	—	44800
	250	29"	44"	62"	16"	1¼"	42337	—
	300	29"	48"	62"	16"	1¼"	41869	—
	300	29"	50"	66"	16"	1¼"	—	44330
	400	29"	70"	66"	16"	1¼"	—	43856
	400	30"	68"	64"	16"	1¼"	41247	—
	400 Dark Green	30"	68"	64"	16"	1¼"	44361	—
NEW	400 Vertical Ribbed	33"	84"	43"	16"	—	44654	—
	500	31"	70"	74"	16"	1¼"	—	43616
NEW	600 Vertical Ribbed	35"	84"	58"	16"	—	44655	—
	750	35"	85"	82"	16"	2"	—	44310
	1000	40"	89"	92"	16"	2"	—	44045

* Also available boxed, part number 44802

NEW 100 SLENDER

400 FREESTANDING

NEW 600 VERTICAL RIBBED

PLEASE NOTE:
Tank availability may vary according to manufacturing location. Please contact Norwesco Customer Service or your Norwesco distributor for specific details. Tank dimensions and capacities may vary slightly and are subject to change without notice.

POLYPROPYLENE BULKHEAD FITTINGS / EPDM OR VITON GASKETS

Norwesco's polypropylene fittings come standard with an EPDM gasket. Viton gaskets are available as an option when EPDM may not be suitable for your application. The 2" stainless steel bulkhead fitting comes standard without a gasket.

DESCRIPTION	HOLE SIZE REQUIRED IN TANK FOR INSTALLATION	ITEM CODE	PART NO.
½" Heavy duty double threaded polypropylene fitting	1 7/16"	A	62834
¾" Double threaded polypropylene fitting	1 7/16"	A	60401
EPDM gasket for ½" and ¾" (62834 and 60401)			60402
Type A Viton gasket for ½" and ¾" (62834 and 60401)			60360
¾" Heavy duty double threaded polypropylene fitting	1⅝"	A	62798
EPDM gasket ¾" (62798)			62799
Type A Viton gasket for ¾" (62798)			62800
1" Double threaded polypropylene fitting	2¼"	A	60427
1¼" Double threaded polypropylene fitting	2¼"	A	60403
1¼" Anti-vortex polypropylene fitting	2¼"	D	63065
EPDM gasket for 1" and 1¼" (60427, 60403 and 63065)			60404
Type A Viton gasket for 1" and 1¼" (60427, 60403 and 63065)			60361
Anti-vortex adapter for 1¼" (60403)			62398
1½" Standard duty double threaded polypropylene fitting	2⅜"	A	63931
EPDM gasket for 1½" (63931)			63938
Type A Viton gasket for 1½" (63931)			63939
1½" Double threaded polypropylene fitting	3"	A	60124
Siphon tube, 1½" x 4 15/16" long			63682
Siphon tube, 1½" x 12" long			63279
2" Double threaded polypropylene fitting	3"	A	60405
2" Double threaded 316 stainless steel fitting, less gasket	3"		61767
EPDM gasket for 1½" and 2" (60124, 60405, 63481 and 61767)			60406
Type A Viton gasket for 1½" and 2" (60124, 60405, 63481 and 61767)			60523
2" Standard duty double threaded polypropylene fitting (maximum tank wall thickness = ⅜")	3"	E	63481
2" Heavy duty double threaded polypropylene fitting	3¼"	B	63683
EPDM gasket for 2" (63683)			60336
Type A Viton gasket for 2" (63683)			60008
Siphon tube, 2" short			60335
Siphon tube, 2" x 12" long			63262
Anti-vortex adapter for 2" bulkhead fitting			62399
2" Polypropylene dust plug			60021
2" Self-aligning double threaded polypropylene fitting (designed to install in dome of vertical tank above the liquid level)	4½"		63668
EPDM gasket for 2" self-aligning (63668)			60331
Type A Viton gasket for 2" self-aligning (63668)			60351
3" Double threaded polypropylene fitting (hex nut as shown in photo C)	4½"	C	62299
EPDM gasket for 3" (62299)			60331
Type A Viton gasket for 3" (62299)			60351
2" Polypropylene reducer for 3"			60330
Siphon tube, 3" short			60327
Siphon tube, 3" x 12" long			63263
Siphon tube extension, 3" x 19-1/2" long			64102
4" Double threaded polypropylene fitting (hex nut as shown in photo C)	5¾"		62171
EPDM gasket for 4" (62171)			62785
Type A Viton gasket for 4" (62171)			62786
Siphon tube for 4"			62714

POLYPROPYLENE DOUBLE THREADED BOLTED FITTINGS

Equipped with 316 stainless steel bolts and come standard with EPDM gaskets. Viton gaskets are available as an option for the fittings.

DESCRIPTION	ITEM CODE	PART NO.
¾" Polypropylene bolted fitting with SS bolts and EPDM gaskets	F	60502
1" Polypropylene bolted fitting with SS bolts and EPDM gaskets	F	60505
EPDM gasket for ¾" and 1" Part No. 60498 / Type A Viton gasket for ¾" and 1" Part No. 60355		
1½" Polypropylene bolted fitting with SS bolts and EPDM gaskets	F	60513
2" Polypropylene bolted fitting with SS bolts and EPDM gaskets	F	60516
EPDM gasket for 1½" and 2" Part No. 60497 / Type A Viton gasket for 1½" and 2" Part No. 60356		
3" Polypropylene bolted fitting with SS bolts and EPDM gaskets		62471
EPDM gasket for 3" Part No. 62048 / Type A Viton gasket for 3" Part No. 60602		

2 gaskets required per fitting

CON-TECH STAINLESS STEEL DOUBLE THREADED BOLTED FITTINGS

These fittings are designed to install in heavy wall tanks. Please contact Norwesco Customer Service for additional information.

DESCRIPTION	ITEM CODE	PART NO.
1" 316 SS double threaded bolted fitting with SS long bolts and EPDM gaskets		63972
EPDM gasket for 1" Part No. 64154 / Type A Viton gasket for 1" Part No. 63978		
1½" 316 SS double threaded bolted fitting with SS long bolts and EPDM gaskets		63973
EPDM gasket for 1½" Part No. 64155 / Type A Viton gasket for 1½" Part No. 63979		
2" 316 SS double threaded bolted fitting with SS long bolts and EPDM gaskets		63974
EPDM gasket for 2" Part No. 64156 / Type A Viton gasket for 2" Part No. 63980		
3" 316 SS double threaded bolted fitting with SS long bolts and EPDM gaskets		63975
EPDM gasket for 3" Part No. 64152 / Type A Viton gasket for 3" Part No. 63981		

2 gaskets required per fitting

STAINLESS STEEL BOLTED HALF NIPPLE FITTINGS

DESCRIPTION	ITEM CODE	PART NO.
¾" 316 SS half nipple fitting, MPT, and cross linked polyethylene gasket		64093

STAINLESS STEEL DOUBLE THREADED BOLTED FITTINGS

Bolts are threaded into back plate – no welds or bolt holes that can be potential points of leakage. Fittings come standard without a gasket and require a single gasket installed on the inside of the tank. Available gaskets are cross-linked polyethylene, EPDM or Viton.

DESCRIPTION	ITEM CODE	PART NO.
½" 316 SS double threaded bolted fitting less gasket	G	63216
¾" 316 SS double threaded bolted fitting less gasket	G	63035
1" 316 SS double threaded bolted fitting less gasket	G	62948
EPDM gasket for ½", ¾", 1" Part No. 63205 / Type A Viton gasket for ½", ¾", 1" Part No. 63224		
Cross-linked polyethylene gasket for ½", ¾", 1" Part No. 62950		
1¼" 316 SS double threaded bolted fitting less gasket	G	63036
Cross-linked polyethylene gasket for 1¼" Part No. 63041		
1½" 316 SS double threaded bolted fitting less gasket	G	63037
EPDM gasket for 1¼", 1½" Part No. 63426 / Cross-linked polyethylene gasket for 1½" Part No. 63042		
2" 316 SS double threaded bolted fitting less gasket	G	63038
EPDM gasket for 2" Part No. 63206 / Type A Viton gasket for 2" Part No. 63225		
Cross-linked polyethylene gasket for 2" Part No. 62848		
3" 316 SS double threaded bolted fitting less gasket	H	63038
EPDM gasket for 3" Part No. 63223 / Type A Viton gasket for 3" Part No. 63226		
Cross-linked polyethylene gasket for 3" Part No. 63043		
4" 316 SS 8-bolt double threaded bolted fitting with gasket		63688
EPDM gasket for 4" Part No. 63690 / Type A Viton gasket for 4" Part No. 63691		
Cross-linked polyethylene gasket for 4" Part No. 63689		

1 gasket required per fitting

STAINLESS STEEL SINGLE THREADED BOLTED FITTINGS

DESCRIPTION	ITEM CODE	PART NO.
3" 316 SS single threaded bolted fitting, anti-vortex, less gasket		63233
EPDM gasket for 3" Part No. 63223 / Type A Viton gasket for 3" Part No. 63226		
Cross-linked polyethylene gasket for 3" Part No. 63043 (1 required)		

