SECTION 042200
CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
1. Provide all material, labor, equipment and services necessary to completely install all Concrete Masonry Unit (CMU) materials, accessories and other related items necessary to complete the Project as indicated by the Contract Documents.

1.2 REFERENCES

A. Standards:
1. In accordance with the following standards:
a. ACI American Concrete Institute
b. ASTM American Society of Testing Materials
c. CMACN Concrete Masonry Association of California and Nevada
d. NCMA National Concrete Masonry Association
1) TEK Bulletins
e. TMS The Masonry Society

1.3 DEFINITIONS

A. The following definitions occur within the CMU Industry:
1. Grout: The filler within the Cells of the Concrete Masonry Units.
2. Mortar: The joint material between the Concrete Masonry Units, both Top and Bottom and on the Ends.

1.4 SUBMITTALS

A. Submit in accordance with Specification Section - SUBMITTAL PROCEDURES:
1. Product Data: For each type of product specified.
a. Manufacturer's standard color range for selection by the Architect.
b. All data regarding Concrete Masonry Unit, type, and aggregate to be provided.
c. All data regarding mortar and grout materials, and mix designs to be provided.
d. All data regarding accessories to be provided.
2. Shop Drawings: For the following.
a. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

b. Reinforcing Steel: Detail bending and placement of concrete masonry unit reinforcing bars.

3. Samples. For each type, texture and color selected.
   a. Provide 4" x 4" x 1" nominal size Concrete Masonry samples for texture, color, finish and dimension provided on this project as examples of the major CMU Units for the project.
      1) Provide other chips for all others.
   b. Pigmented Mortar: Make samples using the same sand and mortar ingredients to be used on this project.
      1) Label samples to indicate types and amount of pigments used.
4. Quality Assurance/Control Submittals:
   a. Test Reports:
      1) Concrete Masonry Units: Lineal Shrinkage and Compressive Strength per ASTM C 140 “Test Methods for Sampling and Testing Concrete Masonry Units and Related Units and ASTM C 426 "Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units".
      2) Mortar and Grout: Grout Compressive Strength and Mortar Properties per ASTM C 270 “Specification for Mortar for Unit Masonry”.
      3) Masonry Core test shall be in accordance with CBC Section 2105A.
   b. Certificates:
      1) Concrete Masonry Unit Manufacturers Certification per ASTM C 90 “Specification for Loadbearing Concrete Masonry Units”.
      2) Concrete Masonry Unit Accessory Material Suppliers Certification.
      3) CMU producer shall be certified by the manufacturer of integral CMU water repellent admixture.
      4) Installer Certification.
      5) Contractors Certification.
5. Project Closeout Submittals:
   a. Warranty.
   b. Project Record Documents: In accordance with Specification Section – PROJECT CLOSEOUT.

1.5 QUALITY ASSURANCE

A. Qualifications:
   1. Material:
      a. Manufacturers certification that Concrete Masonry Units furnished meet or exceed the requirements of this Specification Section per ASTM C 90 “Specification for Loadbearing Concrete Masonry Units”.
   2. Suppliers certification for all grout and mortar materials (including aggregate, cement and admixtures) that items furnished meet or exceed the requirements of this Specification Section and per ASTM C 270 “Specification for Mortar for Unit Masonry and ASTM C 476 “Specification for Grout for Masonry”.
      a. Water Permeance of Masonry: ASTM E 514, “Standard Test Method for Water Penetration and Leakage through Masonry".

b. Compressive Strength of Masonry Prisms: ASTM C 1314, “Standard Test Method for Constructing and Testing Masonry Prisms Used to Determine Compliance with Specified Compressive Strength of Masonry.”
c. Drying Shrinkage of CMU: ASTM C 426, “Standard Test Method for Drying Shrinkage of Concrete Masonry Units".

3. Installer:
   a. Engage an experienced Installer who has successfully completed three (3) projects of similar scope and size to that indicated for this Project.
4. Manufacturer/Supplier:
   a. Firm experienced in successfully producing/supplying products similar to that indicated for this Project, with sufficient production/supply capacity to produce/supply required units without causing delay in the work.
   b. Manufacturer belonging to the CMACN.

B. Regulatory Requirements:
1. In accordance with Specification Section - REGULATORY REQUIREMENTS, and the following:
   a. CARB Materials and equipment used for this Project shall comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA), in the area where the project is located.

C. Certificates:
1. Installer's certification that Concrete Masonry Units installation meets or exceeds the requirements of this Specification Section.
2. Contractor's certification that Concrete Masonry Unit materials and installation meets or exceeds the requirements of this Specification Section.

