VOLUME 2 – PROJECT MANUAL

PINAL COUNTY ADMINISTRATIVE COMPLEX PARKING REPAIR PROJECT

FLORENCE, ARIZONA

Project No. 53330028

swan architects, inc.
architecture ■ planning ■ historic preservation

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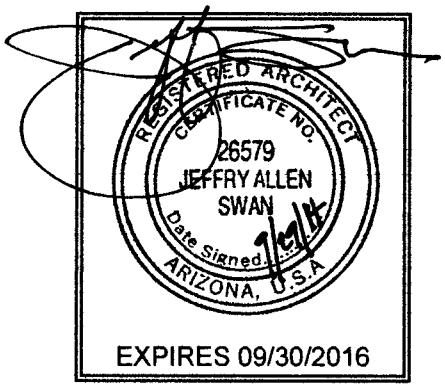

SECTION 01030 - ADDITIVE ALTERNATIVE BID ITEMS

GENERAL

This section provides for additive bids for certain work. The Base Bid includes all work shown on the drawings and specified, EXCLUDING the work required by the Additive Alternative Bid Items. Do not include the additive bid prices in the Base Bid. See Bid Form. The Owner reserves the right to award additive bid items in any order of preference. Award of contract will be made on the basis of the total low bid price for the Base Bid plus Owner-selected additive bid items, if any.

ADDITIVE ALTERNATIVE BID ITEM #1 – ELECTRIC LIGHT POLES AND FIXTURES

State amount to be added to the Base Bid to furnish and install the light poles and lighting fixtures shown on Sheets E-1 and E-2. Include in Base Bid work necessary to remove and terminate lighting fixtures/poles in conflict with completing renovation work shown on drawings. Signage attached to light poles shall be included in the Base Bid.

ADDITIVE ALTERNATIVE BID ITEM #2 – LANDSCAPING AND IRRIGATION

State amount to be added to the Base Bid to furnish and install landscaping and irrigation as shown on Sheets L-1, L-2, L-3, and L-4.

ADDITIVE ALTERNATIVE BID ITEM #3 – SIGNAGE

State amount to be added to the Base Bid to furnish, install, and construct the large and small monument signs on Sheet A-9 and directional signs on Sheet A-10.

ADDITIVE ALTERNATIVE BID ITEM #4 – MISCELLANEOUS IMPROVEMENTS

State amount to be added to the Base Bid to complete miscellaneous improvements including concrete slab renovation, selective demolition, and construction of new concrete steps and steel handrails as indicated on drawings.

END OF SECTION 01030

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

SUMMARY

This Section includes administrative and procedural requirements for cutting and patching.

Refer to other sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.

SUBMITTALS

Cutting and Patching Proposal: Submit to the Architect for approval a proposal describing procedures well in advance of the time cutting and patching will be performed. Request approval to proceed. Include the following information, as applicable, in the proposal:

Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.

List products to be used and firms or entities that will perform work.

Indicate dates when cutting and patching will be performed.

Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporary out-of-service. Indicate how long service will be disrupted.

Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.

QUALITY ASSURANCE

Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection rating.

Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:

Bearing walls, joists, rafters, sills, plates, and similar items.

Visual Requirements: Do not cut and patch construction exposed on the exterior that would, in the Architect's opinion, reduce the building's aesthetic qualities. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.

WARRANTY

Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

MATERIALS

Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

INSPECTION

Examine the surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

PREPARATION

Temporary Support: Provide temporary support of work to be cut.

Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

PERFORMANCE

General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.

Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.

In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Torches or open flame tools are not permitted. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

To cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.

Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

Patching: Patch with durable seams that are as visible as possible. Comply with specified tolerances.

Where feasible, inspection and test patched areas to demonstrate integrity of the installation.

Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

CLEANING

Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials.

END OF SECTION 01045

SECTION 01310 - SCHEDULES AND REPORTS

GENERAL:

This Section provides for schedules and reports required before commencing construction or during the course of construction of the Project. This section is complementary to the General Conditions and nothing herein shall be considered to waive any requirements of the General Conditions or the Amendments and Additions to the General Conditions.

SCHEDULE OF VALUES:

The schedule of values, as required by the General Conditions, shall be submitted on AIA Document G-702 for the purpose of evaluating the work completed for each monthly payment. Each monthly payment request shall be submitted in the same form with all data required by the form completed.

PROGRESS SCHEDULE:

The progress schedule, as required by the General Conditions, shall be submitted in bar-graph form on letter size paper, or a multiple thereof, for insertion into a standard file folder.

PROGRESS REPORTS:

Progress reports shall be submitted monthly and shall indicate work completed during the preceding month and the proposed work scheduled for the forthcoming month.

END OF SECTION 01310

SECTION 01340 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

GENERAL:

This section provides for the submittal of manufacturer's data, samples, and shop drawings, as provided in Paragraph 3.12 of the General Conditions. This section is complementary to the General Conditions and nothing herein shall be considered to waive any requirements of the General Conditions.