1 gasket required per fitting

NORWESCO

MANUFACTURING & DISTRIBUTION

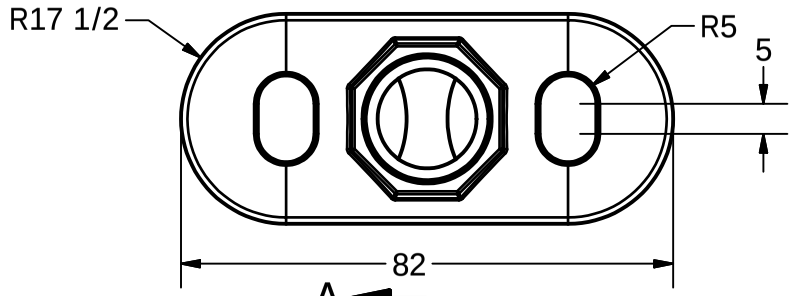
WARRANTY

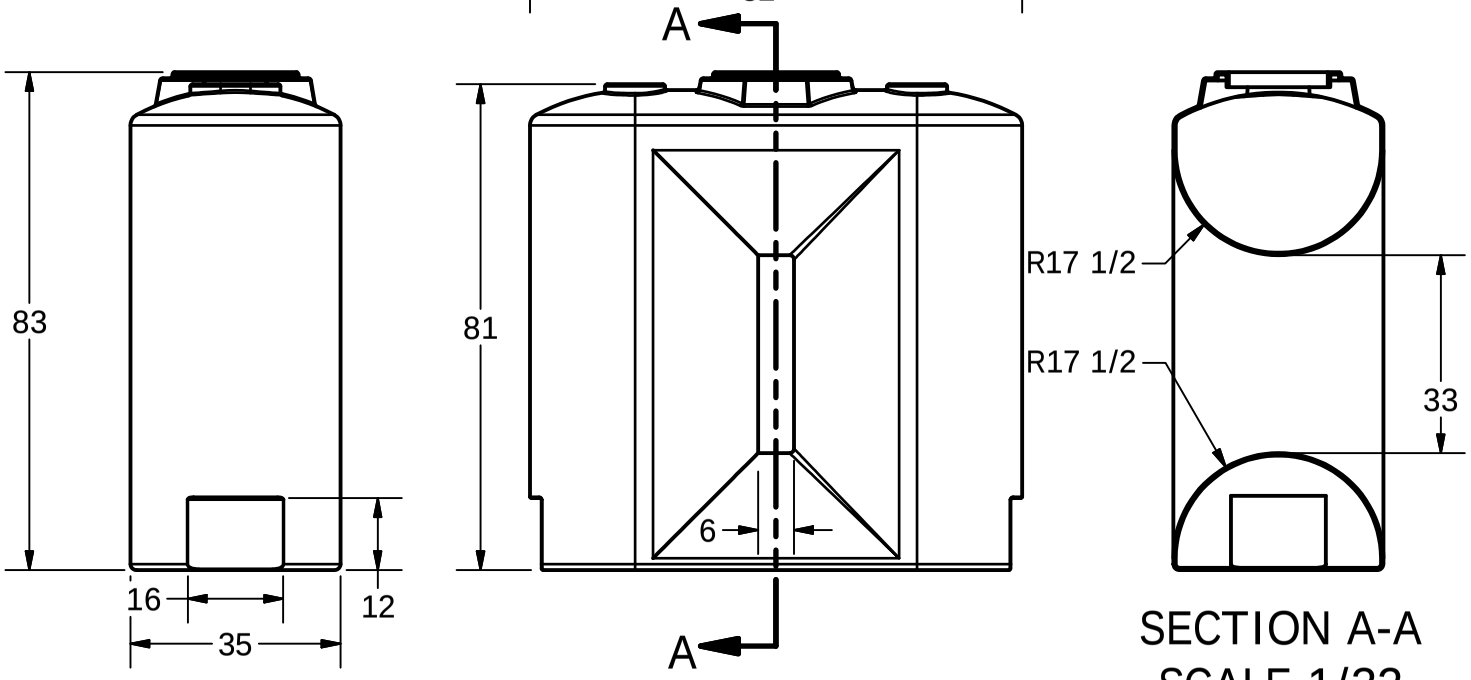
NORWESCO offers a three year warranty from date of manufacture on tanks shown in this brochure. Should a defect appear within the warranty period Norwesco will supply a new, equivalent tank in replacement thereof. Norwesco's liability is limited to the value of the tank itself and specifically excludes the cost of installation and/or removal or consequential damages. Please contact your chemical supplier or Norwesco Customer Service for chemical resistance information. Tank dimensions and capacities may vary slightly and are subject to change without notice.

NORWESCO
Norwesco, INC.

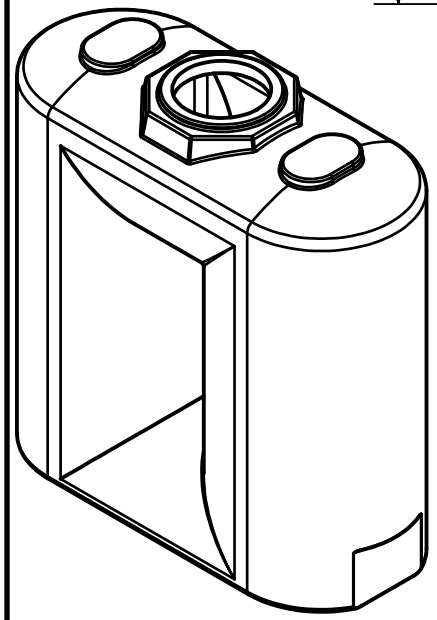
4365 Steiner Street
P.O. Box 439
St. Bonifacius, MN 55375-0439
Tel (800) 328-3420
Fax (800) 874-2371

www.norwesco.com





SECTION A-A
SCALE 1/32



DRAWN	Jerry Paulson	7/19/2013
CHECKED		
QA		
MFG		
APPROVED		

NORWESCO, INC. SAINT BONIFACIUS, MN

TITLE

750 GALLON FREE STANDING TANK

SIZE		DWG NO	REV
A			

SCALE: 1/16

SHEET 1 OF 1

The Public Health and Safety Organization

NSF Product and Service Listings

These NSF Official Listings are current as of **Thursday, March 02, 2023** at 12:15 a.m. Eastern Time. Please contact NSF to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information: http://info.nsf.org/Certified/PwsComponents/Listings.asp?Company=23790&Standard=061&

NSF/ANSI/CAN 61
Drinking Water System Components - Health Effects

NOTE: Unless otherwise indicated for Materials, Certification is only for the Water Contact Material shown in the Listing. Click here for a list of Abbreviations used in these Listings. Click here for the definitions of Water Contact Temperatures denoted in these Listings.

Norwesco, Inc.

(http://www.norwesco.com)

4365 Steiner Street
St. Bonifacius, MN 55375
United States
800-328-3420
952-446-1945
Visit this company's website (http://www.norwesco.com)

Facility : Hanford, CA

Protective (Barrier) Materials

Trade Designation	Water Contact Size Restriction	Water Contact Temp	Water Contact Material
Tanks[1]			
Applicator Tanks	20 - 500 gal.	CLD 23	PE
Applicator Tanks (Slim Line)	150 - 200 gal.	CLD 23	PE
Below Ground Holding Tanks	2,000 - 20,000 gal.	CLD 23	PE
Bushman-Water Tank[2]	>= 20 gal.	CLD 23	PE
Cistern	>= 500 gal.	CLD 23	PE
Cistern DL[2]	>= 600 gal.	CLD 23	PE
Cistern Sphere	250 - 325 gal.	CLD 23	PE
Cistern Sphere DL[2]	>= 225 gal.	CLD 23	PE

Cone Bottom	125 - 10,000 gal.	CLD 23	PE
Drainable Leg	710 - 3210 gal.	CLD 23	PE
Elliptical	200 - 1600 gal.	CLD 23	PE
Elliptical Leg Tanks	135 - 4035 gal.	CLD 23	PE
Flat Bottom Utility	20 - 500 gal.	CLD 23	PE
Horizontal	35 - 6025 gal.	CLD 23	PE
Inductor Tanks	20 - 80 gal.	CLD 23	PE
Loaf Tanks	50 - 1050 gal.	CLD 23	PE
Mini Bulk	>= 120 gal.	CLD 23	PE
PCO	30 - 300 gal.	CLD 23	PE
Pickup	>= 210 gal.	CLD 23	PE
Specialty Water	525 - 1100 gal.	CLD 23	PE
Specialty Water Tanks / Free Standing Tanks	100 - 4200 gal.	CLD 23	PE
Specialty Water Tanks (w/Steel Frame)	375 gal.	CLD 23	PE
Spot Sprayers	20 - 25 gal.	CLD 23	PE
Tuna Can	5000 gal.	CLD 23	PE
Vertical	20 - 20,000 gal.	CLD 23	PE
Water Hauling Tanks	1250 - 2400 gal.	CLD 23	PE
Water Only	20 - 20,000 gal.	CLD 23	PE

[1] Certified tanks are available in black, blue, green, or white.
[2] DL - Domed lid.

NOTE: Only products bearing the NSF Mark on the product, product packaging, and/or documentation shipped with the product are Certified.

Facility : St. Bonifacius, MN

Protective (Barrier) Materials

Trade Designation	Water Contact Size Restriction	Water Contact Temp	Water Contact Material
Tanks[1]			
Applicator Tanks	20 - 500 gal.	CLD 23	PE
Applicator Tanks (Slim Line)	150 - 200 gal.	CLD 23	PE
Below Ground Holding Tanks	2,000 - 20,000 gal.	CLD 23	PE
Bushman-Water Tank[2]	>= 20 gal.	CLD 23	PE
Cistern	>= 500 gal.	CLD 23	PE
Cistern DL[2]	>= 600 gal.	CLD 23	PE
Cistern Sphere	250 - 325 gal.	CLD 23	PE
Cistern Sphere DL[2]	>= 225 gal.	CLD 23	PE
Cone Bottom	125 - 10,000 gal.	CLD 23	PE
Drainable Leg	710 - 3,210 gal.	CLD 23	PE
Elliptical	200 - 1,600 gal.	CLD 23	PE
Elliptical Leg Tanks	135 - 4,035 gal.	CLD 23	PE

Flat Bottom Utility	20 - 500 gal.	CLD 23	PE
Horizontal	35 - 6,025 gal.	CLD 23	PE
Inductor Tanks	20 - 80 gal.	CLD 23	PE
Loaf Tanks	50 - 1,050 gal.	CLD 23	PE
Mini Bulk	>= 120 gal.	CLD 23	PE
PCO	30 - 300 gal.	CLD 23	PE
Pickup	>= 210 gal.	CLD 23	PE
Specialty Water	525 - 1,100 gal.	CLD 23	PE
Specialty Water Tanks (w/Steel Frame)	375 gal.	CLD 23	PE
Specialty Water Tanks / Free Standing Tanks	100 - 4,200 gal.	CLD 23	PE
Spot Sprayers	20 - 25 gal.	CLD 23	PE
Tuna Can	5,000 gal.	CLD 23	PE
Vertical	20 - 20,000 gal.	CLD 23	PE
Water Hauling Tanks	1,250 - 2,400 gal.	CLD 23	PE
Water Only	20 - 20,000 gal.	CLD 23	PE

[1] Certified tanks are available in black, blue, green, or white.
[2] DL - Domed lid.

Facility : Lancaster, OH

Protective (Barrier) Materials

Trade Designation	Water Contact Size Restriction	Water Contact Temp	Water Contact Material
Tanks[1] [2]			
Applicator Tanks	20 - 500 gal.	CLD 23	PE
Applicator Tanks (Slim Line)	150 - 200 gal.	CLD 23	PE
Below Ground Holding Tanks	2,000 - 20,000 gal.	CLD 23	PE
Bushman-Water Tank	>= 20 gal.	CLD 23	PE
Cistern	>= 500 gal.	CLD 23	PE
Cistern DL	>= 600 gal.	CLD 23	PE
Cistern Sphere	250 - 325 gal.	CLD 23	PE
Cistern Sphere DL	>= 225 gal.	CLD 23	PE
Cone Bottom	125 -10,000 gal.	CLD 23	PE
Drainable Leg	710 - 3210 gal.	CLD 23	PE
Elliptical	200 - 1600 gal.	CLD 23	PE
Elliptical Leg Tanks	135 - 4035 gal.	CLD 23	PE
Flat Bottom Utility	20 - 500 gal.	CLD 23	PE
Horizontal	35 - 6025 gal.	CLD 23	PE
Inductor Tanks	20 - 80 gal.	CLD 23	PE
Loaf Tanks	50 - 1050 gal.	CLD 23	PE
Mini Bulk	>= 120 gal.	CLD 23	PE
PCO	30 - 300 gal.	CLD 23	PE
Pickup	>= 210 gal.	CLD 23	PE

Specialty Water	525 - 1100 gal.	CLD 23	PE
Specialty Water Tanks (w/Steel Frame)	375 gal.	CLD 23	PE
Specialty Water Tanks / Free Standing Tanks	100 - 4200 gal.	CLD 23	PE
Spot Sprayers	20 - 25 gal.	CLD 23	PE
Tuna Can	5000 gal.	CLD 23	PE
Vertical	20 - 20,000 gal.	CLD 23	PE
Water Hauling Tanks	1250 - 2400 gal.	CLD 23	PE
Water Only	20 - 20,000 gal.	CLD 23	PE

[1] DL - Domed Lid
[2] Certified tanks are blue, black, green, or white.

