

## DIVISION 37

### MASONRY

**37.01 SCOPE:** The work in this section includes the furnishing of all labor, materials, equipment and other incidentals to construct the masonry walls, door and woodwork for the pumping station in accordance with the Contract Documents and BOCA code.

**37.02 MATERIALS:**

- A. Concrete Masonry Units: Shall be hollow load-bearing concrete block walls conforming to ASTM C90, Grade N-I, of nominal sizes as shown on the plans. Block used in unprotected exterior walls and in walls below grade shall consist of normal weight aggregate conforming to ASTM 33. All other block shall consist of lightweight aggregate conforming to ASTM C331. All interior partition units shall meet UL requirements for two hour fire rated concrete masonry units. Lintels, bond beams and other special shapes shall be provided where indicated or required. Block shall be sound and free from cracks and other defects that interfere with proper placing, and shall have smooth, close-textured, and uniformly colored surfaces, suitable for exposed walls.
- B. Brick: ASTM C216, Grade SW Type (FSS) brick for brick veneer shall be standard size as selected by Owner, based on samples as provided in accordance with the General Conditions. An allowance of \$150.00 per thousand shall be made by the Contractor.
- C. Mortar:
1. Portland Cement: ASTM C150, Type 1
  2. Sand: Clear, Sharp, graded from fine to coarse, ASTM C-144
  3. Water: Clean and potable
  4. Mixture: One (1) part cement, two (2) parts sand
- D. Horizontal Joint Reinforcement: ASTM A-82, fabricated from cold drawn steel wire. The wire shall be zinc-coated after fabrication by the hot-dip process in accordance with ASTM A-153, Class B-2. Reinforcement shall consist of two or more parallel longitudinal wires, not less than 0.1875-inch in diameter, weld connected with truss-type cross wires, not less than 0.1483-inch diameter at minimum 16 inches o.c. The out-to-out spacing of the longitudinal wires shall be 1-1/2 to 1-3/4 inches less than the actual width of the masonry wall. The distance between welded contacts of cross wires with each longitudinal wire shall not exceed 6 inches for smooth wire and 16 inches for deformed wire. Joint reinforcement shall be provided in flat sections, not less than 10 feet in length, except that corner reinforcements and other special shapes may be less in length.

E. Reinforcing Bars for lintels, bond beams and elsewhere as required shall conform to ASTM A615 deformed, Grade 60.

F. Anchors and Ties: Galvanize anchors and ties after fabrication in accordance with ASTM A153, Class B-1, B-2 or B-3.

1. Rigid Steel Anchors: ASTM A36, 1/4 inch by 1-1/2 inch with ends turned two inches up and two inches, down, not less than 16 inches long for eight-inch and four-inch walls, and not less than 24 inches long for twelve-inch walls. Maximum wall thickness at intersections shall govern anchor lengths.

2. Adjustable Anchors: Triangular anchors of 1/4 inch diameter mill galvanized wire and weld-on rod of 1/4 inch diameter round bright basic wire. Select from one of the following:

<u>Manufacturer</u>	<u>Product</u>
A.A. Wire Products Co.	Flex-O-Lok
Heckman Building Products	Nos. 315 & 316
Hohmann and Barnard, Inc.	VWT & 359
Jim Taylor, Inc.	Triangle-Ty

G. Control Joints: "Dur-O-Wall", regular rapid control joint or Hohmann and Barnard, Inc., "Quadri-Seal", control joint, sizes as indicated or required.

1. Wire Mesh Ties: Tie wire, not lighter than 20-gauge, galvanized, in 1/2-inch mesh, and of suitable width and length.

2. Corrugated Metal Ties: Not less than 7/8-inch wide, approximately 6 inches long, and not lighter than 22 gauge.

H. Miscellaneous Flashing: Miscellaneous flashing, including thru-wall, lintel, sill, and flashing at heads of openings, shall be one of the following:

1. Thirty (30) U.S. Standard gauge stainless steel with ribs or deformations designed to provide an interlocking mechanically keyed bond in the mortar bed to prevent movement in all lateral directions.