D. Mockups:
1. Provide a four (4) foot by six (6) foot mock-up wall showing all Concrete Masonry Unit finishes in conjunction with one another, and the mortar joints and tooling required for this Project. Mock-up, once approved, will be the basis for verifying the aesthetic and structural quality of the work for this Project. Protect during construction.

E. Meetings:
1. Pre-Installation: Schedule prior to the start of work.
   a. Coordinate the work with other work being performed.
   b. Identify any potential problems that may impede planned progress and proper installation of work regarding quality of installation and warranty requirements.
   c. Include discussions on the integral water-repellent CMU admixture and water-repellent mortars.
2. Progress: Scheduled by the Contractor during the performance of the work.
   a. Review for proper installation of work progress and properly tooled joints.
   b. Identify any installation problems and acceptable corrective measures.
   c. Identify any measures to maintain or regain project schedule if necessary.
3. Completion: Scheduled by the Contractor upon proper completion of the work.
   a. Inspect and identify any problems, which may impede issuance of warranties or guaranties.

b. Maintaining installed work until the Notice of Substantial Completion has been executed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packing, Shipping, Handling, and Unloading:
1. Products shall be handled in such a manner as to assure that they are free from spalls, breakage and other damage.

B. Acceptance at Site:
1. Products must be in manufacturer's original wrapped pallets with labels indicating brand name, model, and grade.
2. Damaged products will not be accepted.

C. Storage and Protection:
1. Products shall be stored above ground on level platforms, six (6) inches above ground, allowing air circulation under stacked units.
a. Cover materials with protective waterproof covering providing for adequate air circulation and ventilation to prevent wetting prior to use.

1.7 PROJECT CONDITIONS

A. Environmental Requirements:
1. Rain: Work under this section shall not be started or maintained under threat of rain unless the work is protected from the rain.
2. Temperature: Ambient temperature to install products shall be forty (40) degrees Fahrenheit and rising.

B. Existing Conditions:
1. Examine site and compare it with the drawings and specifications. Thoroughly investigate and verify conditions under which the work is to be performed. No allowance will be made for extra work resulting from negligence or failure to be acquainted with all available information concerning conditions necessary to estimate the difficulty or cost of the work.
2. Conduct work so as not to interfere unnecessarily with adjacent roads, streets, drives and walks.

1.8 WARRANTY

A. Contractor's General Warranty:
1. In accordance with Specification Section - WARRANTIES.

B. Manufacturer's Warranty:
1. In accordance with manufacturer's written standard warranty:
a. Warranty Period One (1) Year.

C. Installer's Warranty:
1. In accordance with the terms of the Specification Section - WARRANTIES

a. Warranty Period — One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. These products listed herein establish the size, pattern, color range and function selected by the Architect for this Project. Manufacturers that are listed as acceptable alternative manufacturers and substitutions must still comply with the requirements of this project and the products listed in order to be approved as an equivalent during the Submittal Process. If the acceptable alternative manufacturers listed or substitutions are not approved during the Submittal Process due to non-compliance with the contract documents, then the Contractor shall submit product specified.
   1. Specified Concrete Masonry Unit product manufacturer:
      a. BASALITE.
   2. Specified Integral Water Repellent Admixture for CMU Production:
      a. "Rheopel" as manufactured by BASF, or
      b. "RainBloc" as manufactured by ACM CHEMISTRIES, or
      c. "Dry-Bloc II" as manufactured by W. R. GRACE and CO.
   3. Specified Pre-Blended Water Repellent Admixture for Mortar:
      a. "Rheopel Plus" as manufactured by BASF, or
      b. "RainBlock" as manufactured by ACM CHEMISTRIES, or
      c. "Dry-Bloc Integral Water Repellent" as manufactured by W. R. GRACE and CO.
   4. Specified Grout Admixture product manufacturer:
      a. "Grout Aid" by SIKA.
   5. Specified Joint Reinforcement, Ties and Anchors product manufacturer:
      a. HOHMANN AND BARNARD, INC.

B. Products from other manufacturers not listed must submit in accordance with Specification Section - SUBSTITUTION PROCEDURES.