Facility : Fairfield, TX

Protective (Barrier) Materials

Trade Designation	Water Contact Size Restriction	Water Contact Temp	Water Contact Material
Tanks[1]			
Applicator Tanks	20 - 500 gal.	CLD 23	PE
Applicator Tanks (Slim Line)	150 - 200 gal.	CLD 23	PE
Below Ground Holding Tanks	2,000 - 20,000 gal.	CLD 23	PE
Bushman-Water Tank[2]	>= 20 gal.	CLD 23	PE
Cistern	>= 500 gal.	CLD 23	PE
Cistern DL[2]	>= 600 gal.	CLD 23	PE
Cistern Sphere	250 - 325 gal.	CLD 23	PE
Cistern Sphere DL[2]	>= 225 gal.	CLD 23	PE
Cone Bottom	125 -10,000 gal.	CLD 23	PE
Drainable Leg	710 - 3210 gal.	CLD 23	PE
Elliptical	200 - 1600 gal.	CLD 23	PE
Elliptical Leg Tanks	135 - 4035 gal.	CLD 23	PE
Flat Bottom Utility	20 - 500 gal.	CLD 23	PE
Horizontal	35 - 6025 gal.	CLD 23	PE
Inductor Tanks	15 - 80 gal.	CLD 23	PE
Loaf Tanks	50 - 1050 gal.	CLD 23	PE
Mini Bulk	>= 120 gal.	CLD 23	PE
PCO	30 - 300 gal.	CLD 23	PE
Pickup	>= 210 gal.	CLD 23	PE
Specialty Water	525 - 1100 gal.	CLD 23	PE
Specialty Water Tanks (w/Steel Frame)	375 gal.	CLD 23	PE
Specialty Water Tanks / Free Standing Tanks	100 - 4200 gal.	CLD 23	PE
Spot Sprayers	20 - 25 gal.	CLD 23	PE
Tuna Can	5,000 gal.	CLD 23	PE
Vertical	20 - 20,000 gal.	CLD 23	PE
Water Hauling Tanks	1250 - 2400 gal.	CLD 23	PE

Water Only	20 - 20,000 gal.	CLD 23	PE

[1] Certified Tanks are White, Black, Green, or Blue.
[2] DL - Domed Lid.

Facility : Tooele, UT

Protective (Barrier) Materials

Trade Designation	Water Contact Size Restriction	Water Contact Temp	Water Contact Material
Tanks[1]			
Applicator Tanks	20 - 500 gal.	CLD 23	PE
Applicator Tanks (Slim Line)	150 - 200 gal.	CLD 23	PE
Below Ground Holding Tanks	2,000 - 20,000 gal.	CLD 23	PE
Bushman-Water Tank[2]	>= 20 gal.	CLD 23	PE
Cistern	>= 500 gal.	CLD 23	PE
Cistern DL[2]	>= 600 gal.	CLD 23	PE
Cistern Sphere	250 - 325 gal.	CLD 23	PE
Cistern Sphere DL[2]	>= 225 gal.	CLD 23	PE
Cone Bottom	125 - 10,000 gal.	CLD 23	PE
Drainable Leg	710 - 3210 gal.	CLD 23	PE
Elliptical	200 - 1600 gal.	CLD 23	PE
Elliptical Leg Tanks	135 - 4035 gal.	CLD 23	PE
Flat Bottom Utility	20 - 500 gal.	CLD 23	PE
Horizontal	35 - 6025 gal.	CLD 23	PE
Inductor Tanks	20 - 80 gal.	CLD 23	PE
Loaf Tanks	50 - 1050 gal.	CLD 23	PE
Mini Bulk	>= 120 gal.	CLD 23	PE
PCO	30 - 300 gal.	CLD 23	PE
Pickup	>= 210 gal.	CLD 23	PE
Specialty Water	525 - 1100 gal.	CLD 23	PE
Specialty Water Tanks / Free Standing Tanks	100 - 4200 gal.	CLD 23	PE
Specialty Water Tanks (w/Steel Frame)	375 gal.	CLD 23	PE
Spot Sprayers	20 - 25 gal.	CLD 23	PE
Tuna Can	5000 gal.	CLD 23	PE
Vertical	20 - 20,000 gal.	CLD 23	PE
Water Hauling Tanks	1250 - 2400 gal.	CLD 23	PE
Water Only	20 - 20,000 gal.	CLD 23	PE

[1] Certified tanks are available in black, blue, green, or white.
[2] DL - Domed lid.

Facility : Washougal, WA

Protective (Barrier) Materials

Trade Designation	Water Contact Size Restriction	Water Contact Temp	Water Contact Material
Tanks[1]			
Applicator Tanks	20 - 500 gal.	CLD 23	PE
Applicator Tanks (Slim Line)	150 - 200 gal.	CLD 23	PE
Below Ground Holding Tanks	2,000 - 20,000 gal.	CLD 23	PE
Bushman-Water Tank	>= 20 gal.	CLD 23	PE
Cistern	>= 500 gal.	CLD 23	PE
Cistern DL[2]	>= 600 gal.	CLD 23	PE
Cistern Sphere	250 - 325 gal.	CLD 23	PE
Cistern Sphere DL[2]	>= 225 gal.	CLD 23	PE
Cone Bottom	125 - 10,000 gal.	CLD 23	PE
Drainable Leg	710 - 3210 gal.	CLD 23	PE
Elliptical	200 - 1600 gal.	CLD 23	PE
Elliptical Leg Tanks	135 - 4035 gal.	CLD 23	PE
Flat Bottom Utility	20 - 500 gal.	CLD 23	PE
Horizontal	35 - 6025 gal.	CLD 23	PE
Inductor Tanks	20 - 80 gal.	CLD 23	PE
Loaf Tanks	50 - 1050 gal.	CLD 23	PE
Mini Bulk	>= 120 gal.	CLD 23	PE
PCO	30 - 300 gal.	CLD 23	PE
Pickup	>= 210 gal.	CLD 23	PE
Specialty Water	525 - 1100 gal.	CLD 23	PE
Specialty Water Tanks (w/Steel Frame)	375 gal.	CLD 23	PE
Specialty Water Tanks / Free Standing Tanks	100 - 4200 gal.	CLD 23	PE
Spot Sprayers	20 - 25 gal.	CLD 23	PE
Tuna Can	5000 gal.	CLD 23	PE
Vertical	20 - 20,000 gal.	CLD 23	PE
Water Hauling Tanks	1250 - 2400 gal.	CLD 23	PE
Water Only	20 - 20,000 gal.	CLD 23	PE

[1] Certified tanks are available in black, blue, green, or white.
[2] DL - Domed lid.

Number of matching Manufacturers is 1

Number of matching Products is 162

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Storage Tank Water Level Controls shall consist of:

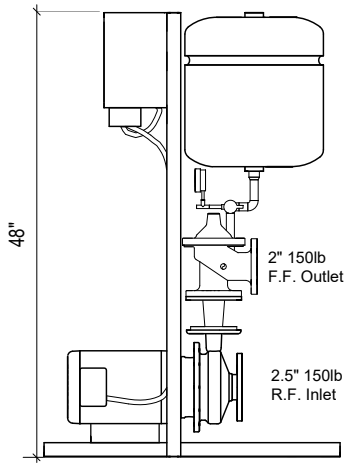
2 Tank level sensors to be Warrick Conductivity 5 Electrode Bulkhead Probe assemblies.
Probe #1 - Ground Reference
Probe #2 - Low Level Cut-Off
Probe #3 - Fill Start Level
Probe #4 - Fill Stop Level
Probe #5 - High Tank Level

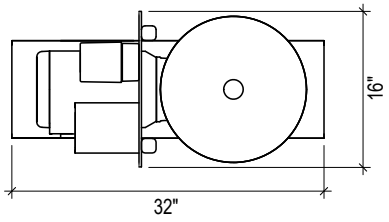
Tank probe assemblies shall be interfaced to 2 - Warrick 16M level controllers and 2 - Warrick 26M Low Water Cut Off controllers installed in a non metalic control enclosure with associated Hand-Off_Auto Fill selector switch, Active Tank selector switch, alarm indicators and alarm horn with Silence pushbutton.

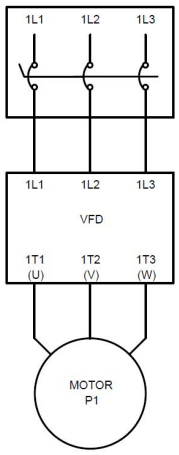
Solenoid valve/Tank fill valve shall be 2” valve assembly with Failsafe Spring Return Closed Belimo Valve Operator 24V DC.