2. Five-ounce copper or 38 U.S. Standard gauge stainless steel factory bonded between two layers of waterproof, rot and mold-resistant, and reinforced Kraft covering.

3. A dual metal core of copper bonded with asphalt to a of lead, factory bonded between layers of waterproof, rot and mold-resistant and reinforced Kraft covering. Total metal core weight shall be 5 ounces.

I. Masonry Grout:

1. Proportions: Parts by Volume. Measurement by shovel not permitted.

<u>Portland Cement</u>	<u>Sand</u>	<u>Coarse Aggregate</u>
One Part	2½ Parts	1½ Part (Maximum size 3/8")

2. Mixing Grout: Mix materials in a mechanical batch mixer for a minimum of five minutes. Add sufficient water to provide a fluid mix.

**37.03 MATERIAL STORAGE:** All mortar materials shall be stored under cover in a dry place so that damage from moisture, freezing and other sources are prevented. Masonry unit shall be piled on plank platforms in dry locations, and shall be protected with tarpaulins or other suitable material until laid in the wall. Reinforcement and other metal items shall be protected from the elements.

**37.04 GENERAL:** All masonry work shall be done by skilled craftsmen in a workmanlike manner throughout. Exterior walls shall be completely waterproof. Masonry shall be loaded, unloaded, stored, and handled in such manner as to prevent chipping, scratching, or other damage. Slightly damaged masonry units may be used in areas not exposed to view; no chipped, marred, or otherwise damaged masonry units will be permitted where exposed to view in the finished work.

A. Submittals:

1. Test Reports: Submit to the Engineer two copies of tests reports certifying that masonry units meet specified ASTM requirements as per the General Conditions.
2. Certificates: Submit to the Engineer certificates certifying that fire-rated concrete masonry units meet specified UL requirements.

B. Tests: Using the services of an approved independent testing laboratory, test representative samples of each type of concrete masonry unit incorporated into the work. Test samples in accordance with ASTM C140. Manufacturer of concrete masonry units shall pay for all tests.

C. Certification: Manufacturer of fire-rated concrete masonry units shall certify that fire-rated units have been manufactured in accordance with UL requirements for indicated rating. Base certification on inspections made by an approved independent testing laboratory. Manufacturer shall pay for all costs incurred in certifying fire-rated units.

**37.05 ERECTION:** Masonry shall be laid plumb, square and true to lines and dimensions. Courses shall be level with joints uniform and properly tooled.

A. General Requirements:

1. In laying masonry units, over-plumbing and pounding on corners and jambs to fit stretcher units shall be avoided after units are set in position. Where an adjustment must be made after mortar has started to set, the mortar shall be removed and replaced with fresh mortar. If necessary to "stop-off" a horizontal run of masonry, rack back half block length in each course. Toothing will not be permitted. When work is resumed, remove loose units and clean contact surfaces of all mortar and debris.
2. Where fresh masonry joins masonry that has partially or totally set, the exposed surface of the set masonry shall be cleaned, roughened and lightly wetted so as to obtain the best possible bond with the new work. All loose masonry and mortar shall be removed.
3. During erection, walls shall be kept dry by covering at the end of each day or shutdown period with canvas or waterproof paper. Partially completed walls not being worked on shall be similarly protected at all times. Covering shall overhang at least 2 feet on each side of the wall.
4. Work by other trades, including door and window frames, louvered openings, pipes, anchors, miscellaneous metal work, flashing, etc., shall be built in carefully and neatly as masonry work progresses.

Spaces around metal doorframes shall be filled solidly with mortar. Control joints with pre-molded filler strips set rigidly in place shall be provided where indicated. Keep the open space at expansion and control joints free of mortar by using a continuous wood or metal strip set temporarily in walls.

5. No masonry shall be laid when the temperature of outside air is below 40 degrees F. unless suitable means are provided to heat masonry materials and protect completed work from freezing. Protection shall consist of heating masonry materials to at least 40 degrees F., and maintaining an air temperature of above 40 degrees F. on both sides of the masonry for a period of at least 48 hours.
6. Do not wet units prior to setting. However, in drying weather-brush a small amount of water on contact surfaces to obtain a good bond.
7. Lintel and bond beam units shall be reinforced as detailed and filled with masonry grout. Minimum bearing of lintels at each end shall be S inches unless otherwise noted.

8. Forms and Shoring: Forms and shoring for beams and other members supporting masonry and for reinforced masonry members shall conform to the shape, lines and dimensions of members indicated and shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry. Approved curing conditions shall be maintained, and forms shall remain on girders and beams not less than 10 days, and on slabs not less than 7 days, after completion of the members. No less than 16 hours shall elapse before uniform construction loads are applied to completed masonry members. Not less than 64 hours shall elapse before concentrated loads are applied.
9. Adequately brace walls against displacement during construction.

B. Concrete Masonry Units:

1. The first course of concrete masonry units shall be laid on a full bed of mortar for the full width of the unit; succeeding courses of block shall be laid with full mortar coverage on horizontal and vertical shells. Vertical joints shall be shoved tight. The bed joints of concrete masonry unit shall be formed by applying the mortar to the entire top surfaces of the inner and outer face shells, and the head joints shall be formed by applying the mortar for a width of about one-inch to the ends of the adjoining units laid previously. The mortar for joints shall be smooth, nor furrowed, and shall be of such thickness that it will be forced out of the joints as the units are being placed in position. Where anchors, bolts and ties occur within the cells of the units, such cells shall be filled with masonry grout as the work progresses. Metal latch shall be placed under cells before they are filled. Concrete brick shall be used for bonding walls, working out the coursing, topping out walls under sloping slabs, distributing concentrated loads, backing brick headers, and elsewhere as required.
2. Exposed Concrete Units: Concrete masonry units for exposed walls shall be selected for undamaged edges and ends of the exposed surfaces, it is not intended that all units within any one wall or partition be perfect without slight cracks and small chips, but rather that discretion be used in selecting the units with closer matching faces and least imperfections for exposure to view. Special attention shall be given to placing the units plumb, parallel and with a properly tooled joint. Exposed surfaces shall be kept clean and free of blemishes. Bond pattern shall be as indicated and specified. Upon completion, and after grouting and point, exposed surfaces shall present a reasonably uniform appearance not unpleasing to the eye and suitable to receive decorative finish. Masonry units which exceed imperfections allowed by ASTM C-90 shall not be used in walls and partitions exposed to view.

3. Reinforced Concrete Masonry Unit Walls: Walls shall be laid in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Cross webs adjacent to vertical cores that are to be filled with grout shall be fully embedded in mortar, to prevent leakage of grout, mortar fins protruding from joints shall be removed before grout is placed; the minimum clear dimensions of vertical cores shall be 2 inches by 3 inches. Reinforcing shall be positioned accurately as indicated.

As masonry work progresses, vertical reinforcing shall be rigidly secured in place at vertical intervals not to exceed 160-bar diameters. Horizontal reinforcing shall be embedded in grout as grouting proceeds. The minimum clear distance between masonry and vertical reinforcement shall not be less than 1/2 inch. Unless indicated or specified otherwise, splices shall be formed by lapping bars not less than 20-bar diameters and wire tying them together.

4. Exercise care in laying up units so that anchors, reinforcement and other materials specified elsewhere will be built in as the work progresses. Reinforce and anchor masonry in accordance with these specifications, the drawings, and requirements of the applicable building code. Where conduit, outlet and switchboxes or other openings occur, cut masonry units neatly. Cut units with power-driven masonry saws only.
5. Concrete block shall be laid in running bond unless otherwise shown. Joints shall be 3/8 inch.
6. Cutting of units shall be done with a power-driven masonry saw.
7. Wall and Partition Intersections: Unless indicated otherwise, partitions shall extend from the floor to the bottom of the roof construction above. Walls and partitions shall be structurally bonded or anchored to each other and to beams and columns; partitions and interior walls shall be securely anchored or wedged to the construction above. Wedging shall be done with slate, metal, or clay tile shims, at least two days after the erection of the wall or partition, and the top joint shall be filled solidly with mortar.
8. Openings and Accessories: Door and window frames, louvered openings, anchors, pipes, ducts and conduits shall be built in carefully and neatly as the masonry work progresses. Ties and anchors shall be placed accurately as shown or herein specified, as the work progresses. Grouting of ties or anchors into hardened mortar or grout will not be permitted. Spaces around metal door frames shall be filled solidly with mortar. Structural steelwork, bolts, anchors, inserts, plugs, ties, lintels and miscellaneous metalwork specified elsewhere shall be placed in position as the work progresses.

C. Jointing for Masonry: When mortar has become thumbprint hard, all exposed masonry joints shall be compressed and tooled with an approved jointer, unless otherwise specified. Width of Joints shall be as specified herein before. After jointing and when mortar is sufficiently hard, walls shall be rubbed lightly with burlap to knock off loose particles.

1. Interior concrete block shall have concave joints, unless otherwise noted.
2. Exterior solid split face masonry units shall have 3/8 inch raked joints.
3. Joints shall be uniform in thickness and the average thickness of any three consecutive Joints shall be 3/8 to 1/2 inch, to be adjusted and approved as initial placement commences. Story poles or gage rods shall be made and approved prior to starting the work and shall be used throughout the work. Changes in coursing or bonding after the work is started will not be permitted. Exposed joints shall be tooled slightly concave with a round or other approved jointer, when the mortar is thumbprint hard. The Jointer shall be slightly larger than the width of the joint so that complete contact is made along the edges of the units, compressing and sealing the surface of the joint. Tools which cause discoloration shall not be used. Joints shall be tooled first. Joints shall be brushed to remove all loose and excess mortar. All horizontal joints shall be level. Vertical joints shall be plumb and in alignment from top to bottom of wall within a tolerance of plus or minus 1/2 inch.

Weep holes shall be provided at base of walls and other locations indicated. Unless indicated otherwise, weep holes shall be constructed of open masonry head joints spaced 24 to 32 inches apart.

D. Types, Proportions and Mixing of Mortar: Mortar types and proportions shall conform to ASTM C-270.

1. Mortar Types:
  - a) Mortar for masonry in contact with earth shall be Type M.
  - b) Mortar for exposed exterior walls and interior load bearing walls shall be Type S.
  - c) Mortar for interior non-load bearing masonry partitions shall be Type N.
2. Mortar Proportions: Parts by volume.
  - a) Cement-Lime Mortar

<u>Type</u>	<u>Portland Cement</u>	<u>Hydrated Lime</u>	<u>Sand</u> (measure in Damp loose conditions)
M	1	¼	Not less than
S	1	¼ to ½	2¼ and not more than 3 times
N	1	½ to 1¼	the sum of the volumes of cement and lime used.

- b. Masonry Cement Mortar: Subject to approval of the Engineer, mortar may be mixed with masonry cement as specified below.

<u>Type</u>	<u>Portland Cement</u>	<u>Masonry Cement</u>	<u>Sand</u>
M	1	1	6
S	½	1	4½
N	0	1	3

3. Mixing of Mortar: Mortar ingredients shall be mixed in bins of an approved type, and shall be thrown in loosely and not packed or shaken down. Under no conditions shall mortar be re-mixed or allowed to stand over 45 minutes.

D. Cleaning:

1. Cleaning: During construction, care shall be taken continuously to keep the exposed faces clean of mortar and other stains. When mortar joints reach thumbprint hardness and are tooled, the exposed work shall be brushed with a soft fiber brush to remove adhering mortar, and a wood paddle shall be used to remove more tenacious material. Do not wet concrete masonry units until mortar has thoroughly set. Clean masonry from scaffolding, not ladders. Bases of walls shall be protected from splash stains by covering the adjacent ground with sand, sawdust, or polyethylene. At the completion of the masonry work, holes in exposed masonry shall be pointed, and defective joints shall be cut out and tuck point solidly with mortar which has been retempered one to two hours after original mixing.
2. Exposed masonry shall be protected against staining from wall coverings or other sources and excess mortar shall be wiped off the surface as the work progresses.
3. Upon completion of work, all exposed masonry, including concrete block, shall be cleaned only with stiff brushes and water.