2.2 MATERIALS

A. Block:
   1. Hollow Load Bearing Units in accordance with CBC Section 2103A.1, and ASTM C 90 "Standard Specification for Loadbearing Concrete Masonry Units", (85 - 105 pcf of concrete or greater):
      a. Primary Aggregate — Lightweight Expanded Shale aggregate.
         1) The aggregate used for all Precision Faced Units not visible on the exterior or the interior, can be Pumice aggregate.
      b. All exposed Concrete Masonry Units shall have integral color from manufacturer per material standard ASTM C 979 “Specification for Pigments for Integrally Colored Concrete”.
         1) Including all colors to maximum dye content of 6 percent.
      c. Maximum lineal shrinkage from saturated to over dry condition of not more than 0.065 percent.

d. Twenty-eight day compressive strength of 2,000 psi.
e. Integral CMU Water-Repellent:
1) Integral liquid admixture mixed with concrete during production of CMUs.
2) Water Permeance of Masonry: Capable of achieving a Class E Rating when evaluated using ASTM E 514 “Test Method for Water Penetration and Leakage Through Masonry”.
f. Compressive Strength of Masonry Prisms: No statistically lower compressive strength of prisms shall occur as a result of adding integral water-repellent CMU and mortar admixtures when compared to a control (containing no admixtures) CMU and mortar when tested according to ASTM C 1314 “Test Method for Compressive Strength of Masonry Prisms”.
g. Drying Shrinkage of CMU: No statistically higher drying shrinkage of the CMU shall occur as a result of adding integral water-repellent CMU admixture when compared to a control (containing no admixtures) CMU when tested according to ASTM C 426 “Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units”.

2. Nominal Face Dimensions and Finishes: See drawings for locations of Concrete Masonry Unit types and sizes.
a. CMU shall be:
1) Split-Faced on both sides.
2) Split-Faced on one side and Precision-Faced on opposite side.
3) Precision-Faced on both sides.

B. Veneer Block (Face Shell):
1. Nominal Face Dimensions and Finishes: See drawings for locations of Concrete Masonry Unit types and sizes, minimum thickness of 2-5/8".
a. CMU Veneer Block shall be:
1) Precision Face Scored Veneer Unit.
2) Split-Faced Veneer Unit.
3) Precision Faced Veneer Unit.

C. Joint Reinforcement, Ties and Anchors:
1. General: Comply with requirements below for basic materials, as well as requirements for each form of joint reinforcement, tie, and anchor for size and other characteristics.
2. Hot-Dip Galvanizied Steel Wire: Uncoated wire in accordance with ASTM A 82 “Specification for Steel Wire, Plain, for Concrete Reinforcement”, with zinc coating applied after prefabrication into units in accordance with ASTM A 123 “Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products”, 1.5 oz. per sq. ft, of wire surface.
3. Joint Reinforcement: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units.
a. Width: Approximately 2 inches less than nominal width of walls and partitions, providing mortar cover of not less than 5/8 inch on joint faces exposed to exterior and 1/2 inch elsewhere.
b. Wire Size, Side Rods: 0 gage, 0.15 inches.
c. Wire Size, Cross Rods: 9 gage, 0.15 inches.
d. Wire Size, Two-Piece Adjustable: 9 gage diameter in exterior walls.

e. Single-Wythe Configuration: Truss design, continuous diagonal cross rods spaced not more than 16 inches on center.
f. Multi-Wythe Configuration: Non-Aligned Bed Joints in Cavity or Composite masonry Walls:
1) Adjustable wall tie pintle section fitting into eye section of rectangular box-type cross ties spaced not more than 16 inches on center.
2) Truss type units with side rods spaced for embedment within each face shel of back-up wythe, ties extended to within 1 inch of exterior face of facing wythe.
g. Flexible Anchors: Masonry to Structural Framework: Two-piece anchors permitting vertical or horizontal differential movement between wall and framework parallel to, but resisting tension and compression forces perpendicular to, plane of wall.
1) Anchorage to Steel Framework: Manufacturer's standard anchors with crimped 1/4 inch diameter wire anchor section for welding to steel 3/16", triangular-shaped wire tie section szied to extend within 1 inch of exterior face of facing wythe.
h. Unit Type Masonry Inserts in Concrete: Cast iron or malleable iron inserts of type and size indicated.
i. Dovetail Slots: Dovetail slots with filler strips, of slot size as required; 22 gage sheet metal.
j. Anchor Bolts: Steel bolts with hex nuts and flat washers, complying with ASTM A 307 “Specification for Carbon Steel Bolts and Standards, 60,000 PSI Tensile Strength”, Grade A, hot dip galvanized complying with ASTM A 153 “Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware”, Class C; sizes and configurations indicated.
k. Reinforcing Bars: In accordance with Specification Section - REINFORCEMENT, deformed steel, per ASTM A 615 “Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement”, Grade 60 for bars No. 3 to No. 18.

4. Miscellaneous Masonry Accessories:
a. Non-Metallic Expansion Joint Strips: Premolded, flexible cellular neoprene rubber filler strips, complying with ASTM D 1056 “Specification for Flexible Cellular Materials – Sponge or Expanded Rubber”, Grade RE41E1, capable of compression up to 35 percent; width and thickness as required.
b. Weepholes: Pre-manufactured weeps.