WATER PRESSURE BOOSTER SYSTEMS

POSI-BOOST







		STANDARD STOCK SYSTEMS				
		PB-200	**PB-300**	**PB-500**	**PB-750**	**PB-1000**
Pump Horsepower		2	3	5	7.5	10
Shipping Weight LBS		190	190	200	200	225
Available Voltages		208-230/460/3	208-230/460/3	208-230/460/3	208-230/460/3	208-230/460/3
Full Load Motor Amperages	208v	7.5	10.6	16.7	24.2	30.8
	230v	6.8	9.6	15.2	22	28
	460v	3.4	4.8	7.6	11	14

Maximum Working Pressure 150 PSI
Single phase available upon request

		POSI-BOOST SYSTEM SELECTION					
		Pressure Boost (PSI)					
		20	**30**	**40**	**50**	**60**	**70**
Flow (GPM)	**50**	PB-200	PB-200	PB-300	PB-500	PB-500	PB-500
	60	PB-200	PB-200	PB-300	PB-500	PB-500	PB-500
	70	PB-200	PB-200	PB-300	PB-500	PB-500	PB-750
	80	PB-200	PB-300	PB-500	PB-500	PB-500	PB-750
	90	PB-200	PB-300	PB-500	PB-500	PB-750	PB-750
	100	PB-200	PB-300	PB-500	PB-500	PB-750	PB-750
	110	PB-200	PB-300	PB-500	PB-500	PB-750	PB-750
	120	PB-200	PB-300	PB-500	PB-750	PB-750	PB-750
	130	PB-300	PB-500	PB-500	PB-750	PB-750	PB-1000
	140	PB-300	PB-500	PB-500	PB-750	PB-750	PB-1000

Larger sizes available upon request

Multiplex Option: (Up to 8 units in parallel)
☒ Duplex
☐ Triplex
☐ Other: _____

Duplex configuration, 100 gpm with 1 pump running, 1 pump on standby

SUGGESTED SPECIFICATION

Furnish and install a Posi-Boost water pressure booster system as manufactured by **Penn Pump & Equipment Company, Inc.,** of Hatfield, PA. The packaged and tested system shall be capable of multiplex system operation and shall be complete with an all-stainless-steel pump, a NEMA 1 variable speed pump controller with disconnect switch, and a hydropneumatic tank for no flow shut down. The packaged pumping system shall be factory assembled and tested with 304 Stainless Steel and shall include a thermal safety purge valve and pressure gauge. Prior to shipment, the Posi-Boost water pressure booster system shall be painted with a high-grade enamel. The complete packaged and tested system shall be certified and labeled to NSF/ANSI 61 & 372 standards.

NSF®
Certified to NSF/ANSI 61 & 372

SPECIFY WITH CONFIDENCE, SPECIFY PENN PUMP SYSTEMS

Penn Pump & Equipment Company, Inc., 2880 Bergey Road Unit O, Hatfield, PA 19440, 215-997-6100, sales@pennpump.com,

SUBMITTAL DATA

CENTRIFUGAL PUMPS

DESIGN FEATURES

- Cast Iron Bronze fitted construction
- Back pull out design
- Compact design minimizes floor space
- Factory assembled and tested
- Built according to Hydraulic Institute – NEMA Standards

STANDARD CONSTRUCTION

- Cast Iron Casing
- Bronze Impeller
- Carbon Steel Shaft
- Bronze Shaft Sleeve
- Bronze Case Wear Ring
- Open Drip-Proof Motor
- Single Mechanical Seal
- Maximum Working Pressure 175 PSI

OPTIONS

- TEFC or Explosion-Proof Motors
- High Temperature Seals
- Special Alloy Shaft Seals
- Higher Working Pressure

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SPECIFY WITH CONFIDENCE, SPECIFY PENN PUMP SYSTEMS

Penn Pump & Equipment Company, Inc., 2880 Bergey Road Unit O, Hatfield, PA 19440, 215-997-6100, (Fax) 215-997-6195, sales@pennpump.com,

WATER PRESSURE BOOSTER SYSTEMS

SUBMITTAL DATA

The integrated pump specific software and setup parameters, allow the operator to set up specific control values for a wide range of applications. iQpump will automatically adjust pump operating conditions, as the process variables change while still maintaining optimum pump performance and protection.

Most existing systems, which require constant pressure or flow control, are using bypass lines, pressure release valves, throttling valves or impeller trim adjustments. The most efficient method is pump speed control. Pump speed control will reduce energy consumption, while maintaining system optimization.

The iQpump Controller can be configured for Simplex, Duplex, Triplex or up to an eight-pump system. One iQpump Controller can be used as a master, which can also control one or two secondary pump motors. The secondary pump motors can be connected using mechanical motor starters, reduced voltage soft starters, or additional iQpump drives. The software is structured in such a way that it only has a few basic pump parameters to be setup to run this application.

The iQpump controller is available from 5 to 500 horsepower. In addition to Water Pressure Booster Pumps in Commercial and Industrial applications, the iQpump controller is suitable for a variety of other pumping applications such as Submersible Deep Well Pumps, Storage Tank Level Control, Metering Pumps, and HVAC pumps and fans.

Drive Performance Features

- Ratings: 5-150 HP, 208 VAC 5-150 HP, 230 / 240 VAC 5-500 HP, 480 VAC
- Overload capacity: nominal 110% for 60 sec. (150% peak)
- Starting torque: 100% at 3 Hz
- Motor preheat function
- Adjustable accel/decel: 0.1 to 6000 sec.
- Controlled speed range: 40:1
- Critical frequency rejection: 3 selectable, adjustable bands
- Torque-limiting: 30-180%
- Energy Saving control
- Torque boost: full range, auto
- Power loss ride-thru: 2 sec.
- Auto restart after power loss or fault reset, selectable, programmable
- Feedback signal loss detection
- Serial communications loss detection
- "Up/Down" floating point control capability (PI)
- Stationary motor auto-tuning
- Pump Sleep function
- Run-permissive input

Pump Control Features

- Operator Keypad with intuitive pump language
- Hand-Off-Auto
- Programmable Pump Process Set Point
- Pump Start Level & Start Time
- Sleep Protection
- Simplex, Duplex, & Triplex Control
- Automatic System Restart
- No Flow Detection
- Low and High Feedback set points
- Pre-Charge Low Level Control
- Thrust Bearing Control
- Automatic System Stabilization
- Motor Condensation Pre-Heat Function

Protective Features

- Current-limited stall prevention
- Heat sink over-temperature, speed fold-back
- Bi-directional start into rotating motor
- Current-limiting DC bus fuse
- Optically-isolated controls
- Short circuit protection: Phase-phase and phase-neutral
- Ground fault protection
- Short circuit withstand rating: 100K RMS
- Electronic motor overload: UL
- Current limit
- Fault display: last 10 faults
- Fault circuit: OC, OV, OT
- Over torque and under torque protection

Pump Protective Features

- Dry Well
- Air in System
- Blocked Impeller
- Pump over Cycling
- No Flow Protection
- Loss of Prime
- Transducer Loss
- Over Torque

Pump Alarms and Messages

- Low Feedback
- High Feedback
- Low Level
- Low Water
- Pump Over Cycling
- No Flow Detection
- Loss of Prime
- Pump Fault
- Motor Thermostat
- Pre-Charge Mode
- Thrust Bearing Active
- Start Mode Active
- Sleep Mode Active

Service Conditions

- Ambient Temperature:
- -10°C to 40°C (14° F to 104° F) NEMA 1, -10°C to 45°C (14° F to 113° F) protected chassis
- Humidity: 95% RH, non-condensing
- Altitude: 3300 ft; higher by derate
- Input voltage: +10%/-15%
- Input frequency: 50/60 Hz ± 5%
- 3-phase, 3-wire, phase sequence insensitive

Design Features

- LCD keypad display, 5 lines x 16 characters, backlit, 6 languages, copy function
- Multi-step speed settings: 5 available
- Setpoint (PI) control
- 32-bit microprocessor logic
- Non-volatile memory, program retention
- Displacement power factor: 0.98
- Output frequency: 0.1 to 120 Hz
- Frequency resolution: 0.06 Hz
- Frequency regulation: 0.1%
- Control Terminal Board: Quick disconnect
- Carrier frequency: selectable to 15 kHz
- 3% DC bus reactor: 30-150 HP, 208 VAC; 30-150 HP, 240 VAC; 40-500 HP, 480 VAC; optional on lower ratings
- 24 VDC control logic, PNP / NPN selectable
- Transmitter/Option power supply
- Input/output terminal status
- Timer function: Elapsed time, Delay on start, Delay on stop
- RS-422/485 port: Modbus protocol
- Volts/hertz ratio: Preset and programmable V/Hz patterns
- Meter Functions: Volt, amp, kilowatt, elapsed run time, speed command
- NEMA 1 or protected chassis
- UL, cUL listed and CE marked; IEC 146;
- MTBF: exceeds 28 years

SPECIFY WITH CONFIDENCE, SPECIFY PENN PUMP SYSTEMS

Penn Pump & Equipment Company, Inc., 2880 Bergey Road Unit O, Hatfield, PA 19440, 215-997-6100, (Fax) 215-997-6195, sales@pennpump.com,

WATER PRESSURE BOOSTER SYSTEMS

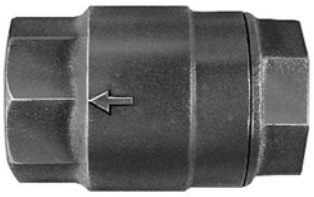
SUBMITTAL DATA

FULL PORT, TWO PIECE, BRASS BALL VALVE

Body	Brass
Ball	Chrome plated brass
Seat	PTFE
Pressure Rating	600 PSI

LUG STYLE BUTTERFLY VALVE

Body	Ductile Iron
Stem	416SS
Disc	Aluminum Bronze
Seat	EPDM
Pressure Rating	200 PSI



BRONZE SILENT CHECK VALVES

Body	Bronze
Seat	PTFE
Spring	Stainless Steel
Pressure Rating	250 PSI

WAFER TYPE CHECK VALVE

Body	Cast Iron ASTM A126-B
Trim	Bronze ASTM B62/316 SS
Spring	302 Stainless Steel, ASTM A276
Pressure Rating	250 PSI

NSF

Certified to NSF/ANSI 61 & 372

SPECIFY WITH CONFIDENCE, SPECIFY PENN PUMP SYSTEMS

Penn Pump & Equipment Company, Inc., 2880 Bergey Road Unit O, Hatfield, PA 19440, 215-997-6100, (Fax) 215-997-6195, sales@pennpump.com,

WATER PRESSURE BOOSTER SYSTEMS

SUBMITTAL DATA

HYDRO-CUSH TANK

Capacity	44 Gallons Standard	☐ 86 Gallons Optional
System Connection	Stainless Steel	
Diaphragm	Butyl	
Liner	Polypropylene	
Pressure Rating	150 PSIG	

PRESSURE RELIEF VALVE

Body	Bronze
Seat	Bronze
Valve	Stainless Steel
Pressure Rating	150 PSIG

THERMAL PURGE VALVE

Body	Brass
Seat	Brass
Spring	300 Series Stainless Steel
Seal	Buna-N
Pressure Rating	300 PSIG
Set Temperature	105°F

PRESSURE GAUGE

Case	Stainless Steel
Bourdon Tube	Brass
Size	4 ½" Dial
Face	Glass

Certified to NSF/ANSI 61 & 372

SPECIFY WITH CONFIDENCE, SPECIFY PENN PUMP SYSTEMS

Penn Pump & Equipment Company, Inc., 2880 Bergey Road Unit O, Hatfield, PA 19440, 215-997-6100, (Fax) 215-997-6195, sales@pennpump.com,

DIVISION 22 - PLUMBING

220517	Sleeves and Sleeve Seals for Plumbing Piping
220518	Escutcheons for Plumbing Piping
220519	Meters and Gages for Plumbing Piping
220523	General Duty Valves for Plumbing Piping
220529	Hangers and Supports for Plumbing Piping and Equipment
220553	Identification for Plumbing Piping and Equipment
220700	Plumbing Insulation
221116	Domestic Water Piping
221119	Domestic Water Piping Specialties

SECTION 220517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1:03 ACTION SUBMITTALS

Product Data: For each type of product indicated.