SHOP DRAWINGS:

The Contractor shall check and verify all field measurements and shall submit with such promptness as to cause no delay in his own work or in that of any other subcontractor, five (5) copies, checked and approved by him, of all trades. The Architect shall check and approve, with reasonable promptness, such drawings only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor shall make any corrections required by the Architect and resubmit to him corrected copies until approved. The Architect's approval of such drawings shall not relieve the Contractor from responsibility for deviations from the Plans or Specifications, unless he has in writing called the Architect's attention to such deviations at the time of submission and secured his written approval, nor shall it relieve him from responsibility for errors in shop drawings. Any corrections or changes indicated on a shop drawing by the Architect shall not be construed as an extra work order. Shop drawing approval shall not be construed as approval of departures from Contract requirements.

Where shop drawings are required it is so stated in the various sections of these Specifications.

PRODUCT DATA:

The data required by these Specifications shall be supplied in quadruplicate, unless otherwise specified in the various sections.

SAMPLES:

The samples required by these Specifications shall be supplied in triplicate, unless otherwise specified in the various sections.

END OF SECTION 01340

SECTION 01500 - TEMPORARY FACILITIES

GENERAL:

This Section provides for temporary facilities and temporary work required in the performance of the Contract. The Owner will identify construction and storage areas allocated to the Contractor for the work, who shall limit his storage and office operations to the defined areas.

SCOPE:

This section provides for temporary facilities and temporary work required in the performance of the Contract.

MAINTENANCE AND REMOVAL:

Maintain temporary facilities in a proper, safe, operating, and sanitary condition for the duration of the Contract. Upon completion of the Contract, remove all temporary facilities from the premises.

FIELD OFFICE AND STORAGE FACILITIES:

Furnishing temporary office facilities will be at the Contractor's discretion. Provide a toll-free telephone and secure storage enclosure for materials and equipment. Weekly meetings will be held in an Owner conference room.

TOILET FACILITIES:

Provide proper sanitary and adequate toilet facilities for the use of all workmen employed on the project, locate where directed, and enforce their use by all personnel on the project.

UTILITIES:

Electrical service and power for construction shall be obtained and paid for by the Contractor.

Water supply for construction shall be obtained and paid for by Contractor.

FIRE PROTECTION:

Provide adequate quantity of fire extinguishers on the premises during the course of demolition of the types and sizes recommended by the NBFU to control fires resulting from the particular work being performed. Instruct employees in their use. Place extinguishers in the immediate vicinity of the work being performed, ready for instant use. In the use of especially hazardous types of equipment, such as acetylene torches, no work shall be commenced unless fire extinguishers of an approved type and capacity are placed in the working area and available for immediate use.

SCAFFOLDING, STAGING, AND PROTECTION:

The work under each section of the Specifications shall include providing, installing, and maintaining all scaffolding, staging, trestles, and planking necessary for the work under each section in strict conformity with applicable laws and ordinances, and maintenance of same so as not to interfere with or obstruct the work of other trades. Additionally, the work under each section of the Specifications shall include providing all forms of protection as necessary to preserve the work of other trades free from damage. These provisions shall be considered as though repeated under each separate section of the Specifications.

BARRICADES AND FENCES:

Contractor shall pay for the existing temporary chain-link fence around the construction site. The construction site proper will not be open to the public, and only authorized personnel of the Architect, Owner, and government agencies shall be allowed entrance.

Provide barricades and warning devices around other work areas and open trenches outside the fenced area. When work is conducted overhead, barricades and warning devices shall be placed in such a manner to prevent entry into unsafe ground or floor areas.

SAFETY AND HEALTH PROGRAM:

This project, its prime contractor and his subcontractors shall, at all times, be governed by the Occupational Safety and Health Act and other applicable safety and health regulations.

The prime contractor and his subcontractors shall immediately report in writing all accidents, injuries, or health hazards to the Owner and Architect. This requirement shall not obviate any mandatory reporting under the provisions of the Occupational Safety and Health Act or other regulations.

PROJECT SIGN:

Provide a 4' x 8' project sign. The cover sheet of the plans will be the format for the sign. The Architect will furnish the design for the sign.

END OF SECTION 01500

SECTION 01700 - PROJECT CLOSEOUT

GENERAL:

This section provides for the requirements and procedures for submittal of pertinent data relating to closing out the project. Detailed instructions elsewhere in these specifications may require that certain items listed herein be submitted prior to substantial completion of the project. This section is complementary to the General Provision and nothing herein shall be considered to waive any requirements of the General Provisions.

PROJECT DOCUMENTS:

Record Documents: Maintain at project site one record copy of the following:

- Plans (Building Official-approved set)
- Specifications (Building Official-approved copy)
- Addenda
- Approved shop drawings, product data, and samples
- Change orders
- Other modifications to contract
- Field test records
- Inspection certificates
- Manufacturer's certificates

Do not use record documents for construction purposes. Maintain documents in clean, dry, and legible condition apart from documents used for construction. Keep record documents available for inspection.

Maintain a set of record drawings at the job site. These drawings shall be kept legible and current and shall be available for inspection at all times by the Architect. Show all changes in the work on these record drawings in a contrasting color.