D. Mortar and Grout:
1. In accordance with the following:
a. Cement: In accordance with ASTM C 150 "Standard Specification for Portland Cement", Type II.
b. Hydrated Lime: In accordance with ASTM C 207 "Standard Specification for Hydrated Lime for Masonry Purposes", Type [M][S][N], unless otherwise noted.
c. Quicklime: In accordance with ASTM C 5 "Standard Specification for Quicklime for Structural Purposes".
d. Lime Putty: Made from hydrated lime or quicklime.
1) If made from quicklime, other than processed pulverized quicklime, slake lime and then screen through a No. 16 mesh sieve. Before using, store and protect slaked and screened lime putty for not less than 10 days.
2) Processed pulverized quicklime shall be slaked for not less than 48 hours, and shall be cool when used.
3) Lime putty prepared from hydrated lime may be used immediately after mixing.

4) Lime putty prepared from quicklime or pulverized quicklime shall have a plasticity figure, after slaking and screening, or not less than 200, and shall weigh not less than 83 lbs. per cubic foot. Lime putty prepared from hydrated lime shall conform to ASTM C 207 "Standard Specification for Hydrated Lime for Masonry Purposes", Type S.

e. Mortar Sand: In accordance with ASTM C 144 "Standard Specification for Aggregate for Masonry Mortar".

f. Modified Mortar Sand:

1) In accordance with ASTM C 144 "Standard Specification for Aggregate for Masonry Mortar" modified to not less than 3 percent shall pass the No. 100 sieve.

g. Grout Aggregate: 3/8 inch maximum size and in accordance with ASTM C 404 "Standard Specification for Aggregates for Masonry Grout".

h. Grout Admixture: SIKA "Grout Aid", Type II.

i. Water: Clean and free of harmful amounts of acid, salts, alkalis, or organic materials.

2.3 MIXES

A. Mortar:

1. In accordance with CBC Section 2103A and ASTM C 270 “Specification for Mortar for Unit Masonry”.
2. Pre-Blended Mortar Mix:
   a. In accordance with ASTM C 270 “Specification for Mortar for Unit Masonry”, Type [M][S][N].
3. Compressive Strength:
   a. See General Structural Drawings from the Structural Engineer.
   b. 2,000 psi at 28 days minimum.

B. Grout:

1. In accordance with CBC Section 2103A.11.7 and ASTM C 476 “Specification for Grout for Masonry”.
2. Pre-Blended Bag Grout:
   a. In accordance with ASTM C 476 “Specification for Grout for Masonry”.
3. Fine Grout Mix unless otherwise noted.
4. Compressive Strength:
   a. See General Structural Drawings from the Structural Engineer.
   b. 2,000 psi at 28 days minimum.

2.4 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:

1. All materials, equipment and placing operations shall be subject to inspection, tests and approval at all times. Agent shall have access to all places where Concrete Masonry Unit materials are proportioned, mixed, cured and stored.

B. Tests and Inspection:

1. All tests will be performed by the Owner's Testing laboratory Agency in accordance with the Specification Section – TESTING LABORTORY SERVICES.
2. Concrete Masonry Units shall be tested per ASTM C 140 “Test Methods for Sampling and Testing Concrete Masonry Units and Related Units and CBC Section 1705A.4.
   a. Lineal Shrinkage: In accordance with ASTM C 426 – "Standard Test method for Drying Shrinkage of Concrete Block."
   b. Compressive Strength: In accordance with ASTM C 140 – "Sampling and Testing of Concrete Masonry Units."
   c. Test three (3) samples of each type of the Concrete Masonry Unit prior to construction.
3. Mortar Tests: At the beginning of Masonry Work, at least 1 test sample each of mortar and grout shall be taken on 3 successive working days, then once per week with at least one sample taken for each 5,000 square feet of wall area, or fraction thereof.
   a. Test specimens for mortar shall be made in accordance with ASTM C 780 “Test method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry”. Test specimens shall be continuously stored in moist air until tested.
   b. Mortar shall show a compressive strength of not less than 1,800 psi at 28 days.
4. Grout Tests: At the beginning of Masonry Work, at least 1 test sample each of grout shall be taken on 3 successive working days, then once per week with at least one sample taken for each 5000 square feet of wall area, or fraction thereof.
   a. Test specimens for grout shall be made in accordance with ASTM C 476 “Specification for Grout for Masonry and CBC Section 1705A.4 Test specimens shall be continuously stored in moist air until tested.
   b. Grout shall show a compressive strength of not less than 2,000 psi at 28 days.