PART 2 – PRODUCTS

2:01 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coat ed, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2:02 STACK-SLEEVE FITTINGS

A. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2:03 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

2. Pressure Plates: Carbon steel

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2:04 SLEEVE-SEAL FITTINGS

Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2:05 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 – EXECUTION

3:01 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.

2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.

2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

3:02 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Section 076200 "Sheet Metal Flashing and Trim."

3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3:03 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3:04 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3:05 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Cast-iron wall sleeves or Galvanized-steel-pipe sleeves

b. Piping NPS 6 and Larger: Cast-iron wall sleeves or Galvanized-steel wall sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system or Sleeve-seal fittings.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6: Cast-iron wall sleeves with sleeve-seal system or Galvanized-steel-pipe sleeves with sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system or Sleeve-seal fittings.
b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system or

Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or Stack-sleeve fittings.

   b. Piping NPS 6 Galvanized-steel-pipe sleeves or Stack-sleeve fittings.

5. Interior Partitions:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

   b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION

SECTION 220518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Escutcheons.

2. Floor plates.

1:03 ACTION SUBMITTALS

Product Data: For each type of product indicated.

PART 2 – PRODUCTS

2:01 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated or rough-brass finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated or rough-brass finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, exposed-rivet hinge, and spring-clip fasteners.

2:02 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 – EXECUTION

3:01 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.

c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.

g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with exposed-rivet hinge.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.

b. Insulated Piping: Split-plate, stamped-steel type with exposed-rivet hinge.

c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.

d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.

e. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with ex posed-rivet hinge.

f. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with exposed-rivet hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

2. Existing Piping: Split-casting, floor-plate type.

3:02 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

SECTION 220519

METERS AND GAGES FOR PLUMBING PIPING

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Dial-type pressure gages.
2. Gage attachments.
3. Test plugs with Test-plug kits.

1:03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Certificates: For each type of meter and gage, from manufacturer.

C. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 – PRODUCTS

2:01 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMETEK, Inc.; U.S. Gauge.
   b. Ashcroft Inc.
   c. Flo Fab Inc.
   d. Marsh Bellofram.

e. Trerice, H. O. Co.

f. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

g. Weiss Instruments, Inc.

2. Standard: ASME B40.100.

3. Case: Sealed types; cast aluminum; 4-1/2-inch or 6-inch nominal diameter.

4. Pressure-Element Assembly: Bourdon tube.

5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

6. Movement: Mechanical, with link to pressure element and connection to pointer.

7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.

8. Pointer: Dark-colored metal.

9. Window: Glass.

10. Ring: Brass or Stainless steel.

11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2:02 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2:03 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Peterson Equipment Co., Inc.

2. Sisco Manufacturing Company, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS ¼ or NPS ½, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200°F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic self-sealing rubber.

G. TEST-PLUG KITS

1. Furnish one test-plug kit containing two thermometers, one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

2. Thermometer: Small, bimetallic insertion type with 1- to 2-inch- diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 200°F.

3. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- diameter dial and probe. Dial range shall be at least 0 to 200 psig.

4. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 – EXECUTION

3:01 INSTALLATION

A. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

B. Install valve and snubber in piping for each pressure gage for fluids.

C. Install test plugs in piping tees.

D. Install pressure gages in the following locations:

1. Building water service entrance into building.

2. Inlet and outlet of each pressure-reducing valve.

3. Suction and discharge of each domestic water pump.

3:02 CONNECTIONS

Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3:03 ADJUSTING

Adjust faces of meters and gages to proper angle for best visibility.

3:04 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be the following:

1. Sealed type, direct-mounted, metal case, 4½ in. diameter for viewing range of 6 ft. or less and 6 in. diameter for viewing range over 6 ft.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be one of the following:

1. Sealed type, direct-mounted, metal case, 4½ in. diameter for viewing range of 6 ft. or less and 6 in. diameter for viewing range over 6 ft.

C. Pressure gages at suction and discharge of each domestic water pump shall be one of the following:

1. Sealed type, direct-mounted, metal case, 4½ in. diameter for viewing range of 6 ft. or less and 6 in. diameter for viewing range over 6 ft.

3:05 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 160 psi

B. Scale Range for Domestic Water Piping: 0 to 100 psi.

END OF SECTION

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron ball valves.
4. Iron, single-flange butterfly valves.
5. Iron, grooved-end butterfly valves.
6. Bronze lift check valves.
7. Bronze swing check valves.
8. Iron swing check valves.
9. Iron swing check valves with closure control.
10. Iron, grooved-end swing check valves.
11. Bronze gate valves.
12. Iron gate valves.
13. Bronze globe valves.
14. Iron globe valves.
15. Lubricated plug valves.

B. Related Sections:
1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.

2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1:03 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1:04 SUBMITTALS

Product Data: For each type of valve indicated.

1:05 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

2. ASME B31.1 for power piping valves.

3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1:06 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.

3. Set angle, gate, and globe valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure of functional surfaces.

5. Set butterfly valves closed or slightly open.

6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.

2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 – PRODUCTS

2:01 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.

2. Handwheel: For valves other than quarter-turn types.

3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.

2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or dis turbing insulation.

3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.

2. Grooved: With grooves according to AWWA C606.

3. Solder Joint: With sockets according to ASME B16.18.

4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2:02 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.

d. Hammond Valve.

e. Kitz Corporation.

f. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig.

c. CWP Rating: 600 psig.

d. Body Design: Two piece.

e. Body Material: Forged brass.

f. Ends: Threaded.

g. Seats: PTFE or TFE.

h. Stem: Stainless steel.

i. Ball: Stainless steel, vented.

j. Port: Full.

2:03 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Hammond Valve.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.

b. SWP Rating: 150 psig.

c. CWP Rating: 600 psig.

d. Body Design: Two piece.

e. Body Material: Bronze.

f. Ends: Threaded.

g. Seats: PTFE or TFE.

h. Stem: Stainless steel.

i. Ball: Stainless steel, vented.

j. Port: Full.

2:04 IRON BALL VALVES

A. Class 125, Iron Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.

b. Conbraco Industries, Inc.; Apollo Valves.

c. Kitz Corporation.

d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-72.

b. CWP Rating: 200 psig.

c. Body Design: Split body.

d. Body Material: ASTM A 126, gray iron.

e. Ends: Flanged.

f. Seats: PTFE or TFE.

g. Stem: Stainless steel.

h. Ball: Stainless steel.

i. Port: Full.

2:05 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.

b. Conbraco Industries, Inc.; Apollo Valves.

c. Crane Co.; Crane Valve Group; Stockham Division.

d. DeZurik Water Controls.

e. Flo Fab Inc.

f. Hammond Valve.

g. Kitz Corporation.

h. Milwaukee Valve Company.

i. Mueller Steam Specialty; a division of SPX Corporation.

j. Spence Strainers International; a division of CIRCOR International, Inc.

k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.

b. CWP Rating: 200 psig.

c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.

e. Seat: NBR.

f. Stem: One- or two-piece stainless steel.

g. Disc: Nickel-plated ductile iron.

2:06 IRON, GROOVED-END BUTTERFLY VALVES

A. 300 CWP, Iron, Grooved-End Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.

b. Kennedy Valve; a division of McWane, Inc.

c. Tyco Fire Products LP; Grinnell Mechanical Products.

d. Victaulic Company.

2. Description:

a. Standard: MSS SP-67, Type I.

b. NPS 8 and Smaller CWP Rating: 300 psig.

c. NPS 10 and Larger CWP Rating: 200 psig.

d. Body Material: Coated, ductile iron.

e. Stem: Two-piece stainless steel.

f. Disc: Coated, ductile iron.

g. Seal: EPDM.

2:07 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 200 psig.

c. Body Design: Vertical flow.

d. Body Material: ASTM B 61 or ASTM B 62, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

2:08 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.

b. Crane Co.; Crane Valve Group; Crane Valves.

c. Crane Co.; Crane Valve Group; Jenkins Valves.

d. Crane Co.; Crane Valve Group; Stockham Division.

e. Kitz Corporation.

f. Milwaukee Valve Company.

g. NIBCO INC.

h. Red-White Valve Corporation.

2. Description:

a. Standard: MSS SP-80, Type 3.

b. CWP Rating: 300 psig.

c. Body Design: Horizontal flow.

d. Body Material: ASTM B 62, bronze.

e. Ends: Threaded.

f. Disc: Bronze.

2:09 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. Crane Co.; Crane Valve Group; Stockham Division.

d. Hammond Valve.

e. Kitz Corporation.

f. Legend Valve.

g. Milwaukee Valve Company.

h. NIBCO INC.

i. Powell Valves.

j. Red-White Valve Corporation.

k. Sure Flow Equipment Inc.

l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.

b. CWP Rating: 200 psig (1380 kPa).

c. Body Design: Clear or full waterway.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Bronze.

g. Gasket: Asbestos free.

B. Class 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. Crane Co.; Crane Valve Group; Stockham Division.

d. Hammond Valve.

e. Milwaukee Valve Company.

f. NIBCO INC.

g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.

b. CWP Rating: 500 psig.

c. Body Design: Clear or full waterway.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Bronze.

g. Gasket: Asbestos free.

2:10 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Weight-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. Crane Co.; Crane Valve Group; Stockham Division.

d. Hammond Valve.

e. Milwaukee Valve Company.

f. NIBCO INC.

g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.

b. CWP Rating: 200 psig.

c. Body Design: Clear or full waterway.

d. Body Material: ASTM A 126, gray iron with bolted bonnet.

e. Ends: Flanged.

f. Trim: Bronze.

g. Gasket: Asbestos free.

h. Closure Control: Factory-installed, exterior lever and weight.

2:11 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.

b. Tyco Fire Products LP; Grinnell Mechanical Products.

c. Victaulic Company.

2. Description:

a. CWP Rating: 300 psig.

b. Body Material: ASTM A 536, ductile iron.

c. Seal: EPDM.

d. Disc: Spring-operated, ductile iron or stainless steel.

2:12 BRONZE GATE VALVES

A. Class 150, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hammond Valve.

b. Kitz Corporation.

c. Milwaukee Valve Company.

d. NIBCO INC.

e. Powell Valves.

f. Red-White Valve Corporation.

g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.

b. CWP Rating: 300 psig.

c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.

d. Ends: Threaded.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron.

B. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. Hammond Valve.

d. Kitz Corporation.

e. Milwaukee Valve Company.

f. NIBCO INC.

g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 300 psig

c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.

d. Ends: Threaded.

e. Stem: Bronze.

f. Disc: Solid wedge; bronze.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron.

2:13 IRON GATE VALVES

A. Class 250, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.

c. NIBCO INC.