- E. Welded Wire Tie Reinforcement: Welded wire tie reinforcement shall be provided in every other course and in the first two courses above and below openings in walls of concrete masonry units. Reinforcement shall be continuous, except terminate reinforcing on each side of control joints. Reinforcement above and below openings shall extend not less than 24 inches beyond each side of openings. Reinforcement shall be provided in the longest available lengths, utilizing the minimum number of splices. Splices shall overlap not less than 12 inches. Welded "L" shaped assemblies, not less than 40 by 48 inches, and "T" shaped assemblies, not less than 32 by 32 inches, both of the same size members and the same construction as the straight reinforcement, shall be provided at corners and intersections of walls and partitions. Reinforcement shall be embedded in the mortar joints in such manner that all parts will be protected by mortar.
- F. Anchors and Ties:
1. Rigid Steel Anchors: Install rigid steel anchors 16 inches on centers vertically at all corners and intersections where prefabricated corner and tee wall reinforcing are not used.
  2. Adjustable Anchors: Weld rod to steel members and set anchors in horizontal joints of masonry wall spaced not more than two feet apart all columns and save purling.
- G. Reinforcing Rods: Secure reinforcing rods to prevent displacement by masonry grout.
- H. Grout Placement: Grouting shall be performed from the interior side of walls, except as approved otherwise. Sills, ledges, offsets and other surfaces to be left exposed shall be protected from grout droppings. Grout falling on such surfaces shall be removed immediately. Grout shall contain sufficient water to be of pouring consistency and sufficiently fluid to flow into joints and around reinforcing without leaving voids. Grout shall be well stirred before placing to avoid segregation of the aggregate and shall be placed by pumping; or pouring from chutes, buckets with spouts, or other spouted containers. The maximum height of grout pour for concrete masonry shall be 4 feet. Grout shall be rodded or agitated thoroughly to eliminate voids, but with caution not to displace masonry from its original position, nor to stain exposed surfaces. Masonry displaced by grouting shall be removed and laid in realignment with fresh mortar. Pours shall be kept at 1½ inches below the top of masonry units in the top course, except for the finish course. Each pouring of grout shall be re-rodded or otherwise re-agitated 1 to 1½ hours after placing.
- I. Miscellaneous Flashing: Install in strict accordance with the manufacturer's printed instructions and details. Flashing at sills and heads of openings shall

extend not less than four inches beyond jambs, with back and side edges turned up two inches to form a water dam.

Thru-wall flashing shall be provided in runs as long as practicable; end laps shall be not less than 4 inches and sealed in a watertight manner in strict accordance with the manufacturer's instructions, using an adhesive or high-grade asphaltic mastic as recommended by the manufacturer. Flashing materials through masonry walls shall be laid in the mortar joints so that both flashing faces are completely covered with mortar to provide the best bond possible. Care shall be taken not to puncture or otherwise damage the flashing during installation, and all damaged flashing shall be replaced with new flashing.

J. Protection:

1. Cover top of exposed masonry wall and partitions at the end of each day's work with waterproof paper or canvas.
2. Masonry shall be protected against freezing for at least forty-eight (48) hours after being laid.
3. Unless adequate precautions against freezing are provided with the approval of the Engineer, no masonry shall be laid when the temperature is below thirty (32) degrees F. on a rising temperature or below forty (40) degrees F. On a falling temperature.
4. No construction shall be built on frozen materials.
5. All masonry surfaces shall be adequately protected from damage by the operations of other trades on the job. And, portions of masonry which are damaged either structurally or in appearance shall be replaced.

**37.06 MEASUREMENT AND PAYMENT:** Masonry work will not be measured but will be included in the lump sum bid price for the pumping station.