C. Verification of Performance:
1. A special inspector shall be employed during the placement of all units, placement of all reinforcing steel, during all grouting operations and during taking of all test specimens.
2. Reports:
   a. Special Inspector shall submit to Architect and to DSA two copies of each report showing results of tests and inspections.
   b. Report shall state that tests and inspections were made in accordance with specifications.
   c. Report shall state whether materials were in conformance with specifications.
3. Cost of testing and inspection will be paid by the Owner, unless otherwise specified. Contractor shall pay all costs of re-inspection and/or re-tests due to non-compliance with specifications as a reimbursement directly to the Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site verification of conditions:
1. Prior to the execution of the work under this specification section, inspect the installed work executed under other sections of this Project Manual which, affect the execution of work under this specification section.

2. Report unacceptable conditions to the Architect. Do not begin work until unacceptable conditions have been corrected.
3. Execution of work under this specification section shall constitute acceptance of existing conditions.

3.2 PREPARATION

A. Coordination:
1. Coordinate work under this specification section with work specified under other sections to ensure proper and adequate interface of work.
   a. Installation of bolts, reinforcing, inserts, etc. as required.
   b. Check and be responsible for accuracy of dowel locations in concrete where dowels project into Concrete Masonry Unit work.
2. Control Joints:
   a. See drawings for type and location of control joints.
3. Bond Beams:
   a. Bond beams shall be located where shown and detailed on the drawings, and shall be reinforced as indicated and as here after specified.
4. Built-in Work:
   a. Miscellaneous Embedded Items: All items indicated to be embedded in masonry shall be carefully located and anchored to prevent movement during grouting operations. Avoid cutting and patching.
      1) Install all anchor bolts and anchors furnished under other sections.
5. Cutting or Patching:
   a. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

B. Protection:
1. Protect all adjacent surfaces from drips, spray, air pollution of the surrounding environment, and other damage from work under this specification section.
2. Protect and cover the top of all Concrete Masonry Unit walls at the end of each day's work to minimize water intrusion, regardless of the time of year.
   a. Continue to temporarily cover the top of the walls until the final parapet cap is installed, and the sealer coats are applied.

C. Surface Preparation:
1. Prepare surface in accordance with manufacturer's written instructions and recommendations.
2. Clean substrates of substances (oil, grease, rolling compounds, incompatible primers, loose mill scale, etc.) which could impair bond of materials specified within this section.
3. Top surfaces of foundation or slab to receive Concrete Masonry Units shall be clean, rough, and free of laitance, as specified in Specification Section - CAST-IN-PLACE CONCRETE, PART 3. Roughness amplitude shall be a minimum of one-fourth inch.

3.3 INSTALLATION

A. General:

1. In accordance with Regulatory Requirements and TMS 602.
2. Set plumb, level, and square.
3. Provide temporary bracing during erection of masonry work. Maintain in place until masonry has set to provide permanent bracing.

B. Layout:
1. Lines shall be straight, true and built accurately to dimension.
2. Masonry lines and levels shall be placed to the following tolerances:
   a. Variation from unit to adjacent unit 1/8 inch maximum.
   b. Variation from plane of wall: 1/4 inch in 10 feet.

C. Reinforcement Bar installation:
1. Installation of Vertical Reinforcement Bars:
   a. Where possible, bars shall be one length and centered in open end of Concrete Masonry Units unless noted otherwise on drawings.
   b. Bar may be doweled at top of footing.
   c. Bars shall be accurately and positively held in place before setting Concrete Masonry Units by wiring to a 2 x 6 properly braced near top of bars and not over 8 feet above foundation or at last Grout pour.
   d. For Low Lift Grout, corner bars and other bars in closed cell units shall be lapped a minimum of 48 bar diameters, unless indicated otherwise.
   e. All vertical reinforcing steel shall be braced throughout its height in a manner that will retain the steel in proper position and provide the proper clearance at spacing not to exceed 192 bar diameters.
2. Installation of Horizontal Reinforcing Bars:
   a. Bars shall be laid in bond beam units directly on top of the cross walls of block webs.
   b. Lap splice bars a minimum of 48 bar diameters, unless indicated otherwise.
   c. Reinforcing steel shall be secured to all foundation dowels and held in place at spacing not to exceed 192 bar diameters.
3. Wire horizontal and vertical bars together.
4. Reinforcing steel shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of bars for bending will not be permitted.
5. Bars shall conform accurately to the sizes, shapes, lines and dimensions shown on drawings and with hooks and beds made as detailed. Bars shall be placed as indicated on the drawings and centered on grout space.
6. At the time grout is placed around it, reinforcing steel shall be clean of mill scale or other coatings that will destroy or reduce bond.

D. Setting of Concrete Masonry Units - In accordance with the following:
1. Bonds: Use Running Bond, or as shown on details.
   a. Place masonry to lines and levels indicated to the following tolerances:
      1) Variation from Unit to Adjacent Unit: 1/8-inch max.
      2) Variation from Plane of Wall: 1/4-inch in 10 feet.
   b. Bond: Unless noted otherwise, lay concrete masonry units in bond pattern indicated with vertical joints located over score of unit in course below (and vice versa).

c. Maintain masonry courses to uniform width. Make vertical and horizontal joints equal and of uniform thickness.
d. Preserve the vertical continuity of cells in concrete unit masonry. The minimum clear horizontal dimensions of vertical cores shall be 3" x 3" for 8-inch wide block.

2. Align vertical cells to maintain vertical continuity of cells to be filled. Open end or notched units may be used to facilitate installation around cells that contain vertical reinforcement. Minimum unobstructed vertical flue 3" x 3". Remove overhanging mortar or other obstructions or debris from inside of cells.
3. Provide bond beam units at cells containing horizontal reinforcement.
4. Integral Water-Repellent CMU:
   a. Installer shall use only mortar containing compatible integral liquid water-repellent mortar admixture at the manufacturer's recommended addition rate and mixed according to manufacturer's recommended instructions for construction of water repellent masonry exterior walls.
   b. Cover top of unfinished masonry work to protect it from the weather and to prevent accumulation of water in the cells of the CMU.
   c. Cleaning:
      1) Remove "primary" efflorescent from masonry walls exposed in the finished work in accordance with the manufacturer's recommendations and the NCMA TEK Bulletin #8-3A.
      2) Remove dirt or stains from masonry walls exposed in the finished work in accordance with the manufacturer's recommendations and the NCMA TEK Bulletin #8-2A.
      3) Promptly remove excess wet mortar and grout containing integral water-repellent mortar admixture from the face of the masonry as work progresses. Do not use strong acids, over-aggressive sandblasting or high-pressure cleaning methods.
      4) Comply with applicable environmental laws and restrictions.
5. Joints:
   a. Set Concrete Masonry Units in full shoveled bed of Mortar.
   b. Width of joint: 3/8 inch.
      1) Depth of joint: Equal to Face Shell Wall Thickness.
   c. Head joints shall be solidly filled.
   d. Mortar Joint Finish Method:
      1) All mortar joints shall be compressed and shaped by a specific designated tool throughout the project. Provide identical tools when more than one worker is scheduled to finish joints.
      2) At exposed and concealed surfaces:
         a) Vertical Joints: Compressed, Raked and Tooled joints.
         b) Horizontal Joints: Compressed, Raked and Tooled joints.
      3) Provide compressed Flush Joints when other material is to be applied directly onto and over Concrete Masonry Units being covered (including areas covered by rubber base).
6. Vertical Control Joints:
   a. Space joints at 25'-4" o.c. maximum, unless specifically noted otherwise. Joints shall be spaced symmetrically and uniformly and shall be subject to the Architect's approval.
   b. All joints shall be through wall separations with horizontal reinforcing discontinuous.

c. All joints shall be sealed with backer rods and urethane sealant on both faces. Refer to Specification Section - SEALANTS for sealant requirements.

7. Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections greater than 1/4 inch, mortar droppings and other foreign material, per CBC Section 2104A.5.
8. Do not install cracked, broken, chipped or stained masonry units.
9. Lay only dry concrete masonry units.
10. Lay masonry in full bed of mortar, properly jointed with other work. Deep or excessive furrowing of mortar joints is not permitted.
    a. Block Cap: Lay with full mortar coverage on horizontal and vertical joints.
    b. Install grout cap where and as indicated.
11. Fully bond intersections and external and internal corners.
12. Do not shift or tap masonry units after mortar has taken initial set. Where adjustments must be made, remove mortar and replace.
13. Remove excess mortar.
14. Perform job-site cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.
15. Step back unfinished work for joining with new work. Do not use toothing.
16. Provide cleanouts as indicated in "installation of grout".