2. Description:

a. Standard: MSS SP-70, Type I.

b. CWP Rating: 500 psig.

c. Body Material: ASTM A 126, gray iron with bolted bonnet.

d. Ends: Flanged.

e. Trim: Bronze.

f. Disc: Solid wedge.

g. Packing and Gasket: Asbestos free.

B. Class 250, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.

b. CWP Rating: 500 psig.

c. Body Material: ASTM A 126, gray iron with bolted bonnet.

d. Ends: Flanged.

e. Trim: Bronze.

f. Disc: Solid wedge.

g. Packing and Gasket: Asbestos free.

2:14 BRONZE GLOBE VALVES

A. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Hammond Valve.

c. Kitz Corporation.

d. Milwaukee Valve Company.

e. NIBCO INC.

f. Red-White Valve Corporation.

g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.

b. CWP Rating: 300 psig.

c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.

d. Ends: Threaded.

e. Stem: Bronze.

f. Disc: PTFE or TFE.

g. Packing: Asbestos free.

h. Handwheel: Malleable iron.

2:15 IRON GLOBE VALVES

A. Class 250, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. Crane Co.; Crane Valve Group; Stockham Division.

d. Hammond Valve.

e. Milwaukee Valve Company.

f. NIBCO INC.

g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.

b. CWP Rating: 500 psig.

c. Body Material: ASTM A 126, gray iron with bolted bonnet.

d. Ends: Flanged.

e. Trim: Bronze.

f. Packing and Gasket: Asbestos free.

2:16 LUBRICATED PLUG VALVES

A. Class 250, Cylindrical, Lubricated Plug Valves with Threaded Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Homestead Valve; a division of Olson Technologies, Inc.

b. Milliken Valve Company.

c. R & M Energy Systems; a unit of Robbins & Myers, Inc.

2. Description:

a. Standard: MSS SP-78, Type IV.

b. CWP Rating: 400 psig.

c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.

d. Pattern: Regular pattern.

e. Plug: Cast iron or bronze with sealant groove.

B. Class 250, Cylindrical, Lubricated Plug Valves with Flanged Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Homestead Valve; a division of Olson Technologies, Inc.

b. Milliken Valve Company.

C. R & M Energy Systems; a unit of Robbins & Myers, Inc.

2. Description:

a. Standard: MSS SP-78, Type IV.

b. CWP Rating: 400 psig.

c. Body Material: ASTM A 48/A 48M or ASTM A 126, Grade 40 cast iron with lubrication-sealing system.

d. Pattern: Regular pattern.

e. Plug: Cast iron or bronze with sealant groove.

PART 3 – EXECUTION

3:01 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully opened to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material com position is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3:02 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.

   2. Lift Check Valves: With stem upright and plumb.

3:03 ADJUSTING

Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3:04 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

   1. Shutoff Service: Ball, butterfly, or gate or plug valves.

   2. Butterfly Valve Dead-End Service: Single-flange (lug) type.

   3. Throttling Service: Globe, ball, or butterfly valves.

   4. Pump-Discharge Check Valves:

      a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.

      b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight, metal-seat check valves.

c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

2. For Copper Tubing, NPS 2½ and Larger: Flanged ends.

3. For Steel Piping, NPS 2 and Smaller: Threaded ends.

4. For Steel Piping, NPS 2½ and Larger: Flanged.

5. For Grooved-End Steel Piping: Valve ends may be grooved.

3:05 VALVE SCHEDULE

Refer to individual piping system specifications for valve schedules.

END OF SECTION

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports

1:03 DEFINITIONS

MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1:04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting

combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1:05 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.

2. Metal framing systems.

3. Pipe stands.

4. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.

2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1:06 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 – PRODUCTS

2:01 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.

3. Nonmetallic Coatings: Plastic coating, jacket, or liner.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.

2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2:02 TRAPEZE PIPE HANGERS

Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2:03 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cooper B-Line, Inc.

b. GS Metals Corp.

c. Thomas & Betts Corporation.

d. Unistrut Corporation; Tyco International, Ltd.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.

3. Standard: MFMA-4.

4. Channels: Continuous slotted steel channel with inturned lips.

5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

7. Metallic Coating: Hot-dipped galvanized.

8. Plastic Coating: PVC.

2:04 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.

2. ERICO International Corporation.

3. PHS Industries, Inc.

4. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2:05 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used. (Only with approval from the Owner).

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2:06 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

2. Base: Stainless steel.

3. Vertical Members: Two or more stainless-steel, continuous-thread rods.

4. Horizontal Member: Stainless-steel rod with stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

2. Bases: One or more; Stainless.

3. Vertical Members: Two or more stainless-steel channels.

4. Horizontal Member: Stainless-steel channel.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2:07 PIPE POSITIONING SYSTEMS

Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2:08 EQUIPMENT SUPPORTS

Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2:09 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.

2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 – EXECUTION

3:01 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-½ and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180°.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS ¼ to NPS 3-½: 12 inches long and 0.048 inch thick.

b. NPS 4: 12 inches long and 0.06 inch thick.

c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3:02 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3:03 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and so con tours of welded surfaces match adjacent contours.

3:04 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3:05 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3:06 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS ½ to NPS 30.

2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050°F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.

3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS ¾ to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS ½ to NPS 24 if little or no insulation is required.

5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS ½ to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS ¾ to NPS 8.

7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS ½ to NPS 8.

8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS ½ to NPS 8.

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS ½ to NPS 8.

10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.

11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.

12. U-Bolts (MSS Type 24): For support of heavy pipes NPS ½ to NPS 30.

13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.

16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-½ to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.

19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical ad justment is not necessary.

21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS ¾ to NPS 24.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS ¾ to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.

2. Steel Clevises (MSS Type 14): For 120 to 450°F piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.

4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.

5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450°F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.

2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.

3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.

7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.

8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.

11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.

12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

a. Light (MSS Type 31): 750 lb.

b. Medium (MSS Type 32): 1500 lb.

c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.

14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.

3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.

2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-¼ inches.

3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.

4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.

5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.

    b. Vertical (MSS Type 55): Mounted vertically.

    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use powder-actuated fasteners (if approved by building owner) or mechanical-expansion anchors instead of building attachments where required in concrete construction.

S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

SECTION 220553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve tags.
5. Warning tags.

1:03 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 – PRODUCTS

2:01 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Minimum Label Size: Length and width vary for required label content, but not less than 2-½ by ¾ inch.

3. Minimum Letter Size: ¼ inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

4. Fasteners: Stainless-steel rivets or self-tapping screws.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8½ by 11 inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2:02 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160°F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2½ by ¾ inch.

F. Minimum Letter Size: ¼ inch for name of units if viewing distance is less than 24 inches, ½ inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2:03 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.

2. Lettering Size: At least 1½ inches high.

2:04 VALVE TAGS

A. Valve Tags: Stamped or engraved with ¼ inch letters for piping system abbreviation and ½ inch numbers.

1. Tag Material: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8½ by 11 inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2:05 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches.

2. Fasteners: Reinforced grommet and wire.

3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

4. Color: Yellow background with black lettering.

PART 3 – EXECUTION

3:01 PREPARATION

Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3:02 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3:03 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3:04 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves with in factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tags scale be minimum 1½ inches, round in shape.

3:05 WARNING-TAG INSTALLATION

Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

SECTION 220700

PLUMBING INSULATION

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Insulation Materials:
    a. Flexible elastomeric.
    b. Mineral fiber.
2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Lagging adhesives.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied fabric-reinforcing mesh.
9. Field-applied cloths.
10. Field-applied jackets.
11. Tapes.
12. Securements.
13. Corner angles.

1:03 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

2. Detail insulation application at pipe expansion joints for each type of insulation.

3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

4. Detail removable insulation at piping specialties, equipment connections, and access panels.

5. Detail application of field-applied jackets.

6. Detail application at linkages of control devices.

7. Detail field application for each equipment type.

C. Qualification Data: For qualified Installer.

E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

F. Field quality-control reports.

1:04 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Engineer. Use materials indicated for the completed Work.

1. Piping Mockups:

a. One 10-foot section of NPS 2 straight pipe.

b. One each of a 90-degree threaded, welded, and flanged elbow.

c. One each of a threaded, welded, and flanged tee fitting.

d. One NPS 2 or smaller valve, and one NPS 2½ or larger valve.

e. Two support hangers including hanger shield and insert.

f. One threaded strainer and one flanged strainer with removable portion of insulation.

g. One threaded reducer and one welded reducer.

h. One pressure temperature tap.

i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.

3. Notify Engineer seven days in advance of dates and times when mockups will be constructed.

4. Obtain Engineer's approval of mockups before starting insulation application.

5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.

6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

7. Demolish and remove mockups when directed.

1:05 DELIVERY, STORAGE, AND HANDLING

Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1:06 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1:07 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 – PRODUCTS

2:01 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible elastomeric thermal insulation is not suitable for temperatures lower than minus 70°F (minus 57°C) and higher than 220°F (104°C).

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aeroflex USA Inc.; Aerocel.

b. Armacell LLC; AP Armaflex.

c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.

b. Fibrex Insulations Inc.; FBX.

c. Johns Manville; 800 Series Spin-Glas.

d. Knauf Insulation; Insulation Board.

e. Manson Insulation Inc.; AK Board.

f. Owens Corning; Fiberglas 700 Series.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fibrex Insulations Inc.; Coreplus 1200.

b. Johns Manville; Micro-Lok.

c. Knauf Insulation; 1000(Pipe Insulation.

d. Manson Insulation Inc.; Alley-K.

e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850°F (454°C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100°F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; CrimpWrap.

    b. Johns Manville; MicroFlex.

    c. Knauf Insulation; Pipe and Tank Insulation.

    d. Manson Insulation Inc.; AK Flex.

    e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2:02 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Insulco, Division of MFS, Inc.; Triple I.

    b. P. K. Insulation Mfg. Co., Inc.; Super-Stik.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Insulco, Division of MFS, Inc.; SmoothKote.

    b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.

    c. Rock Wool Manufacturing Company; Delta One Shot.

2:03 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Aeroflex USA Inc.; Aeroseal.

    b. Armacell LCC; 520 Adhesive.

    c. Foster Products Corporation, H. B. Fuller Company; 85-75.

d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.

b. Foster Products Corporation, H. B. Fuller Company; 85-20.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.

b. Foster Products Corporation, H. B. Fuller Company; 85-20.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); 739, Dow Silicone.

b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.

c. Speedline Corporation; Speedline Vinyl Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2:04 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-35.

b. Foster Products Corporation, H. B. Fuller Company; 30-90.

c. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180°F.

4. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.

5. Color: White.

2:05 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-52.

b. Foster Products Corporation, H. B. Fuller Company; 81-42.
c. Vimasco Corporation; 136.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250°F.

5. Color: Aluminum.

6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B ASJ Flashing Sealants, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one the following:

    a. Childers Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250°F.