Upon substantial completion of the work, transfer the information from the record drawings to the as-built drawings.

As-Built Drawings: Provide as-built drawings which clearly show: (a) all differences between the contract work as drawn and as installed; (b) work added to, or deleted from, the contract; and (c) the location of concealed work.

Concealed work shall mean work installed underground or in a location which cannot be readily inspected.

In showing changes in the work, or added work, use the same legends used on the contract drawings. Indicate exact locations by dimensions and exact elevations, given in job datum, by depth. Give dimensions from a permanent point. Give elevations to sewer and drainage lines to the invert elevation.

As-built drawings shall contain the names, addresses, and phone numbers of the subcontractors and shall be signed by the Contractor.

Architect shall approve the as-built drawings and he shall be the sole judge at to their acceptability. Receipt and approval of as-built drawings is a prerequisite for final payment.

CLOSEOUT PROCEDURES:

Procedures: The following project closeout procedure defines responsibilities of the Contractor, Owner, and Architect in closing project.

Step 1: Contractor submits to Architect in writing a complete punch list of items to be completed or corrected. This shall be submitted a minimum of twenty-one (21) calendar days prior to completion of beneficial occupancy.

Step 2: Owner and Architect shall review Contractor's punch list and conduct a walk-through within five (5) calendar days to determine if punch list is complete and edit it if necessary.

Step 3: Contractor completes and corrects all punch list items and notifies Architect in writing that his work is ready for final inspection. This shall be completed a minimum of three (3) calendar days prior to completion date for beneficial occupancy.

Step 4: Owner and Architect make final inspection. When work is found to be complete for beneficial occupancy, a Certification of Substantial Completion will be issued by the Architect. For work found not to be complete and ready for beneficial occupancy by the contract date, the Contractor shall be assessed liquidated damages in accordance with Date of Completion specified in the Bid Form.

Step 5: When all other requirements of the Contract are fully performed, the Architect will process the final Certificate of Payment including release of retention.

RE-INSPECTION FEES:

Should the Contractor fail to complete and correct punch list items such that additional inspections are required by Architect, Contractor shall pay Architect's standard rates for Architect's additional services plus expenses incurred in travel to site. If Contractor has any questions with regard to any items on punch list, he shall request clarification before final inspection.

FINAL PAPERWORK:

Prior to release of final payment, Contractor shall delivery items listed on attached CLOSEOUT CHECK LIST.

INSPECTION CERTIFICATES:

Each Subcontractor: Upon completion of work, secure in triplicate certificates from any state or local governing bodies having jurisdiction in dictating that work is in strict accordance with applicable codes and deliver certificates to Contractor for transmittal to Architect.

OPERATING AND MAINTENANCE DATA:

Equipment Manuals: Binders shall be 8½" x 11", three-ring, hardback, cleanable, plastic covers, 2" maximum thickness, and shall include the following:

Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS and title of project. When multiple binders are used, correlate data into related consistent groupings.

Manual: Have index with tab dividers for each major equipment section to facilitate locating information on specific piece of equipment. Identify data within each section with Specification section numbers as they appear in Specifications.

Text: Manufacturer's printed data or type-written data on 20-pound paper.

Drawings: Provide with reinforced punched binder tab. Bind in with text, folding larger drawings to size of text pages.

Table of Contents: Title of project; name, addresses, and telephone numbers of Architect and Contractor; schedule of products and systems, indexed to content of volume.

Data: Include the minimum following data:

List: Alphabetical list of all system components, with name, address and 24-hour telephone number of company responsible for servicing each item during first year of operation.

Operating Instructions: Operating instructions for complete system including the following:

Emergency procedures for fire or failure of major equipment

Major start, operation, and shutdown procedure

Manufacturer's printed operation and maintenance instructions

Control manufacturer's sequence of operation

Maintenance Instructions: The maintenance instructions shall include the following:

Proper lubricants and lubricating instructions for each piece of equipment.

Necessary break-in, cleaning, replacement, and adjustment schedule.

Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and any special operating instructions.

Include routine maintenance procedures and guide for troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

Manufacturer's Product Data: Include in the product data on each system and each piece of equipment the following:

Description of system and component parts including function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

Provide service characteristics, controls, and communications on panelboard circuit directories.

Installation instructions.

Drawings and specifications.

Manufacturer's Parts Lists: Include illustrations, assembly drawings, and diagrams required for maintenance.

Complete color-coded wiring diagrams (as-built) including control diagram.

Marked or changed prints locating all concealed parts and all variations from original system design.

Contractors coordination drawings with as-installed color-coded piping diagrams.

Warranties: Bind in copy of each warranty.

Schematic Diagram: Include a schematic diagram showing component parts of system.

Charts of valve tag numbers, with locating and function each valve, keyed to flow and control diagrams.

Operating and Maintenance Data: Refer to the following Divisions/Sections for equipment requiring operating and maintenance data manuals:

Builder's Hardware: Section 08710

Mechanical: Division 15

Electrical: Division 16

Refer to the above Division/Sections for specific requirements of operating and maintenance data for each group of equipment.

Submittals:

Submit two copies of the preliminary draft or proposed formats and outlines of contents before start of work. Architect will review draft and return one copy with comments.

Submit one copy of completed volumes in final form thirty (30) days prior to final inspection. Architect will return copy with comments. Revise contents of documents as required for final submittal.

Submit four (4) copies of revised volumes of data in final form within ten (10) days after final inspection.

WARRANTIES:

Two Year Correction Period: Remedy any defects due to faulty materials or workmanship and pay for any damage to other work resulting therefrom,, which shall appear in work within period of two year from date of Notice of Acceptance and in accordance with terms of any special warranties provided in the Contract Documents. Owner shall give notice of observed defects with reasonable promptness.

Warranty: Upon completion of work, Contractor shall deliver to Architect in duplicate, written warranty based on provisions of Contract Documents properly signed and notarized.

Address warranty to Owner.

Provide separate written warranties from mechanical and electrical subcontractors.

Extended Warranties: Deliver in duplicate extended warranties as specified and dated from date of Notice of Acceptance and signed by subcontractors and manufacturers.

Manufacturer Warranties: Deliver in duplicate manufacturer's warranties as specified and dated from date of Notice of Acceptance signed by manufacturer.

Supplement and not replace impled and express warranties provided by Uniform Commercial Code. Any statements in manufacturer's warranties denying or limiting responsibility for such implied and express warranties shall be void.

Form of Submittal:

Binders: 8½" x 11", three-ring, with hardback, cleanable, plastic covers.

Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of project, name, address, telephone number of Contractor, and name of responsible principal.

Table of Contents: Neatly typed, in sequence of Table of Contents of Project Manual, with each item identified with the number and the specification section in which specified and the name of product or work item.

Separate each warranty or bond with index tab sheets keyed to Table of Contents listing. Provide full information using separate type sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

SPARE PARTS AND MAINTENANCE MATERIALS:

Submittal: Provide products, spare parts, and maintenance materials in quantities specified in each Section, in addition to that used for construction work. Coordinate with the Owner, deliver to person and location as directed. Obtain receipt prior to final payment.

Miscellaneous Keys, Switches, and Wrenches: At completion of project, account for all loose keys for hose bibs, adjustment keys and wrenches for door closers and panic hardware, keys for electric switches, electrical panels, etc., and turn over to the Contractor for transmittal to Owner.

END OF SECTION 01700

SECTION 01710 - FINAL CLEANING

GENERAL:

This Section provides for cleaning of the project work. This Section is complementary to the General Provisions and nothing herein shall be considered to waive any requirements of the General Provisions.

CLEANING UP:

In addition to the cleaning up required by the General Provisions, the Contractor shall also provide final clean up of the site and building to the extent required to make the premises ready for occupancy. When applicable to the project, glass and ceramic tile shall be polished, resilient tile mopped, and carpet vacuumed. Other surfaces cleaned free of dust and soil.

END OF SECTION 01710

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the contract, including the General Conditions and Division 1 specification sections, apply to this Section.

SUMMARY:

This Section specified cast-in-place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

DEFINITIONS

Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

SUBMITTALS

Product Data: For each type of manufactured material and product indicated.

Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

Indicate amounts of mix water to be withheld for later addition at project site.

Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.

Shoring and Reshoring: Include proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

Welding Certificates: Copies of certificates for welding procedures and personnel.

QUALITY ASSURANCE

Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code–Reinforcing Steel."

ACI Publications: Comply with the following, unless more stringent provisions are indicated:

ACI 301, "Specifications for Structural Concrete."

ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

Preinstallation Conference: Conduct conference at project site to comply with requirements in Division 1 Section "Project Meetings."

DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

STEEL REINFORCEMENT

Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

Welded Wire Fabric: ASTM A 185.

REINFORCEMENT ACCESSORIES

Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). cut bars true to length with ends square and free of burrs.

CONCRETE MATERIALS

Portland Cement: ASTM C 150, Type II.

Fly Ash: ASTM C 618, Class C or F.

Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
Class: Moderate weathering region, but not less than 3M.

Nominal Maximum Aggregate Size: 3/4"

Water: Potable and complying with ASTM C 94.

ADMIXTURES

General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

Air-Entraining Admixture: ASTM C 260.

Water-Reducing Admixture: ASTM C 494, Type A.

High-Range, Water-Reducing Admixture: ASTM C 494, Type F.

Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

CURING MATERIALS

Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

RELATED MATERIALS

Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:

Type: Class I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
Type: Class IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

CONCRETE MIXES

Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

Slab-on-Grade and Vertical Concrete: Proportion normal-weight concrete mix as follows:

Compressive Strength (28 Days): 3000 psi

Maximum Slump: 5".

FABRICATING REINFORCEMENT

Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

CONCRETE MIXING

Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.

When air temperature is between 85° and 90° F, reduce mixing and delivery time from 1-1/2" hours to 75 minutes; when air temperature is above 90° F, reduce mixing and delivery time to 60 minutes.

For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.

For mixer capacity larger than 1 cu. y., increase mixing time by 15 seconds for each additional 1 cu. yd.

Provide batch ticket for each batch discharged and used in the work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

FORMWORK

Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

Construct forms tight enough to prevent loss of concrete mortar.

Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

Do not use rust-stained steel form-facing material.

Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the work. Determine sizes and locations from trades providing such items.

Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

EMBEDDED ITEMS

Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

REMOVING AND REUSING FORMS

General: Formwork, for sides of beams, walls, columns, and similar parts of the work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50° F for 24 hours after placing concrete provided concrete is hard enough to no be damaged by form-removal operations and provided curing and protection operations are maintained.

Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

28-day design compressive strength.

Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Appl new form-release agent.

When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

SHORES AND RESHORES

Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and restoring.

In multistory construction, extend shoring or restoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

Plan sequence of removal of shores and restore to avoid damage to concrete. Locate and provide adequate restoring to support construction without excessive stress or deflection.

STEEL REINFORCEMENT

General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

Clean reinforcement of loose rust and mill scale, earth, and other foreign materials.

Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

Shop- or field-weld reinforcement according to AWS D1.4, where indicated.

Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

JOINTS

General: Construct joints true to line with faces perpendicular to surface plane of concrete.

Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:

Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8". Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

CONCRETE PLACEMENT

Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

Before placing concrete, water may be added at project site, subject to limitations of ACI 301.

Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregations.

Deposit concrete in forms in horizontal layers no deeper than 24" and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

Do not use vibrators to transport concrete inside forms. Insert and with draw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Maintain reinforcement in position on chairs during concrete placement.

Screed slab surfaces with a straightedge and strike off to correct elevations.

Slope surfaces uniformly to drains where required.
Begin initial floating using bull floats or darbies to form a uniform and open-texture surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

Cool ingredients before mixing to maintain concrete temperature below 90° F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent if ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

FINISHING FLOORS AND SLABS

General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

Scratch Finish: While still plastic, texture concrete surface that has been screened and bull-floated or darbied. Use stiff brushes, brooms, or rakes.

Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:

Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.

After broadcasting and tamping, apply float finish.

After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

Colored Concrete Finish: Provide colored slabs where shown on the drawings or in the schedules. Coloring agent, as manufactured by Davis or approved equal, shall be integrally mixed with concrete as recommended by the agent manufacturer to achieve Architect-selected standard color.

MISCELLANEOUS CONCRETE ITEMS

Filling In: Fill in holes and openings left in concrete surfaces, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete work.

Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

CONCRETE PROTECTION AND CURING

General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:

Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12", and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

CONCRETE SURFACE REPAIRS

Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2" in any dimension in solid concrete but not less than 1" in depth. Make edges of cuts perpendicular to concrete surface. Clean, damped with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area

at inconspicuous locations to verify mixture and color match before proceeding with patching. compact mortar in place and strike off slightly higher than surrounding surface.

Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

Repairing Uniformed Surfaces: Test uniformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Text surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

Repair finished surfaces containing defects. Surface defects include spalls, copouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01" wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

After concrete has cured at least 14 days, correct high areas by grinding.

Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4" to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

Repair defective areas, except random cracks and single holes 1" or less in diameter, by cutting out and replacing with fresh concrete. remove defective areas with clean, square cuts and exposed steel reinforcement with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair random cracks and single holes 1" or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

Repair materials and installation not specified above may be used, subject to Architect's approval.

FIELD QUALITY CONTROL

Testing Agency: A qualified independent testing and inspecting agency will be hired and paid by Pinal County to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this article.

Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

Testing Frequency: Obtain at least one composite sample for each 100 cu. y. or fraction thereof of each concrete mix placed each day.

When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03300

SECTION 04230 - REINFORCED UNIT MASONRY

PART 1 - GENERAL

RELATED DOCUMENTS:

The plans and general provisions of the contract, including the General Conditions and Division 1 specification sections, apply to this Section.

SUMMARY:

This Section includes reinforced concrete unit masonry.

Related Sections: The following sections contain requirements that relate to this Section.

Furnishing anchor bolts for attaching work is specified in other sections.

SUBMITTALS:

General: Submit the following in accordance with Section 01340.

Mill Certificates, Reinforced Unit Masonry: Steel producer's certificates of mill tests for all reinforcing steel.

Manufacturer's Data, Masonry Accessories: Manufacturer's specifications and other data for each type of accessory required. Include instructions for installation of each. Indicate by transmittal that the Installer has received a copy of each instruction.

Shop Drawings, Reinforced Unit Masonry: Fabrication, bending, and placement of reinforcing bars. Comply with the ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties, and other arrangements and assemblies as required for fabrication and placement of reinforcing for unit masonry work.

Manufacturer's Data, Masonry Units: Manufacturer's data for each type of concrete masonry unit required, including certified copies of laboratory test reports and other data as may be required to show compliance with the specified requirements.

Samples, Concrete Masonry Units: Samples of each type of exposed concrete masonry unit required. Architect's review will be for color and texture only. Compliance with all other requirements is the exclusive requirements is the exclusive responsibility of the Contractor.

QUALITY ASSURANCE:

Codes: Comply with the applicable requirements of governing authorities and codes for the types of masonry construction shown.

In exposed work, do not use masonry units with chips, cracks, voids, discolorations, or other defects which might be visible or cause staining in the finished work.

Coordination: Review installation procedures and coordinate with other work that must be integrated with masonry.

CONSTRUCTION TOLERANCES:

Variation from Plumb: For lines and surfaces of walls do not exceed 1/4" in 10', or 3/8" in a story height or 20'. Except for external corners and other conspicuous lines, do not exceed 1/4" in any bay or 20'.

Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4" in any bay or 20'.

Variation of Linear Building Line: For position shown and related portion of walls and partitions, do not exceed 1/2" in any bay or 20' maximum.

Masonry Testing Service: The Owner, acting through the Architect, will engage testing service to test masonry work. The Contractor will pay the cost of testing under Section 01020.

JOB CONDITIONS:

Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

Protect sills, ledges, and projections from mortar droppings.

Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100° F and above.

PART 2 - PRODUCTS

MATERIALS:

Concrete Masonry Units (CMU): Comply with the following:

Manufacturer:

Superlite Block Co.
Marvel

Grade: Load-bearing units, ASTM C 90, Grade N-1.

Weight: Lightweight units using aggregate complying with ASTM C 331, producing dry net weight of not more than 105 pounds per cubic foot.

Types:

Founder's Finish: Sizes as shown on the drawings, color selected from standards.

Smooth-Face Units: Sizes as shown on the plans, natural color.

Reinforcing Bars: Deformed steel, ASTM A 615, of sizes shown, as follows:

Provide Grade 60 for bars No. 4 and larger.
Provide Grade 40 for bars No.2 and No. 3, beam stirrups and ties.
Shop-fabricate reinforcing bars which are shown to be bent or hooked.

Continuous Wire Reinforcing: Fabricate 10'-long units from cold-drawn steel wire, ASTM A 82, with deformed 9-gauge side rods and plain diagonal cross-rods. Unit width 1-1/4" to 2" less than wall thickness. Provide corner units.

MORTAR AND GROUT MIXES:

Measurement: Use methods which will ensure that specified proportions are controlled and accurately maintained. Measure aggregate materials in a damp, loose condition.

Mortar: ASTM C 270, Type S, water-repellent-type for exterior work.

Mix mortar ingredients for a minimum of 5 minutes in a mechanical batch mixer. Use water clear and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than 2-1/2 hours has elapsed since initial mixing. Retemper mortar during 2-1/2-hour period as required to restore workability.

Grout: ASTM C 476, and the following:

Use "fine grout" where specified. Proportion by volume; one part Portland cement, zero to 1/10 part lime, and sand equal to 2-1/4 to 3 times the sum of the volumes of cement and lime materials.

Use "coarse grout" where specified. Proportion by volume; one part Portland cement, zero to 1/10 part lime, and fine aggregate (sand) equal to 2-1/4 to 3 times the sum of the volumes of cement and lime materials, and coarse aggregate equal to one to 2 times the sum of the volumes of cement and lime materials.

Mixing: Combine and mix cement, lime, water, aggregates, and approved admixtures for a minimum of 5 minutes in a mechanical batch mixer. For mortar, add as much water as is required for workability. Mix grout to have a slump of 10" plus or minus 1", at time of placement.

Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemicals accelerators, unless otherwise accepted in writing by the Architect.

Flashings for Masonry: Provide flashing reglets shown to be built into masonry. Fabricate from 24-gauge galvanized steel, unless otherwise indicated.

PART 3 - EXECUTION

INSPECTION:

Examine the areas and conditions under which work is to be executed. If conditions detrimental to the proper and timely completion of the work are encountered, do not proceed with the work until unsatisfactory conditions have been corrected.

INSTALLATION, GENERAL:

Do not wet concrete masonry units.

Lay CMU units with full-face shell and vertical head joint (end joint between units) mortar beds. Do not slush head joints. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths shown, or if not shown, provide 3/8" joints.

Layout walls in advance for accurate spacing of exposed bond patterns with uniform joint widths, and to properly locate openings, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and wherever possible at other locations.

Lay-up walls plumb and true with courses level, accurately spaced, and coordinated with other work.

Pattern Bond: Lay CMU wall units in 1/2 running bond with vertical joints in each course centered on units in courses above and below, unless otherwise shown. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, lintels, bond beams, and other special conditions.

Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimensions shown and to provide minimum clearance and grout coverage for vertical reinforcing bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcing bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms. Do not use paper or other bond breakers.

Wall Thickness: Build walls to the actual thickness of the masonry units, using units of nominal thickness shown or specified.

Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

Cut masonry units using motor-driven saw to provide clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full-size units without cutting wherever possible. Do not lay wet units.

Do not use mortar or grout which has begun to set or if more than 2-1/2 hours has elapsed since initial mixing. Retemper mortar during the 2-1/2-hour period only as required to restore workability.

Tool exposed joints slightly concave, unless otherwise shown. Cut joints flush for masonry which will be concealed or covered by other materials. Rake out mortar wherever joints are to receive caulking or sealants.

Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove masonry units, clean off mortar, and reset in fresh mortar.

Stop masonry work by racking back 1/2 masonry unit length in each course; do not tooth. Stop grout pours 4-inches back of rack at ends and as further specified at top of pours. Prior to resuming masonry work, remove loose units and unbonded mortar, clean exposed surfaces of set masonry and, if specified to be wetted, wet units lightly.

Build in items specified under this and other sections of these specifications as the work progresses. Fill in solidly with masonry around built-in items.

Fill space between hollow metal frames and masonry solidly with mortar.

Where built-in items are to be embedded in cores of hollow masonry units, place a small mesh expanded metal lath or wire screening in second joint below and rod grout into core.

Install flashing reglets and anchor slots in reinforced masonry work as shown.

Temporary Form Work: Provide Form Work and shores as required for temporary support of reinforced masonry elements. Design, erect, support, brace, and maintain Form Work.

Construct Form Work to conform to shape, line, and dimensions shown. Make sufficiently tight to prevent leakage of mortar grout, or concrete (if any). Brace, tie, and support as required to maintain position and shape during construction and curing of reinforced masonry.

Do not remove forms and shores until reinforced masonry member has hardened sufficiently to carry its own weight and all other reasonable temporary loads that may be placed on it during construction.

Allow not less than 7 days to elapse after completion of the member before removing shores or forms. Provide suitable curing conditions during the curing period.

PLACING REINFORCING:

General: Clean free of loose rust, mill scale, earth, ice, or other materials which will reduce bond to mortar or grout. Do not use reinforcing bars with kinks or bends not shown on drawings of final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

Position reinforcing accurately at the spacing shown. Support and secure vertical bars against displacement. Horizontal reinforcing may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1" (whichever is greater).

Splice reinforcing bars where shown; do not splice at other points unless acceptable to the Architect. Provide not less than minimum lap shown, or if not shown not less than 45-bar diameters.

Embed prefabricated horizontal joint reinforcing as the work progresses, with a minimum cover of 5/8" on exterior face of walls and 1/2" at other locations. Lap units not less than 6" at ends. Use prefabricated "L" and "T" units to provide continuity at corners and intersections. Cut and bend units as recommended by

manufacturer for continuity at returns, offsets, pipe enclosures, and other special conditions. Space horizontal joint reinforcing at 16" O.C. vertically, unless otherwise shown.

Provide masonry lintels where shown and wherever openings of more than 1'-0" are shown without structural steel or other supporting lintels. Provide pre-cast masonry or formed-in-place masonry lintels. Thoroughly cure pre-cast lintels before handling and installation. Temporarily support formed-in-place lintels.

Unless otherwise shown, provide one horizontal reinforcing bar for each 4" of wall thickness, of size-number not less than the number of feet of opening width.

For hollow masonry unit walls, use specially formed U-shaped lintel units with reinforcing bars placed as shown, filled with grout.

Provide minimum bearing at each jamb of 8".

Reinforce masonry openings less than 1'-0" wide, with horizontal joint reinforcing placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcing a minimum of 2'-0" beyond jambs of the opening.

GROUTING:

Use "fine grout" for filling spaces less than 4" in both horizontal directions.

Use "coarse grout" for filling spaces 4" or larger in both horizontal directions.

Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.

Low-Lift Grouting: Place vertical reinforcing prior to laying of CMU. Extend above elevation of maximum pour height as required to allow for splicing. Support in position at vertical intervals not exceeding 8'-0".

Lay CMU to maximum pour height. Do not exceed 4' height or if bond beam occurs below 4' height, stop pour at course below bond beam.

Pour grout using container with spout or by chute. Vibrate grout during placing. Place grout continuously. Terminate grout pours 1-1/2" below top course of pour.

Bond Beams: Stop grout in vertical cells 1-1/2" below bond beam course. Place horizontal reinforcing in bond beam; lay at corners and intersections as shown. Place grout in bond beam course before filling vertical cores above bond beam.

High-Life Grouting: Do not use high-lift grouting technique for grout of CMU unless minimum cavity dimension is 3" or larger.

Provide clean-out holes in first course at all vertical cells which are to be filled with grout.

Use units with one face shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in one face shell.

Construct masonry to full height of maximum grout pour specified, prior to placing grout.
Limit grout pours to heights recommended by the National Concrete Masonry Association (NCMA) for the type of units, reinforcing, and grout used in the work, but in no case exceed 10' height.

Place vertical reinforcing before grouting. Place before or after laying masonry units, as required by job conditions. Tie vertical reinforcing to dowels at base of masonry where shown and thread CMU over or around reinforcing. Support vertical reinforcing at intervals not exceeding 8'-0".

Place horizontal beam reinforcing as the masonry units are laid.

Preparation of Grout Spaces: Prior to grouting, inspect and clean grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry, and other foreign materials from grout spaces. Clean reinforcing and adjust to prior position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close clean-out holes and brace closures to resist grout pressures.

Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

Place grout by pumping into grout spaces unless alternate methods are acceptable to the Architect.

Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Place grout in lifts which do not exceed 4'. Allow not less than 30 minutes, nor more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

Place grout in lintels or beams over openings in one continuous pour.

Where bond beam occurs more than one course below top of pour, fill bond beam course to within 1' of vertically reinforced cavities, during construction of masonry.

When more than one pour is required to complete a given section of masonry, extend reinforcing beyond masonry as required for splicing. Pour grout to within 1-1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcing for second pour section before grouting. Repeat sequence if more pours are required.

REPAIR, POINTING, AND CLEANING:

Remove and replace masonry units which are loose, chipped, broken, stained, or otherwise damaged, of if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar.

Point-up all joints at corners, openings, and adjacent work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

Cleaning Exposed Masonry Surfaces:

Wipe off excess mortar as the work progresses. Dry brush at the end of each day's work.

Final Cleaning: After mortar is thoroughly set and cured, clean sample wall area of approximately 20 square feet as follows. Obtain Architect's acceptance of sample cleaning before proceeding to clean rest of masonry work.

Dry clean to remove large particles of mortar using wood paddles and scrapers. Use chisel or wire brush if required.

Presoak wall by saturating with water and flush off loose mortar and dirt.

Scrub down wall with stiff fiber brush and a solution of 1/2 cup of trisodium phosphate and 1/2 cup of household detergent dissolved in one gallon of water.

Rinse walls, using clean, pressurized water, to neutralize cleaning solution and remove loose material.

Acid Cleaning: If cleaning of sample wall area by non-acid method is unacceptable, clean as follows:

Dry clean and presoak as specified for non-acid cleaning and apply proprietary acid-type cleaners in compliance with manufacturer's instructions.

Protect other work from acid solutions and cleaning operations.

PROTECTION:

Advise Contractor of proper procedures required to protect the masonry work from deterioration, discoloration, or damage during subsequent construction operations.

Normal weathering of masonry work, exposed to the weather after completion, will be acceptable, provided other conditions and activities do not interfere and result in an unacceptable condition.

END OF SECTION 04230

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of the contract, including the Articles, apply to this Section.

SUMMARY:

This Section includes the following:

Steel pipe and tube handrails and railings.

Related sections include the following:

Section 09900 "Painting".

PERFORMANCE REQUIREMENTS

General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:

Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."

Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.

SUBMITTALS

Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other work.

For installed handrails and railings indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

Qualification Data: For firms and person specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

Product Test Reports: From a qualified testing agency indicating handrails and railings comply with ASTM E 985, based on comprehensive testing of current products.

QUALITY ASSURANCE

Source Limitations: Obtain each type of handrail and railing through one source form a single manufacturer.

STORAGE

Store handrails and railings in a dry, well-ventilated, weather-tight place.

PRODUCT CONDITIONS

Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.

COORDINATION

Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

PART 2 - PRODUCTS

METALS

General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

Extruded Bar and Tube: ASTM B 211 ASTM B 211), alloy 6063-T5/T52.

Extruded Structural Pipe and Tube: ASTM B 429, alloy 6063-T6.

Drawn Seamless Tube: ASTM B 209 (ASTM B 209M), alloy 6061-T6.

Die and Hand Forgings: ASTM B 247 (ASTM B 247M), alloy 6061-T6.

Castings: ASTM B 26/B 26M, alloy A356-T6.

Tubing: ASTM A 554, Grade MT 304.

Pipe: ASTM A 312/A 312M, Grade TP 304.

Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.

Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:

Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

Black finish, unless otherwise indicated.

Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.

Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless another grade is required by structural loads.

Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

WELDING MATERIALS, FASTENERS, AND ANCHORS

Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

PAINT

Shop Primers: Provide primers to comply with applicable requirements in Section 09900 "Painting."

Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

GROUT AND ANCHORING CEMENT

Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

FABRICATION

General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinate installation. Use connections that maintain structural value of joined pieces.

Form changes in direction of railing members as follows:

By radius bends of radius indicated by Architect.

Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

Welded Connections: Fabricate handrails and railings by connecting members with concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

Ease exposed edges to a radius of approximately 1/32", unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the work.

Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

Close exposed ends of handrail and railing members with prefabricated end fittings.

Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4" or less.

Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

FINISHES, GENERAL

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

PART 3 - EXECUTION

INSTALLATION, GENERAL

Fit exposed connections together to form tight, hairline joints.

Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

> Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
>
> Set posts plumb within a tolerance of 1/16" in 3'.
>
> Align rails so variations form level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4" in 12'.

Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

RAILING CONNECTIONS

Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements of welded connections in "Fabrication" article whether welding is performed in the shop or in the field.

ANCHORING POSTS

Form or core-drill holes not less than 5" deep and 3/4" larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring materials written instructions:

> Nonshrink, ,nonmetallic grout
> Nonshrink, nonmetallic grout or anchoring cement

Cover anchorage joint with flange of same metal as post or as specified attach flange to post as follows:

Welded to post after placing anchoring material.

CLEANING

Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

PROTECTION

Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

Restore finishes damage during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521