E. Installation of Grout:
1. General:
    a. All cells shall be grouted solid.
    b. Use low lift or high lift grouting at Contractor's option.
    c. Use grout pump, hopper or bucket to place grout.
    d. Place grout in final position within 1-1/2 hours after introduction of mixing water.
    e. Place grout and rod with a 3/4 inch flexible cable vibrator sufficiently to case it to flow into all voids between the cells and around the reinforcing steel. Slushing with mortar will not be permitted.
    f. Stop grout approximately 1-1/2 inches below top of last course, except at top course bring grout to top of wall.
2. Low Lift Grouting Procedure: In accordance with CBC Section 2104A.5.1.1.1, and to be used only if approved by the Architect.
    a. Set all vertical bars.
    b. Concrete Masonry Unit walls shall be built up 16 inches high uniformly around one complete building unit. No vertical construction joints will be allowed unless noted and detailed on the drawings.
    c. Lay Concrete Masonry Units no higher than 24" and clean cells of mortar.
    d. Set horizontal bars on bond beam unit crosswalls next to verticals.
    e. If course at top of lift contains horizontal reinforcement, grout all cells to a level 3/4" below the top of the Concrete Masonry Units. This will provide about 1-1/4" grout cover over the horizontal bar. Puddle grout in place using a No. 4 bar or a 1 x 2 stick, and repeat puddling in 30 to 60 minutes.
    f. Consolidate each lift twice. Once while placing grout and once more after initial absorption of water but before set.
    g. Repeat steps "c.", "d.", "e." and "f." above until the wall is completed.

3. High Lift Grouting Procedure (only upon prior approval of the Architect , Structural Engineer and [DSA) shall be in accordance with CBC Section 2104A.5.1.1.1.2 & IR 21-2.13:
   a. Clean-outs must be provided at the bottom of each pour for each cell.
      1) Construct clean out courses with inverted open-bottom bond beam units involved to permit cleaning of all cells by flushing. Cleanouts shall not be less than 3x4 inch openings cut from one full shell. Do not plug cleanout holes until masonry work, reinforcement and final cleaning of the grout spaces have been completed and inspected.
   b. The Contractor is cautioned that with the high lift method, the walls have very little lateral stability against winds or earthquake before grout has set and it shall be this Contractor's responsibility to adequately brace the walls until the roof sheathing is installed.
   c. "Dur-O-Wall" reinforcing shall be provided in mortar joints at all wall corners, ends, jambs of openings and wall intersections.
   d. Lay up walls subject to maximum height limitations of CBC Section 2104A.5.1.2.2 or 2104A.5.1.2.3.
   e. Construction procedure shall be as follows:
      1) Set all full length vertical bars on center line of wall, centered in cells, and braced as noted above under typical reinforcing.
      2) Lay Concrete Masonry Units full height of walls, or 12 feet maximum including wiring horizontal bars to verticals, for one complete building unit. No vertical construction joints will be allowed unless noted and detailed on the drawings.
      3) Construct clean out courses with open-bottom bond beam units inverted to permit cleaning of all cells by flushing. Cleanouts shall not be less than 3 x 4 inch openings cut from one full shell. Do not plug cleanout holes until masonry work, reinforcement and final cleaning of the grout spaces have been completed and inspected.
      4) Clean all cells and top of foundation wall of mortar by hosing cells with suitable nozzle jet or sandblasting as soon as mortar has partially set. Final cleaning shall be inspected through clean-outs at each cell in base of wall. Remove all mortar fine protruding more than 1/2 inch into the grout space by dislodging the projections with a rod as the work progress or by washing the grout space at least twice a day during erection using a high pressure stream of water.
      5) Set vertical bars in closed cells where required; i.e., at wall corners, sides of openings, etc. Wire to horizontals at top and bottom. Use metal spacers at 48" o.c. maximum to hold bars in line.
      6) No grout shall be placed until mortar has set a minimum of 3 days in hot weather or 5 days in cold weather, and the top of foundation wall has been thoroughly cleaned and grout plugs have cured a minimum of 48 hours.

7) Place grout in lifts not to exceed 4 feet in height, with a waiting period between lifts, dependent on weather and absorption rate of the masonry, in order to place the succeeding lift after the preceding lift becomes plastic but prior to initial set. The first lift shall be consolidated using mechanical vibrators. After the required waiting period, place the second lift and consolidate with the vibrator, reconsolidating the lift below to a depth of 12 to 18 inches. Repeat the waiting, placing and consolidating process until the top of the grout pour is reached. Reconsolidate the top lift after the required waiting period. The high-lift grouting of any section of wall between lateral flow barriers shall be completed to the top of a pour in one working day unless a new series of clean out holes is established and the resulting horizontal construction joint cleaned.

8) Repeat items 1 - 7 until all cells are filled. The wall must be grouted to its full height during one working day. No horizontal construction joints will be allowed.

9) Above 12 feet level low lift grouting procedures shall be used.

F. Curing:

1. While Concrete Masonry Units are being laid and after, dampen both faces for a period of 3 days using a spray regulated to keep surface damp. After grouting, dampen for a period of 24 hours.

3.4 APPLICATION

A. Applied Finish:

1. Sealer (Coordinate with Specification Section – PAINTING):
   a. Apply sealer to all exterior and all interior surfaces (including all concealed areas such as the backs of parapet walls and in concealed exterior and interior soffits) to minimize efflorescence, and to prevent water intrusion into the interior of buildings from the exposed exterior surfaces.
   b. Apply sealer as directed by the manufacturer.
      1) Coverage and installation rates shall be as per manufacturer's written recommendations.
      2) Apply sealer in minimum two coats at the rates required.

3.5 REPAIR / RESTORATION

A. General:

1. Materials or Workmanship not conforming to appearance or strength specified will be deemed defective and shall be removed and replaced with no change to the contract in time or cost.
2. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units.
3. Pointing: During the tooling of joints, enlarge any voids or holes and completely fill with mortar.
4. Dry brush masonry surface after mortar has set, at the end of each day's work and after final pointing.
5. Leave work and surrounding surface clean and free of mortar sports and droppings.

6. Cleaning: Upon completion of masonry installation, repair all holes. Defective joints shall be cut out and rejointed. Exposed masonry surfaces shall be cleaned free of mortar, or grout stain and efflorescence.

B. Defective Mortar Or Grout:
1. Should the strength of mortar or grout fall below that specified, remainder of Work shall be adjusted to reach required strength. Work in place representing inferior grout and mortar and indicating a strength less than the minimum specified shall be tested by taking and testing core samples. Number and location of cores shall be determined by Structural Engineer.
2. Should compression tests of cores fail to meet required strength, masonry shall be deemed to be defective and shall be removed and replaced at no cost to Owner.
3. Costs relative to taking and testing of core samples shall be paid by the Owner and will be deducted from Contract Amount. Cost of patching core holes shall be borne by the Contractor.

3.6 FIELD QUALITY CONTROL

A. Site Tests:
1. Tests will be performed by the Owner's Testing Laboratory Agency in accordance with the Specification Section – TESTING LABORATORY SERVICES.
2. Mortar and Grout shall be tested per CBC Section 2105A.5.
   a. Samples shall be continuously stored in moist air until tested.
   b. Grout Compressive Strength: For each mix provided, in accordance with ASTM C 1019 "Standard Test Method for Sampling and Testing Grout".
   c. Mortar Property Specification: For each mix provided in accordance with ASTM C 780 "Standard Test method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry".
3. Masonry Core test shall be in accordance with CBC Section 2105A.
4. One set of tests for each 5,000 square feet of wall area or portion thereof.

B. Inspection:
1. Inspections will be performed by the Owner's Project Inspector in accordance with Specification Section – TESTING AND INSPECTION SERVICES.
   a. Special Project Inspector shall be employed during the placement of all units, placement of all reinforcing steel, during all grouting operations and during taking of all test specimens.
      1) Per CBC Section 1701A.5 for DSA/SSS.
2. Schedule inspections and notify the Architect, Project Inspector, Testing Agency and any other regulatory agencies of the time at least 48 hours prior to the inspection.
3. No work shall be without the required inspections.

3.7 CLEANING

A. Clean in accordance with Specification Section - PROJECT CLOSEOUT.
1. At the conclusion of the Concrete Masonry Unit work, the Contractor shall clean down all walls, remove all scaffolding and equipment, clean up all debris, refuse, any surplus materials and remove them from the premises.

2. Concrete Masonry Unit walls shall be brushed daily with a mason's soft hair brush to remove surplus mortar and splattering at scaffolding lines. This must be done immediately after initial, but before final set.
3. Grout or mortar spillage shall be removed by use of clean, plain water before it has a chance to set.
4. In areas not cleaned in accordance with the above, the Architect shall have the right to require sandblasting of the entire wall between concrete columns or piers, between control joints or entire wall unit that includes the affected areas.

B. Removal of Stains and Efflorescence:
1. Removal of Stains: In accordance with NCMA TEK Bulletin #8-2A "Removal of Stains from Concrete Masonry".
2. Removal of Efflorescence: In accordance with NCMA TEK Bulletin #8-3A "Control and Removal of Efflorescence".

3.8 PROTECTION

A. Protection from Weather:
1. Protect newly installed work from temperatures in accordance with CBC 2104A.3 and CBC 2104A.4.
   a. Cold Weather: When ambient air temperature falls below 40 degrees F.
   b. Hot Weather: When ambient air temperature rises above 100 degrees F.
2. During installation, cover the top of unfinished masonry work to protect it from the weather and to prevent accumulation of water in the cores of the masonry units.

END OF SECTION