5. Color: White.

6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2:07 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2:08 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.

    b. Proto PVC Corporation; LoSmoke.

    c. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.

3. Color: White.

4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

5. Factory-fabricated tank heads and tank side panels.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; Metal Jacketing Systems.

b. PABCO Metals Corporation; Surefit.

c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Factory cut and rolled to size.

b. Finish and thickness are indicated in field-applied jacket schedules.

c. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.

2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.

3) Tee covers.

4) Flange and union covers.
5) End caps.

6) Beveled collars.

7) Valve covers.

8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

a. Factory cut and rolled to size.

b. Material, finish, and thickness are indicated in field-applied jacket schedules.

c. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.

2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.

3) Tee covers.

4) Flange and union covers.

5) End caps.

6) Beveled collars.

7) Valve covers.

8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2:10 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.

b. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.

c. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.

3. Thickness: 11.5 mils.

4. Adhesion: 90 ounces force/inch in width.

5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.

7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.

b. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.

c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.

3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.

5. Elongation: 500 percent.

6. Tensile Strength: 18 lbf/inch in width.

2:11 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products; Bands.

b. PABCO Metals Corporation; Bands.

c. RPR Products, Inc.; Bands.

d. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, ½ inch wide with wing or closed seal.

e. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

a. Products: Subject to compliance with requirements, provide one of the following:

1) AGM Industries, Inc.; CWP-1.

2) GEMCO; CD.

3) Midwest Fasteners, Inc.; CD.

4) Nelson Stud Welding; TPA, TPC, and TPS.

2. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide one of the following:

      1) AGM Industries, Inc.; Tactoo Insul-Hangers, Series T.

      2) GEMCO; Perforated Base.

      3) Midwest Fasteners, Inc.; Spindle.

   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

   c. Spindle: copper- or zinc-coated, low carbon steel fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel, or stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1½ inches in diameter.

   a. Products: Subject to compliance with requirements, provide one of the following:
      1) AGM Industries, Inc.; RC-150.

      2) GEMCO; R-150.

      3) Midwest Fasteners, Inc.; WA-150.

      4) Nelson Stud Welding; Speed Clips.

   b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal ¾ inch wide, stainless steel or Monel.

D. In paragraph below, stainless steel is the most common wire used and is best suited for all applications.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. C & F Wire.

    b. Childers Products.

    c. PABCO Metals Corporation.

    d. RPR Products, Inc.

2:12 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 – EXECUTION

3:01 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3:02 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

3:03 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

    1. Install insulation continuously through hangers and around anchor attachments.

    2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

    3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

    4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

    1. Draw jacket tight and smooth.

    2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

    3. Overlap jacket longitudinal seams at least 1½ inches. Install insulation with

longitudinal seams at top of pipe. Staple laps with outward clinching staples along edge at 2 inches o.c.

a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.

2. Testing agency labels and stamps.

3. Nameplates and data plates.

4. Manholes.

5. Handholes.

6. Cleanouts.

3:04 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.

4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.

4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3:05 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.

2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.

3. Protect exposed corners with secured corner angles.

4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.

    b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.

    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.

    d. Do not overcompress insulation during installation.

    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.

    f. Impale insulation over anchor pins and attach speed washers.

    g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel bands.

6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.

7. Stagger joints between insulation layers at least 3 inches.

8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.

9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.

2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch-diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.

2. Fabricate boxes from galvanized steel or stainless steel, at least 0.050 inch thick.

3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3:06 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe

diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket, except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
   1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.

   2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

   3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.

   4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3:07 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3. Install insulation to flanges as specified for flange insulation application.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3:08 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.

4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

4. Install insulation to flanges as specified for flange insulation application.

3:09 FIELD-APPLIED JACKET INSTALLATION

A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturers recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weather-proof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3:10 FINISHES

A. Equipment and Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Engineer. Vary first and second coats to allow visual inspection of the completed Work.

3:11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

2. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, two locations of threaded fittings, two locations of welded fittings, one locations of threaded strainer, one location of welded strainers, one locations of threaded valve, and one locations of flanged valve for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3:12 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Domestic water pump insulation shall be the following:

1. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.

D. Domestic hot-water pump insulation shall be the following:

1. Mineral-Fiber Board: 1 inch thick and 3-lb/cu. ft. nominal density.

E. Domestic water hydropneumatic tank insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber Pipe and Tank: 1 inch thick.

F. Domestic hot-water storage tank insulation shall be one of the following, of thickness to provide an R-value of 12.5:

1. Mineral-Fiber Board: 3-lb/cu. ft. nominal density.
2. Mineral-fiber pipe and tank.

G. Piping system filter-housing insulation shall be one of the following:

1. Mineral-Fiber Board: 2 inches thick and 3-lb/cu. ft. nominal density.
2. Mineral-Fiber Pipe and Tank: 2 inches thick.

3:13 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.

2. Underground piping.

3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3:14 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:

a. Flexible Elastomeric: ¾ inch thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1¼ and Larger: Insulation shall be one of the following:

a. Flexible Elastomeric: 1 inch thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1½ inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1¼ and Smaller: Insulation shall be one of the following:

a. Flexible Elastomeric: ¾ inch thick.

b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1½ and Larger: Insulation shall be one of the following:

a. Flexible Elastomeric: 1 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1½ inch thick.

C. Hot Service Drains:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe, Type I or II: 1 inch thick.

3:15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Equipment, Exposed:

1. PVC: 30 mils thick.

D. Piping, Exposed:

1. PVC: 30 mils thick.

END OF SECTION

SECTION 221116

DOMESTIC WATER PIPING

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.

2. Encasement for piping.

3. Flexible connectors.

1:03 PERFORMANCE REQUIREMENTS

Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1:04 SUBMITTALS

A. Product Data: For the following products:

1. Specialty valves.

2. Transition fittings.

3. Dielectric fittings.

4. Flexible connectors.

5. Backflow preventers and vacuum breakers.

6. Sleeves and sleeve seals.

7. Water penetration systems.

B. Water Samples: Specified in "Cleaning" Article.

C. Field quality-control reports.

1:05 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 – PRODUCTS

2:01 PIPING MATERIALS

Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2:02 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D 1785, Schedule 80.

1. PVC Socket Fittings: ASTM D 2467 for Schedule 80.
2. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

2:03 PIPING JOINING MATERIALS

A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2:04 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Form: Sheet or Tube.

C. Material: LLDPE film of 0.008-inch minimum thickness or high-density, cross-laminated PE film of 0.004-inch minimum thickness.

D. Color: Black.

2:05 SPECIALTY VALVES

A. PVC Union Ball Valves: Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Valve, Inc.
2. Asahi/America, Inc.
3. Colonial Engineering, Inc.
4. Fischer, George Inc.
5. Hayward Flow Control Systems; Hayward Industrial Products, Inc.
6. IPEX Inc.
7. Jomar International, LTD.
8. King Bros. Industries.
9. Legend Valve.
10. McDonald, A.Y. Mfg. Co.
11. NIBCO INC.
12. Sloane, George Fischer, Inc.
13. Spears Manufacturing Company.
14. Thermoplastic Valves Inc.

B. Description:

1. Standard: MSS SP-122.
2. Pressure Rating: 125 psig at 73 deg F.
3. Body Material: PVC.
4. Body Design: Union type.
5. End Connections for Valves NPS 2 and Smaller: Detachable.
6. Ball: PVC; full port.
7. Seals: PTFE or EPDM-rubber O-rings.
8. Handle: Tee shaped.

C. PVC Ball Check Valves: Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Valve, Inc.
2. Asahi/America, Inc.
3. Colonial Engineering, Inc.
4. Fischer, George Inc.
5. Hayward Flow Control Systems; Hayward Industrial Products, Inc.
6. IPEX Inc.
7. Legend Valve.
8. NIBCO INC.

9. Sloane, George Fischer, Inc.
10. Spears Manufacturing Company.
11. Thermoplastic Valves Inc.

D. Description:

1. Pressure Rating: 125 psig at 73 deg F.
2. Body Material: PVC.
3. Body Design: Union type ball check.
4. End Connections for Valves NPS 2 and Smaller: Detachable.
5. Ball: PVC.
6. Seals: EPDM or FKM-rubber O-rings.

2:06 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Charlotte Pipe and Foundry Company.
b. Harvel Plastics, Inc.
c. Spears Manufacturing Company.

2. Description: CPVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket or threaded end.

D. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Colonial Engineering, Inc.
b. NIBCO INC.
c. Spears Manufacturing Company.

2. Description: PVC four-part union. Include brass threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

2:07 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 – EXECUTION

3:01 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

C. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

D. Install domestic water piping level with 0.25 percent slope downward toward drains and plumb.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping adjacent to equipment and specialties to allow service and maintenance.

G. Install piping to permit valve servicing.

H. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

3:02 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following.

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. PVC Piping: Join according to ASTM D 2855.

3:03 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic Water Piping Specialties."

D. In Aboveground Domestic Water Piping: Plastic-to-metal transition fittings or unions.

3:04 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.

2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls.

C. Support vertical piping and tubing at base and at each floor.

D. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.

E. Install supports for vertical PVC piping every 48 inches.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3:05 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.

2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3:06 ESCUTCHEON INSTALLATION

Install escutcheons for penetrations of walls, ceilings, and floors in accordance with Division 22 Section "Escutcheons for Plumbing Piping."

3:07 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe Insulation using joint sealants appropriate for size, depth, and location of joint.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using wall penetration systems.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide ¼-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.

2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe or Stack sleeve fittings.

    a. Extend sleeves 2 inches above finished floor level.

    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. Steel pipe sleeves for pipes smaller than NPS 6.

    b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.

    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

3:08 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3:09 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3:10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least three days before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.

3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.

4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.

6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3:11 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.

3. Open throttling valves to proper setting.

4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.

6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3:12 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3:14 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. PVC, Schedule 80 pipe, socket fittings and solvent cemented joints.

3:15 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller.

2. Throttling Duty: Use ball valves for piping NPS 2 and smaller.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

D. PVC valves matching piping materials may be used.

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Balancing valves.

2. Strainers.

3. Water hammer arresters.

1:03 PERFORMANCE REQUIREMENTS

Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1:04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1:05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. NSF Compliance:

1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 – PRODUCTS

2:01 BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong International, Inc.

b. Flo Fab Inc.

c. ITT Industries; Bell & Gossett Div.

d. NIBCO INC.

e. Watts Industries, Inc.; Water Products Div.

2. Type: Ball or Y-pattern globe valve with two readout ports and memory setting indicator.

3. Body: Brass or bronze,

4. Size: Same as connected piping, but not larger than NPS 2.

5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Cast-Iron Calibrated Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong International, Inc.
b. Flo Fab Inc.

c. ITT Industries; Bell & Gossett Div.

d. NIBCO INC.

e. Watts Industries, Inc.; Water Products Div.

2. Type: Adjustable with Y-pattern globe valve, two readout ports, and memory-setting indicator.

3. Size: Same as connected piping, but not smaller than NPS 2½.

C. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

2:02 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.

2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2½ and larger.

3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2½ and larger.

4. Screen: Stainless steel with round perforations, unless otherwise indicated.

5. Perforation Size:

a. StrainersNPS 2 and Smaller: 0.033 inch.

b. Strainers NPS 2½ to NPS 4: 0.045 inch.

c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Factory-installed, hose-end drain valve.

2:03 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.

b. MIFAB, Inc.

c. Sioux Chief Manufacturing Company, Inc.

d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.

3. Type: Metal bellows or Copper tube with piston.

4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

PART 3 – EXECUTION

3:01 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install balancing valves in locations where they can easily be adjusted.

C. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

D. Install water hammer arresters in water piping according to PDI-WH 201.

3:02 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3:03 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

2. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3:04 ADJUSTING

Set field-adjustable flow set points of balancing valves.

END OF SECTION

DIVISION 26 - ELECTRICAL

260519	Low-Voltage Electrical Power Conductors and Cables
260526	Grounding and Bonding for Electrical Systems
260529	Hangers and Supports for Electrical Systems
260533	Raceways and Boxes for Electrical Systems
260544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
260548	Vibration and Seismic Controls for Electrical Systems
260553	Identification for Electrical Systems
262816	Enclosed Switches and Circuit Breakers

SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1:03 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1:04 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

PART 2 – PRODUCTS

2:01 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Types THW and THHN-THWN.

D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

2:02 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 – EXECUTION

3:01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3:02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THW, THHN-THWN, or XHHW single conductors in raceway.

B. Exposed Feeders: Type THW or THHN-THWN single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THW or THHN-THWN single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THW or THHN-THWN single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or Metal-clad cable, Type MC.

1. Metallic cable may be used on this project only as follows:

a. From junction box to light fixture (8 feet maximum length);
b. For lighting circuits from light fixture to light fixture above accessible ceilings (10 feet maximum length);
c. Connection to motors (2 feet maximum);
d. Branch circuits in stud walls.

2. All other wiring shall be installed in EMT or rigid metal conduit unless approved otherwise by the Engineer prior to installation. All feeder wiring shall be run in conduit. All branch circuit wiring shall be run in conduit from the panel to the room/area served by the branch circuit.

F. Class 1 Control Circuits: Type THHN-THWN, in raceway.

G. Class 2 Control Circuits: Type THHN-THWN, in raceway or Power-limited cable, concealed in building finishes.

3:03 INSTALLATION OF CONDUCTORS AND CABLES

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

D. Support cables according to Section 260529 “Hangers and Supports for Electrical Systems.”

E. Identify and color-code conductors and cables according to Section 260553 “Identification for Electrical Systems.”

3:04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3:05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 “Sleeves and Sleeve Seals for Electrical Raceways and Cabling.”

3:06 FIRESTOPPING

Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to match original or designed fire-resistance rating of assembly.

3:07 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes: Grounding systems and equipment.

1:03 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 – PRODUCTS

2:01 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2:02 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

PART 3 – EXECUTION

3:01 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

3:02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Receptacle circuits.
3. Single-phase motor and appliance branch circuits.
4. Three-phase motor and appliance branch circuits.
5. Flexible raceway runs.
6. Armored and metal-clad cable runs.

3:03 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing

conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

C. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3:04 LABELING

A. Comply with requirements in Section 260553 "Identification for Electrical Systems" for instruction signs. The label or its text shall be green.

3:05 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground individual ground rods. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Section 260548 “Vibration and Seismic Controls for Electrical Systems” for products and installation requirements necessary for compliance with seismic criteria.

1:03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1:04 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1:05 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1:06 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

Part 2 – PRODUCTS

2:01 SUPPORT, ANCHORAGE AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated or stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2:02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 – EXECUTION

3:01 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where it's Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be ¼ inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1½ inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3:02 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3:03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3:04 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 3.

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturers written instructions.

3:05 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with “Exterior Painting” and “Interior Painting” for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Metal wireways and auxiliary gutters.
3. Boxes, enclosures, and cabinets.

1:03 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

PART 2 – PRODUCTS

2:01 METAL CONDUITS, TUBING AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
7. Republic Conduit.
8. Robroy Industries.
9. Southwire Company.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
12. Wheatland Tube Company; a division of John Maneely Company.

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. ARC: Comply with ANSI C80.5 and UL 6A.

E. IMC: Comply with ANSI C80.6 and UL 1242.

F. PVC-Coated Steel Conduit: PVC-coated IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

G. EMT: Comply with ANSI C80.3 and UL 797.

H. FMC: Comply with UL 1; zinc-coated steel or aluminum.

I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

2. Fittings for EMT:
   a. Material: Steel or die cast.
   b. Type: Setscrew or compression.

3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2:02 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.

4. Square D; a brand of Schneider Electric.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be NEMA 3R listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: NEMA 1 - Screw-cover type; NEMA 3R - Flanged-and-gasketed type unless otherwise indicated.

E. Finish: Manufacturer's standard enamel finish.

2:03 BOXES, ENCLOSURES AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. FSR Inc.
6. Hoffman; a Pentair company.
7. Hubbell Incorporated; Killark Division.
8. Kraloy.
9. Milbank Manufacturing Co.
10. Mono-Systems, Inc.
11. O-Z/Gedney; a brand of EGS Electrical Group.
12. RACO; a Hubbell Company.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Thomas & Betts Corporation.
16. Wiremold/Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb. shall be listed and marked for the maximum allowable weight.

F. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 2-gang - 4 inches square by 2-1/8 inches deep; single gang - 4 inches by 2-1/8 inches by 2-1/8 inches deep.

K. Gangable boxes are allowed beyond 2-gang boxes.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer’s standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer’s standard enamel.

M. Cabinets:

1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 – EXECUTION

3:01 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC, PVC-coated IMC, or ARC.
2. Concealed Conduit, Aboveground: IMC.
3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: IMC. Raceway locations include the following:

    a. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations, and for connection to mechanical equipment in mechanical rooms.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: ¾ inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

3:02 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 260529 “Hangers and Supports for Electrical Systems” for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Raceways are NOT permitted in floor slabs on grade or elevated floor slabs, only below slabs on grade.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer’s written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1¼ inch trade size and insulated throat metal bushings on 1½ inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus ¼ turn more.

P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

W. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3:03 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 “Sleeves and Sleeve Seals for Electrical Raceways and Cabling.”

3:04 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated wall assemblies.

3:05 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

PART 2 – PRODUCTS

2:01 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2:02 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2:03 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2:04 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2:05 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 – EXECUTION

3:01 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide ¼ inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3:02 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3:03 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 260548

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

B. Related Sections include the following:

1. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1:03 DEFINITIONS

A. The IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1:04 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC.

a. Component Importance Factor: 1.0.
b. Component Response Modification Factor: 1.5.
c. Component Amplification Factor: 1.0.

1:05 ACTION SUBMITTALS

A. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.

a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other electrical Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1:06 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

B. Qualification Data: For testing agency.

C. Welding certificates.

D. Field quality-control test reports.

1:07 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing

laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 – PRODUCTS

2:01 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

B. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to ¼ inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

D. Restrained Spring Isolators : Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to ¼ inch- thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2:02 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division.
6. Mason Industries.
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 603 galvanized or ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or reinforcing steel angle clamped to hanger rod. Do not weld stiffeners to rods.

F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2:03 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.

4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 – EXECUTION

3:01 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3:02 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3:03 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:

1. Install restrained isolators on electrical equipment.
2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3:04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3:05 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Engineer, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Engineer's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four of each type and size of installed anchors and fasteners selected by Engineer.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3:06 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General, Special, and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1:03 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1:04 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 – PRODUCTS

2:01 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on a white field.
2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

G. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2:02 METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on a white field.

2. Legend: Indicate voltage and system or service type.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2:03 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

D. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

E. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2:04 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pre-tensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pre-tensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

F. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2:05 FLOOR MARKING TAPE

A. 2-inch- wide, yellow semi-gloss paint, with stripes in clear zone area.

2:06 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. ¼ inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
2. ¼ inch grommets in corners for mounting.
3. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES" (for 208V systems) "48 INCHES" (for 480V systems).

2:07 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2:08 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73°F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185°F.
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73°F, According to ASTM D 638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185°F.
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73°F, According to ASTM D 638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284°F.
5. Color: Black.

2:09 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location
(exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 – EXECUTION

3:01 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3:02 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label or self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.

   a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.

   b. Colors for 208/120-V Circuits:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.

   c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Workspace Indication: Paint floor markings to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

I. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

J. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for power transfer and load shedding.

K. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Switchboards and Panelboards: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with ½ inch (13 mm) high letters on 1½ inch (38 mm) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Individual Circuit Breakers in Switchboards: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with ½ inch (13 mm) high letters on 1½ inch (38 mm) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    c. Indoor Equipment: Adhesive film label or Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with ½ inch (13 mm) high letters on 1½ inch (38 mm) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    d. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    e. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Update existing directory. Typewritten directory of circuits in the location provided by panelboard manufacturer. Directory shall list what the breaker serves and the actual room numbers/areas, not Architectural room numbers. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Switchboards and the individual circuit breakers contained within it.
   d. Emergency system boxes and enclosures.
   e. Enclosed switches.
   f. Enclosed circuit breakers.
   g. Enclosed controllers.
   h. Variable-speed controllers.
   i. Push-button stations.
   j. Contactors.

END OF SECTION

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 – GENERAL

1:01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General, Special and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1:02 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1:03 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1:04 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.”

1:05 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.

2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1:06 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1:07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. Include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2, Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of over current protective device.

1:08 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1:09 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22° F and not exceeding 104° F.
2. Altitude: Not exceeding 6600 feet.

1:10 COORDINATION

Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 – PRODUCTS

2:01 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Siemens Energy & Automation, Inc.
2. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate required fuses,

lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Hookstick Handle: Allows use of a hookstick to operate the handle.
5. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.
6. Service-Rated Switches: Labeled for use as service equipment.

2:02 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Siemens Energy & Automation, Inc.
2, Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Hookstick Handle: Allows use of a hookstick to operate the handle.
4. Lugs: Mechanical or Compression type, suitable for number, size, and conductor material.

2:03 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Siemens Energy & Automation, Inc.
2. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

E. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

F. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

G. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical or Compression type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

2:04 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen Areas: NEMA 250, Type 4X.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.

PART 3 – EXECUTION

3:01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3:02 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548 “Vibration and Seismic Controls for Electrical Systems.”

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3:03 IDENTIFICATION

A. Comply with requirements in Section 260553 “Identification for Electrical Systems.”

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.

2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3:04 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3:05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION