AMERICAN UNIVERSITY of AFGHANISTAN

PROJECT TECHNICAL SPECIFICATION FOR CONSTRUCTION OF

DINING FACILITY FOR INTERNATIONAL CAMPUS

IN KABUL, AFGHANISTAN

Issued for Construction

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PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

A. Drawings
   Large scale drawings take precedence over small scale drawings. Written or calculable dimensions take precedence over scaled dimensions.

   If there are any errors in dimensions, set out or size, immediately notify the Contracting Officer.

B. Schedule
   The schedule forms part of the specification. Information in the schedule will take precedence over information in the specification.

C. Bill Of Quantities
   If there are any errors in description of items or omissions in the BOQ, immediately notify the Contracting Officer.

   If there are any items which are unclear or are not available within the project program, immediately notify the Contracting Officer.

D. Services diagrammatic layouts
   Layouts of service lines, plant and equipment shown on the drawings are diagrammatic only, except where figured dimensions are provided or calculable.

   Before commencing work:
   
   Obtain measurements and other necessary information. Coordinate the design and installation in conjunction with all trades.

E. Site Levels
   Spot levels and identified levels on drawings take precedence over contour lines and ground profile lines.

1.2 INSPECTION

A. Inspection Notification Schedule
   The Contractor is to notify the Contracting Officer when the items identified in the Inspection notification schedule are ready for inspection.

B. Written Notice
   Minimum notice for inspections to be made on site is 24 hours for off-site personnel, 4 hours for onsite personnel.

   If notice of inspection is required in respect of parts of the works that are to be concealed, advise when the inspection can be made before concealment.
1.3 SUBMISSIONS

A. Samples

The Contracting Officer must approve the testing Laboratory, Submit nominated samples for approval of the Contracting Officer.

If it is intended to incorporate samples into the works, submit proposals for approval. Only incorporate samples in the works which have been approved. Do not incorporate other samples.

Keep endorsed samples in good condition on site, until practical completion.

B. Shop Drawings

General: If required, submit dimensioned drawings showing details of the fabrication and installation of services and equipment, including relationship to building structure and other services, cable type and size, and marking details. Requirement for submission of Shop Drawings is at the discretion of AUAF.

Diagrammatic layouts: Coordinate work shown diagrammatically in the contract documents, and submit dimensioned set-out drawings.

PART 2 – PRODUCTS

2.1 TESTS

A. Notice

Give notice of time and place of nominated tests.

B. Attendance

The Contractor is to carry out and attend all tests were nominated in this specification.

The independent approved testing laboratory shall perform the required tests and report results of all tests noting if the tested material passed or failed such tests and shall furnish copies to the Contracting Officer.

2.2 MATERIALS AND COMPONENTS

A. Consistency

For the whole quantity of each material or product use the same approved manufacturer or source and provide consistent type, size, quality and appearance.

B. Manufacturers’ or Suppliers’ Recommendations

Proprietary items: Select, if no selection is given, and transport, deliver, store, handle, protect, finish, adjust, prepare for use, and provide manufactured items in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Proprietary systems/assemblies: Assemble, install or fix in accordance with the current written recommendations and instructions of the manufacturer or supplier.

Project modifications: Advise of activities that supplement, or are contrary to, manufacturers or suppliers’ written recommendations and instructions.

C. Proprietary Items

Identification of a proprietary item does not necessarily imply exclusive preference for the item so identified, but indicates the necessary properties of the item.

Alternatives: If alternatives are proposed, submit proposed alternatives and include samples, available technical information, reasons for proposed substitutions and cost. If necessary, provide an
English translation. State if provision of proposed alternatives will necessitate alteration to other parts of the works and advise consequent costs.

PART 3 - EXECUTION

Use of explosives will not be permitted.

3.1 COMPLETION

A. Warranties
Name the owner as warrantee in conformance with the Warranty schedule. Register with manufacturers as necessary. Retain copies delivered with components and equipment.

Commencement: Commence warranty periods at practical completion or at acceptance of installation, if acceptance is not concurrent with practical completion.

3.2 OPERATION AND MAINTENANCE MANUALS

A. General
Submit operation and maintenance manuals for installations.

a. Format – hard copy
These will be A4 size loose leaf, in commercial quality files with hard covers, each indexed, divided and titled. Include the following features:

• Cover: Identify each binder with typed or printed title “OPERATION AND MAINTENANCE MANUAL”, to spine. Identify title of project and date of issue.

• Drawings: Fold drawings to A4 size and accommodate them in the files so that they may be unfolded without being detached from the rings.

• Text: Manufacturers’ printed data, including associated diagrams, or typewritten, single-sided on paper, in clear concise English.

Number of copies: 3.

b. Format – soft copy
- In PDF, AutoCad or Microsoft Word, Excel format.
- On compact disk properly identified as above

Number of copies: 3.

---End of Section---
PART 1 - GENERAL

1.1 SUMMARY

A. Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related work:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.
   2. Applications for Payment.
   5. Additional procedures also may be prescribed in other Sections of this Project Manual.

1.2 QUALITY ASSURANCE

A. Coordinate such procedures as are necessary to assure full protection of work and materials as may be further described in the approved Contractor Quality Control Plan for this project.

1.3 MANUFACTURERS’ DOCUMENTATION

A. Deliver products to the Project in their manufacturer’s original container, with labels intact and legible.

   1. Maintain packaged materials with seals unbroken and labels intact until time of use.

   2. Promptly remove damaged material and unsuitable items from the Job Site, and replace with material meeting the specified requirements.

   3. Retrieve and provide to the Contractor’s Project Manager any and all manufacturer’s documentation shipped and delivered in the manufacturer’s packaging including but not limited to the following:

      a. Operation and maintenance manuals;

      b. Control Diagrams

      c. Installation Instructions;

      d. Safety Precautions;

      e. Spare Parts List;

      f. Manufacturer's Catalog Data;

B. Contracting Officer may reject non-complying material and products that do not bear satisfactory identification as to manufacturer, grade, quality, and other pertinent information.

1.4 PROTECTION

A. Delivery:
1. Deliver all materials to the Job Site in original, undamaged, packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical information.

B. Protection:

1. Materials for work of this Section shall be properly and appropriately protected in accordance with manufacturer’s instructions and accepted standards until installed and accepted by the Contractor Project Manager.

2. Store materials off of the ground and protected from the elements with waterproof tarpaulins, vented and secured.

3. Security for delivered materials is the responsibility of the Contractor.
   a. No claim for theft or damage to stored materials relevant to this project will be recognized by Contracting Officer.
   b. All such claims are the responsibility of the Contractor’s Insurance Company and should be so directed.

4. Damaged or deteriorating materials shall not be used and shall be removed from the Job Site.

C. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.

D. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

E. Maintain finished surfaces clean, unmarred, and suitably protected until accepted by the Contracting Officer.

1.5 REPAIRS AND REPLACEMENTS

A. In the event of damage, promptly make replacements and repairs to the approval of Contracting Officer, at no additional cost.

B. Additional time required to secure replacements and to make repairs to items damaged as the result of actions by the Contractor will not be considered when submitting requests for extensions of time.

1.6 PAYMENT

A. Contractor will invoice properly documented, protected, and insured materials in accordance with the terms of our Agreement.

---End of Section---
SECTION 02 51 00
WATER DISTRIBUTION

PART 1 - GENERAL

1.1 REFERENCES

A. Publications are referenced in the text by basic designation only. To the extent referenced, publications form a part of this specification.

1.2 DESIGN REQUIREMENTS

A. Water Distribution Mains:

1. Provide water distribution mains indicated conforming to either High Density Polyethylene (HDPE). Provide water main accessories, gate valves and check valves as specified and where indicated. Submit design calculations of water piping.

1.3 SUBMITTALS

A. Within 30 calendar days after the Contractor has received the Contracting Officer Notice to Proceed, submit:

1. Product Data:
   a. Piping Materials.
   b. Water distribution main piping, fittings, joints, valves, and coupling.
   c. Water service line piping, fittings, joints, valves, and coupling.
   d. Hydrants.
   e. Submit manufacturer’s standard drawings or catalog cuts, except submit both drawings and cuts for push-on and/or rubber-gasketed bell-and-spigot joints. Include information concerning gaskets with submittal for joints and couplings.

2. Design Data:
   a. Design calculations of water piping.
   b. Test Reports.
   c. Bacteriological Disinfection.
   d. Certificates.
   e. Water distribution main piping, fittings, joints, valves, and coupling.
   f. Water service line piping, fittings, joints, valves, and coupling.
   g. Lining.
   h. Displacement Type Meters.
   i. Compound Type Meters.
   j. Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise
and that production control tests have been performed at the intervals or frequency specified in the publication.

3. Manufacturer's Instructions:
   a. Delivery, storage, and handling.
   b. Installation procedures for water piping.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

1. Inspect materials delivered to site for damage.
2. Unload and store with minimum handling.
3. Store materials on site in enclosures or under protective covering.
4. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight.
5. Do not store materials directly on the ground.
6. Keep inside of pipes, fittings, valves and hydrants free of dirt and debris.

B. Handling:

1. Handle pipe, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition.
2. Take special care to avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged.
3. Do not place any other material or pipe inside a pipe or fitting after the coating has been applied. Carry, do not drag pipe to the trench.
4. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe.
5. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method.
6. Before installation, the pipe shall be inspected for defects.
7. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government.
8. Store rubber gaskets that are not to be installed immediately, under cover out of direct sunlight.
9. Polyethylene (PE) Pipe, Fittings, and Accessories:
   a. Handle PE pipe, fittings, and accessories in accordance with AWWA C901.
10. Miscellaneous Plastic Pipe and Fittings:
    a. Handle Polyvinyl Chloride (PVC) and HDPE pipe and fittings in accordance with the manufacturer's recommendations.
b. Store plastic piping and jointing materials that are not to be installed immediately under cover out of direct sunlight.

PART 2 - PRODUCTS

2.1 WATER DISTRIBUTION MAIN MATERIALS

Piping Materials: As indicated in the contract documents.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPELINES

A. General Requirements for Installation of Pipelines:

1. These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.

B. Location of Water Lines:

1. Terminate the work covered by this section at a point approximately 1.5 m from the building, unless otherwise indicated.

2. Do not lay water lines in the same trench with fuel lines or electric wiring.

3. Water Piping Installation Parallel With Sewer Piping:

a. Normal Conditions: Lay water piping at least 3.0 m horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.

b. Unusual Conditions: When local conditions prevent a horizontal separation of 3.0 m, the water piping may be laid closer to a sewer or sewer manhole provided that:

   (1.) The bottom (invert) of the water piping shall be at least 450 mm above the top (crown) of the sewer piping.

   (2.) Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling. Approved waste water disposal method shall be utilized.

   (3.) The sewer manhole shall be of watertight construction and tested in place.

4. Installation of Water Piping Crossing Sewer Piping:

a. Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 450 mm between the bottom of the water piping and the top of the sewer piping.

b. Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:

   (1.) Sewer piping passing over or under water piping shall be constructed of AWWA-approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.

   (2.) Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 450 mm between the bottom of the sewer
piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 6.1 m, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.

5. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.

D. Pipe Laying and Jointing:

1. Remove fins and burrs from pipe and fittings.

2. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition.

3. Provide proper facilities for lowering sections of pipe into trenches.

4. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches.

5. Cut pipe in a neat workmanlike manner accurately to length established at the site and work into place without springing or forcing.

6. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material.

7. Blocking or wedging between bells and spigots will not be permitted.

8. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.

9. Grade the pipeline in straight lines; avoid the formation of dips and low points.

10. Support pipe at proper elevation and grade.

11. Secure firm, uniform support.

12. Wood support blocking will not be permitted.

13. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.

14. Provide anchors and supports where necessary for fastening work into place.

15. Make proper provision for expansion and contraction of pipelines.

16. Keep trenches free of water until joints have been properly made.

17. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads.

18. Do not lay pipe when conditions of trench or weather prevent installation.

19. Depth of cover over top of pipe shall not be less than 760 mm.

20. A 0.127 mm (5 mil) brightly colour plastic tracing tape, not less than 50 mm (2 inches) in width with a continuous metallic backing and a corrosion-resistant 0.0254 mm (1 mil) metallic foil core to permit easy location of the none metallic pipe line, shall be placed approximately 300 mm below finished grade level of the ground surface.
E. Penetrations:

1. Pipe passing through walls of valve pits and structures shall be provided with ductile-iron or Schedule 40 steel wall sleeves.

2. Annular space between walls and sleeves shall be filled with rich cement mortar.

3. Annular space between pipe and sleeves shall be filled with mastic.

F. Flanged Pipe:

1. Flanged pipe shall only be installed above ground or with the flanges in valve pits.

G. Installation of Water Service Piping:

1. Location:
   a. Connect water service piping to the building service where the building service has been installed.
   b. Where building service has not been installed, terminate water service lines approximately 1.5 m from the building line or at a point directed by Contracting Officers; such water service lines shall be closed with plugs or caps.

2. Service Line Connections to Water Mains:
   a. Connect service lines 50 mm size to the main with a rigid connection or a corporation stop and gooseneck and install a gate valve on service line below the frostline, as indicated.
   b. Where applicable, connect service lines to ductile-iron water mains in accordance with AWWA C600 for service taps.
   c. Connect service lines to PVC plastic water mains in accordance with UBPPA UNI-B-8 and the recommendations of AWWA M23, Chapter 9, "Service Connections."

3.2 FIELD QUALITY CONTROL

A. Field Tests and Inspections:

1. Prior to hydrostatic testing, obtain Contracting Officer approval of the proposed method for disposal of waste water from hydrostatic testing.

2. Contractor will conduct field inspections and witness field tests specified in this section.

3. The Contractor shall perform field tests, and provide labor, equipment, and all incidentals required for testing.

4. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications.

B. Testing Procedure:

1. Test PVC plastic water mains and water service lines made with PVC plastic water main pipe in accordance with the requirements of UBPPA UNI-B-3 for pressure and leakage tests.
2. The amount of leakage on pipelines made of PVC plastic water main pipe shall not exceed the amounts given in UBPPA UNI-B-3, except that at joints made with sleeve-type mechanical couplings, no leakage will be allowed.

3. Test water service lines in accordance with applicable requirements of AWWA C600 for hydrostatic testing.

4. No leakage will be allowed at plastic pipe joints] flanged joints and screwed joints.

3.3 CLEANUP

A. Upon completion of the installation of water lines, and appurtenances, all debris and surplus materials resulting from the work shall be removed.

-----End of Section-----
PART 1 - GENERAL

1.1 SUMMARY

A. Provide sanitary sewerage system as shown on the Drawings, specified herein, and needed for a complete and proper installation.

B. Related work:

1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received Contracting Officer’ Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;

3. Manufacturer's recommended installation procedures which, when approved by Contracting Officer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Un plasticized Polyvinyl chloride pipe and fittings (UPVC) class C.

B. PVC schedule 40.

C. Steel pipe.

D. GI pipes.

2.2 MANHOLES

A. Cast-in-place:

1. Construct base slab of cast-in-place concrete or use precast concrete base sections.

2. Make inverts in cast-in-place concrete and precast concrete bases with a smooth-surfaced semicircular bottom conforming to the inside contour of the adjacent sewer sections.
a. For changes in direction of the sewer and entering branches into the manhole, make a circular curve in the manhole invert of as large a radius as manhole size will permit.

3. Cast-in-place concrete work shall be in accordance with the requirements specified under paragraph entitled “Concrete Work” of this section.

   a. Make joints between concrete manholes and pipes entering manholes with the resilient connectors specified for this purpose; install in accordance with the recommendations of the connector manufacturer.

4. Provide joints of mortar, with approved mastic or rubber gasket, or an approved combination of those types.

5. Provide precast units of concrete rings and eccentric cone section, with ladder rungs cast into the units.

6. Approved manufacturer:

   a. (Locally available in Afghanistan).

B. Portland cement:

   1. For concrete in manholes, comply with ASTM C150, type II.

   2. For concrete in cradle and encasement: Type optional with Contractor.

C. Concrete:

   1. Provide concrete in accordance with pertinent provisions of relevant sections of these Specifications.

D. Mortar:

   1. Comply with ASTM C270, type M.

2.3 FRAMES AND COVERS

A. Use cast iron frames and covers, with the wording “SEWER” cast into the covers in letters 50 mm (2") high and plainly visible, as manufactured by (locally available in Afghanistan).

2.4 CLEANOUTS

A. Provide cleanouts as required and where shown on the Drawings.

   1. Provide traffic weight covers and frames where cleanouts are within pavement

   2. Acceptable products:

       a. (Locally available in Afghanistan), 250 mm (10") round cover, unless otherwise shown on the Drawings.

B. Where cleanout is within a graded area, construct as shown on the Drawings.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by Contractor.
PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENTS

A. Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.3 INSTALLATION

A. Trench, backfill, and compact for the work of this Section in strict accordance with pertinent provisions of relevant sections of these Specifications.

B. Location:

1. Where the sewer location is not located clearly by dimensions on the Drawings, locate the sewer:
   a. Not closer than 3 meters (ten feet) from a water supply main or service line.
   b. Where the bottom of the water pipe will be at least 300 mm (12”) above the top of the sewer pipe, the horizontal spacing may be a minimum of 1.8 meters (six feet).
   c. Where gravity flow sewers cross above water lines, fully encase the sewer pipe for a distance of ten feet on each side of the crossing; or
   d. Use acceptable pressure pipe with no joint closer horizontally than three feet from the crossing.
   e. Where concrete encasement is used, provide not less than 100 mm (4”) thickness including that on pipe joints.

C. Pipe laying:

1. Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.
2. Lay pipe by proceeding upgrade with the spigot ends of bell-and-spigot pipe pointing in direction of flow.
3. Lay each pipe accurately to the indicated line and grade, aligning so the sewer has a uniform invert.
4. Continually clear interior of the pipe free from foreign material.
5. Before making pipe joints, clean and dry all surfaces of the pipe to be joined.
6. Use lubricants, primers, cleaners and adhesives recommended for the purpose by the pipe manufacturer.
7. Place, fit, join, and adjust the joints to obtain the degree of water tightness required.

3.4 WYE BRANCHES

A. Provide wye branches where sewer connections are indicated or required:
1. Where joining an existing line, join by placing a saddle over the line, and make connection in a manner which will not obstruct or interfere with the existing flow.

2. When conditions are such that connection pipe cannot be supported adequately on undisturbed earth or compacted fill, encase the pipe in a concrete backfill, or support on a concrete cradle.

B. Provide concrete required because of conditions resulting from faulty construction methods or negligence, at no additional.

3.5 MANHOLES

A. General:

1. Shape the invert channels to be smooth and semicircular, conforming to the inside of the adjacent sewer section.

2. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.

3. Make changes in size and grade of channels smoothly and evenly.

4. Form the invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened.

5. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 25 mm (1") per 300 mm (foot) nor more than 50 mm (2") per 300 mm (foot).

6. Prevent free drop inside the manholes exceeding 450 mm (18") measured from the invert of the inlet pipe to the top of the floor of the manhole outside the channels.

7. Construct drop manholes whenever the free drop otherwise would be greater than 450 mm (18").

B. Manhole rungs:

1. Provide each manhole with individual wall-mounted rungs fabricated of aluminum, plastic-covered steel, or galvanized steel.

2. Comply with the requirements of governmental agencies having jurisdiction.

C. Jointing and plastering:

1. Completely fill mortar joints, and leave smooth and free from surplus mortar on the inside of the manhole.

D. Frames and covers:

1. Unless otherwise shown on the Drawings, set frames and covers:

2. In paved areas:
   a. So that the top of the cover will be flush with the finished pavement; or

3. In unpaved areas:
   a. 50 mm (2") higher than finished grade.
3.6 TESTING AND INSPECTING

A. Do not allow or cause any of the work of this Section to be covered up or enclosed until after it has been inspected and tested, and has been approved by Contracting Officer.

B. Leakage tests:
   1. Test lines for leakage by exfiltration tests.
      a. Prior to testing for leakage, backfill the trench to at least the lower half of the pipe.
      b. If required, place sufficient additional backfill to prevent pipe movement during testing, leaving the joints uncovered to permit inspection.
   2. Water exfiltration tests:
      a. Test each section of sewer line between successive manholes by closing the lower end of the sewer to be tested, and the inlet sewer of the upper manhole, using stoppers.
      b. Fill the manhole and pipe with water to a point four feet above the invert of the sewer at the center of the upper manhole; or, if groundwater is present, four feet above the average adjacent groundwater level.
   3. Water infiltration test:
      a. If, in the opinion of Contractor, excessive groundwater is encountered in the construction of a section of the sewer, the exfiltration test shall not be used.
      b. Close the end of the sewer at the upper structure sufficiently to prevent the entrance of water.
      c. Discontinue pumping of groundwater for at least three days, then test for infiltration.
      d. Infiltration into each individual reach of sewer between adjoining manholes shall not exceed that allowed in the formula given for the exfiltration test, except that "H" in the formula shall be the difference between the groundwater surface and the invert of the sewer at the downstream manhole.
   4. Provide and use measuring devices approved by Contracting Officer.
   5. Provide water, materials, and labor for making required tests.
   6. Make tests in the presence of Contractor, giving Contractor at least three days advance notice of being ready for test observation.

C. Submit test data to Contracting Officer for review and approval.

---End of Section---
PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all materials, labor, tools, equipment and other items necessary to install concrete formwork in locations shown on the Drawings, as specified herein, and as needed for a complete and proper installation of the work described in this Contract.

B. Related work specified elsewhere:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:
   1. The Manufacturer is responsible for researching and complying with all applicable codes.

1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’ “Notice to Proceed” submit the following:
   1. Shop Drawings:
      a. Include sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
      b. Include standard details showing recommendations for installation of concrete formwork.
   2. Product data:
      a. Materials list of items proposed to be provided under this Section;
      b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;
   3. Samples:
      a. Submit samples of each of the following:
         (1.) Proprietary materials including form coatings, ties, and accessories, and manufactured form systems if used.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”
PART 2 - PRODUCTS

2.1 GENERAL
A. All products specified within this Section are subject to local availability in markets accessible to Afghanistan.

B. In the absence of local Afghanistan product standards or laboratory certifications against which to review sample products, the Contractor and the manufacturer shall provide a letter certifying that the submitted product and installation will conform to the requirements of the project scope of work and will meet or exceed accepted local standards for products and installations of the type covered by this Section.

C. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the scope of work whether or not these are specifically described herein.

D. Unless specifically otherwise approved by Contracting Officer, provide all products of this Section from a single manufacturer.

2.2 STANDARD PRODUCTS
A. Provide components and equipment that are "standard products" of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship.

B. For the purposes of this project "standard products" is defined as products that have been in satisfactory commercial or industrial use for at least 2 years.

2.3 FORM MATERIALS
A. Except for metal forms, use new materials.
   1. Materials may be re-used during progress of the Work, provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing formwork of the required quality.

B. For footing and foundations, use locally available boards or planks secured to wood or steel stakes, substantially constructed to shapes indicated and to support the required loads.

C. For studs, wales, and supports, use locally available lumber, with dimensions as required to support the loads but not less than 50 mm x 100 mm (2" x 4").

D. Wall forms:
   1. Exposed concrete surfaces:
      a. Use 25 mm (1") minimum thickness locally available plywood, graded in accordance with locally accepted standards.
      b. Seal edges and coat both faces with colorless coating which will not affect application of applied finishes.
   2. Unexposed concrete surfaces:
      a. Use 25 mm x 150 mm (1" x 6") shiplap locally available lumber, surfaced one side and two edges, or 20 mm (3/4") minimum thickness locally available lumber, graded in accordance with locally accepted standards, sanded both sides, mill-oiled.

E. Column forms, if required:
1. For square or rectangular columns, use 50 mm (2") thick locally available planks or joists, surfaced one side and two edges, or use metal forms.

2. For round columns, use metal forms or patented paper tube forms approved in advance by Contracting Officer.

3. Construct column forms with tight joints and securely clamped together with steel clamps.

### 2.4 FORM TIES

A. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by Contracting Officer.

1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.

2. At horizontal pour lines, locate ties not more than 150 mm (6") below the pour lines. Tighten after concrete has set and before the next pour is made.

3. For exposed concrete surfaces, provide form ties of removable type with special-bolts equipped with permanent plugs and a system approved by Contracting Officer for fixing the plugs in place.

### 2.5 DESIGN of FORMWORK

A. General:

1. Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.

2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.

3. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.

4. Design forms and false work to include assumed values of live load, dead load, weight of moving equipment operated on the formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.

5. Provide shores and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.

6. Provide trussed supports when adequate foundations for shores and struts cannot be secured.

7. Support form materials by structural members spaced sufficiently close to prevent objectionable deflection.

8. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within the allowable tolerances.

9. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints, and provide backup material at joints as required to prevent leakage and prevent fins.
10. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads.

2.6 EARTH FORMS

A. Side forms for footings may be omitted, and concrete may be placed directly against excavation, only when requested by the Contractor and approved by Contracting Officer.

B. When omission of forms is accepted, provide additional concrete 25 mm (1") on each side of the minimum design profiles and dimensions shown on the Drawings.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FORM CONSTRUCTION

A. General:

1. Construct forms complying with ACI 347 to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.

2. Provide for openings, offsets, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features as required.

B. Fabrication:

1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

2. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.


4. Provide top forms for inclined surfaces where so directed by Contractor.

C. Forms for exposed concrete:

1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back the joints with extra studs or girts to maintain true, square intersections.

3. Use extra studs, wales, and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete.

4. Do not use narrow strips of form material which will produce bow.

D. Corner treatment:

1. Unless shown otherwise, form chamfers with 20 mm x 20 mm (3/4" x 3/4") strips, accurately formed and surfaced to produce uniformly straight lines and tight edges.
2. Extend terminal edges to required limit, and miter the chamfer strips at changes in direction.

E. Locate control joints as indicated on the Drawings and where required but not shown on the Drawings, as approved by Contracting Officer.

F. Provisions for other trades:
   1. Provide openings in concrete formwork to accommodate work of other trades.
   2. Verify size and location of openings, recesses, and chases with the trade requiring such items.
   3. Accurately place and securely support items to be built into the concrete.

3.3 **FORM COATINGS**

A. Coat form contact surfaces with form coating compound before reinforcement is placed.
   1. Do not allow excess form coating material to accumulate in the forms or to come in contact with surfaces which will bond to fresh concrete.
   2. Apply the form coating material in strict accordance with its manufacturer's recommendations.

3.4 **REMOVAL of FORMS**

A. General:
   1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
   2. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
   3. Do not strip floor slabs in less than two days.
   4. Do not strip vertical concrete in less than seven days.

B. Finished surfaces:
   1. Exercise care in removing forms from finished concrete surfaces so that surfaces are not marred or gouged.
   2. Release sleeve nuts or clamps, and pull the form ties neatly.
   3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.
   4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use cement grout specified in Section 03300 of these Specifications, flushing the holes with water before packing, screening off flush, and grinding to match adjacent surfaces.

---End of Section---
SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Provide concrete reinforcement where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.
   2. Section 03300: Cast-in-place concrete.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Comply with pertinent provisions of the following, except as may be modified herein:
   1. ACI 318;
   2. CRSI "Manual of Standard Practice."

1.3 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received Contracting Officer’ Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings showing details of bars, anchors, and other items, if any, provided under this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01640.

B. Delivery and storage:
   1. Use necessary precautions to maintain identification after bundles are broken.
   2. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.

PART 2 - PRODUCTS

2.1 REINFORCEMENT MATERIALS AND ACCESSORIES

A. Bars:
   1. Provide deformed billet steel bars complying with ASTM A615 grade 60 Ksi (4200kg/cm²).
B. **Steel wire:**
   1. Comply with ASTM A82.
   2. For tie wire, comply with Fed Spec QQ-W-461, annealed steel, black, 16 gage minimum.

C. **Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:**
   1. Use wire bar type supports complying with CRSI recommendations, unless otherwise shown on the Drawings.
   2. Do not use wood, brick, or other non-complying material.
   3. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
   4. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or plastic-protected legs.

### 2.2 FABRICATION

**A. General:**

1. Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.

2. In case of fabricating errors, do not straighten or rebind reinforcement in a manner that will weaken or injure the material.

3. Reinforcement with any of the following defects will not be acceptable.
   a. Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances.
   b. Bends or kinks not shown on the Drawings.
   c. Bars with reduced cross-section due to excessive rusting or other causes.

## PART 3 - EXECUTION

### 3.1 SURFACE CONDITIONS

**A.** Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 INSTALLATION

**A. General:**

1. Comply with the specified standards for detail and method of placing reinforcement and supports, except as may be modified herein.

2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

3. Position, support, and secure reinforcement against displacement by formwork, construction, and concrete placing operations.
4. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.

5. Place reinforcement to obtain minimum coverage by concrete.

6. Arrange, space, and securely tie bars and bar supports together with the specified wire.

7. Set tie wires so twisted ends are directed away from exposed concrete surfaces.

B. Provide sufficient numbers of supports, and of strength to carry the reinforcement.

C. Do not place reinforcing bars more than 50 mm (2") beyond last leg of any continuous bar support.

D. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

3.3 SPLICES

A. Lap splices:

1. Tie securely with the specified wire to prevent displacement of splices during placement of concrete.

B. Splice devices:

1. Obtain Contracting Officer' approval prior to using splice devices.

2. Install in accordance with manufacturer's written instructions.

3. Splice in a manner developing at least 125% of the yielding strength of the bar.

C. Perform welding in accordance with AWS D1.4-79.

D. Do not splice bars except at locations shown on the Drawings, except as otherwise specifically approved by Contracting Officer.

3.4 TESTING

A. Samples:

1. Samples for physical tests of reinforcement will consist of at least two pieces, each 450 mm (18") long, of each size of reinforcement steel, selected by the testing agency from material at the building site or at the fabricator's or supplier's yard.

2. Material to be sampled at the building site shall have been delivered thereto at least 72 hours before it is needed.

B. Tests:

1. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number, and provided mill analyses accompany the report, then one tensile test and one bend test will be made from a specimen of each ten tons or fraction thereof of each size of reinforcement steel.

2. Where positive identification of the heat number cannot be made, or where random samples are taken, then one series of tests will be made for each 2250 kilograms or fraction thereof of each size of reinforcement steel.

---End of Section---
SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide cast-in-place concrete where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.
   2. Section 03345: Concrete finishing.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Quality control:
   1. Do not commence placement of concrete until mix designs have been reviewed and approved by Contracting Officer and until copies are at the job site and the batch plant.
   2. Also see other requirements for testing as stated in Part 3 of this Section.

1.3 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Contracting Officer Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”.

PART 2 - PRODUCTS

2.1 CEMENT

A. Provide a standard brand of Portland Cement complying with ASTM C150, type I or II, low alkali. Do not change the brand of cement during progress of the Work except as approved in writing by Contracting Officer.

2.2 AGGREGATES

A. General:
   1. Provide hard rock aggregate complying with ASTM C33, with additional attributes as specified herein.
2. For making grading tests of fine and coarse aggregate, use square mesh wire cloth complying with ASTM E11.

B. Fine aggregate:

1. Provide washed natural sand having strong, hard, durable particles, and containing not more than 2% by weight of deleterious matter such as clay lumps, mica, shale, or schist.

2. Grade aggregate from coarse to fine within the limits found in Table I:

| Table I: Sieve Percentage by weight passing sieve: |
|-------------------|------|------|
| size:             | Minimum | Maximum |
| 9.5mm             | 100    | ----  |
| No. 4             | 95     | 100   |
| No. 8             | 65     | 95    |
| No. 16            | 45     | 75    |
| No. 30            | 30     | 50    |
| No. 50            | 10     | 22    |
| No. 100           | 2      | 8     |

C. Coarse aggregate:

1. Provide coarse aggregate consisting of clean, hard, fine grained, sound crushed rock or washed gravel, or a combination of both, containing not more than 5% by weight of flat, chip-like, thin, elongated, friable, or laminated pieces, nor more than 2% by weight of shale or cherty material.
   a. Any piece having a length in excess of five times the average thickness shall be considered flat or elongated.

2. Use coarse aggregate of the largest practicable size for each condition of placement, subject to the following maximum size limitations.
   a. Do not exceed 3/4 of the clear distance between reinforcing bars, 1/5 of the narrowest dimension between sides of forms, or 1/3 the depth of any slab section.

3. Grade combined aggregates within the limits found in Table II:
D. Lightweight aggregate, coarse and fine: Provide rounded, sealed, expanded shale or clay conforming to ASTM C 330.

### Table II: Gradation of Combined Aggregates

<table>
<thead>
<tr>
<th>Sieve size or size in inches:</th>
<th>Percentage by weight passing sieve:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>38mm agg.:</td>
</tr>
<tr>
<td>38mm</td>
<td>95</td>
</tr>
<tr>
<td>25mm</td>
<td>75</td>
</tr>
<tr>
<td>19mm</td>
<td>55</td>
</tr>
<tr>
<td>9.5mm</td>
<td>40</td>
</tr>
<tr>
<td>No. 4</td>
<td>30</td>
</tr>
<tr>
<td>No. 8</td>
<td>22</td>
</tr>
<tr>
<td>No. 16</td>
<td>16</td>
</tr>
<tr>
<td>No. 30</td>
<td>10</td>
</tr>
<tr>
<td>No. 50</td>
<td>2</td>
</tr>
<tr>
<td>No. 100</td>
<td>0</td>
</tr>
</tbody>
</table>

2.3 WATER

A. Use only water which is clean and free from deleterious amounts of acid, alkali, salt and organic materials.

2.4 ADMIXTURES

A. If required, use locally available, standard brands of admixtures for concrete, approved by Contracting Officer.

B. Admixtures shall conform to the appropriate specification listed.

1. Air-Entraining Admixture

   ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.
2. Anti-Freeze

a. Liquid

(1.) Products shall meet or exceed:

(a.) Sika Anti-Freeze 2000 available from:

S.E.P. Group, Wazir Akbar Khan, Street #13, Kabul Afghanistan; phone: +93-797-848-864 or +93-799-466-316; e-mail: sep-group@hotmail.co

b. Granular

(1.) Products shall meet or exceed:

(a.) Sika MR 50W available from:

S.E.P. Group, Wazir Akbar Khan, Street #13, Kabul Afghanistan; phone: +93-797-848-864 or +93-799-466-316; e-mail: sep-group@hotmail.co

c. Hardener (Accelerator)

(1.) Use with super plasticizer for quick set early strength (±100%) during the first 24 hours.

(a.) Products shall meet or exceed:

[1.] Sika Rapid -5 available from:

S.E.P. Group, Wazir Akbar Khan, Street #13, Kabul Afghanistan; phone: +93-797-848-864 or +93-799-466-316; e-mail: sep-group@hotmail.co

C. Water-Reducing or Retarding Admixture

ASTM C 494/C 494M, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

D. High-Range Water Reducer

ASTM C 494/C 494M, Type F or G. The admixture shall be used only when approved in writing.

E. Expanding Admixture

Aluminum powder type expanding admixture conforming to ASTM C 937.

2.5 CONCRETE MIXES

A. Provide a mix design prepared using the approved materials, and meeting the requirements stated on the Drawings.

1. Secure Contracting Officer’ approval of each mix design, including new mix designs required to be prepared, should a change in materials being used occur.

B. Provide concrete with the compressive strengths shown on the Drawings. When such strengths are not shown on the Drawings, provide 4000 psi (280,000 kg/cm²) minimum at 28 days for RCC work and for PCC 1420 psi (100 kg/cm²).

C. For foundation, see drawings.
PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 CONCRETE MIXING

A. Concrete for minor work, when approved by Contracting Officer, may be mixed at the site in a power mixer when the mixer has a capacity not less than one full sack batch.

B. Unless otherwise approved by Contracting Officer, use ready mixed concrete complying with ASTM C94, except as may be modified by the following.

1. For materials for ready mixed concrete, and for methods of measuring materials, comply with applicable provisions of this Section.

2. Equip truck mixers with a mixing water tank fitted with a water gage.

3. Mixing:
   a. Mix each batch of concrete not less than 15 minutes, five minutes of which shall be at the site.
   b. Rotate the drum at the rate specified by the manufacturer of the mixer as "mixing speed."
   c. Whenever there is a delay in unloading, rotate the drum slowly at intervals to prevent incipient set of concrete.

4. Addition of water:
   a. Normally, do not deliver concrete with total permissible amount of water incorporated therein.
   b. Unless otherwise approved by Contracting Officer, withhold at least 12.5L of water per cu. meter (2-1/2 gal. of water per cu. yd.) and add before the concrete is discharged but only under observation of the designated Contractor inspector.
   c. After water is added, at least five minutes of mixing time shall be completed immediately prior to discharge.
   d. Concrete will be rejected if not placed in final position within 1-1/2 hours after water is first added to the batch.

5. Concrete at time of placing shall be in such condition that it can be placed properly.

6. Discharge all wash water from the mixing drum before the truck reloads at the batching plant.

C. Concrete consistency:

1. Use the amount of water established by the approved mix design.
   a. Do not exceed the maximum quantity specified for the grade of concrete.
b. Use the minimum amount of water necessary to produce concrete of the workability required.

c. Do not supplement the predetermined amount of water with additional water for any reason.


a. As part of the routine testing and inspecting, test twice each day or partial day's run of the mixer.

b. Maintain a complete and accurate record of tests

3. Concrete slumps

a. Slump shall be determined in accordance with ASTM C 143/C 143M.

b. Slump of the concrete, as delivered to the point of placement into the forms, shall be within the limits indicated in Table III:

<table>
<thead>
<tr>
<th>Structural Element</th>
<th>Slump</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Slabs, Beams and Columns</td>
<td>25 mm</td>
</tr>
<tr>
<td>Foundation walls, substructure walls, footings</td>
<td>20 mm</td>
</tr>
<tr>
<td>Mass Concrete</td>
<td>30 mm</td>
</tr>
<tr>
<td>Any structural concrete approved for placement by pumping:</td>
<td></td>
</tr>
<tr>
<td>At pump</td>
<td>50 mm</td>
</tr>
</tbody>
</table>

c. When use of a plasticizing admixture conforming to ASTM C 1017/C 1017M or when a Type F or G high range water reducing admixture conforming to ASTM C 494/C 494M is permitted to increase the slump of concrete, concrete shall have a slump of 50 to 100 mm before the admixture is added and a maximum slump of 200 mm at the point of delivery after the admixture is added.

d. For troweled floors, slump of structural lightweight concrete with normal weight sand placed by pump shall not exceed 160 mm at the point of placement.

e. For other slabs, slump of lightweight concrete shall not exceed 100 mm at point of placement.

D. Modified concrete mix:

1. Where modified concrete mix is directed, provide the same composition as regular concrete mix; except omit 50% of the coarse aggregate.

2. Do not exceed the water/cement ratio specified for the grade of concrete.

E. Cement grout and dry-pack grout:

1. Mix at the site, in composition of one volume of Portland Cement to 2-1/2 volumes of fine aggregate.
2. Mix the materials dry; then add sufficient water to make the mixture flow under its own weight.

3. When grout is used as dry-pack concrete, add sufficient water to make a stiff mixture which can be molded into a sphere.

F. Strength Specimens

1. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 100 cubic meters or portion thereof of that concrete mixture placed each day.

2. Additional sets of test specimens shall be made, as directed by Contracting Officer, when the mixture proportions are changed or when low strengths have been detected or when the need for early breaks is identified.

3. A set of test specimens for concrete with a 28-day specified strength shall consist of four specimens, two to be tested at 7 days and two at 28 days.

4. Test specimens for concrete with a 90-day specified strength, when required, shall consist of six specimens, two tested at 7 days, two at 28 days, and two at 90 days.

5. Test specimens shall be formed and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C 39M for test cylinders and ASTM C 78 for test beams.

6. Results of all strength tests shall be reported immediately to Contracting Officer.

G. Miscellaneous provisions:

1. Provide strengths of concrete as shown on the Drawings.

2. Provide concrete dense and free from honeycomb and other defects.

3. Place and finish members to conform to the shapes and dimensions indicated, with all surfaces true to line, plumb, and level.

3.3 INSERTS, ANCHORS, AND EMBEDDED ITEMS

A. Powder driven concrete fasteners:

1. In addition to their use where the pins are loaded in shear, powder driven concrete fasteners may be used in tension for support of light loads such as acoustical ceilings, duct work, conduits, pipes, and similar items when such loads are limited to less than 165kg (75 lbs).

2. Where hanger rods, bolts, wire, or similar items are used to suspend construction items, place in the concrete as required and/or indicated.

3. Where suspended ceilings with metal carrying systems are called for on the Drawings:
   a. Provide hanger wires in the slab, as shown on the Drawings or otherwise required, of sufficient length to extend 305mm (12") below the line of the finish ceiling;
   b. Place the hanger wires in line to receive runner channels, beginning 152mm (6") from the walls parallel to the runners.

B. Reglets and rebates:

1. Form reglets and rebates as required to receive frames, flashing and other equipment.
2. Verify the dimensions and positions of required reglets and rebates with trades whose work is related to or contingent upon such dimensions and positions.

3. If concrete slabs on earth join a wall or other perpendicular concrete surface, form a reglet in the wall to receive and carry the horizontal concrete work.

C. Embedded piping and rough hardware:

1. Coordinate the various trades who are required to fasten work to the structure, or are required to insert therein any sleeve, box, bolt, anchor, insert, or other rough hardware.

2. Provide every facility for setting all required items accurately in the forms.

3. Be responsible for changes in position of such items after they have been set.

4. Provide in the forms for all sleeves, boxes, bolts, anchors, inserts, strap anchors for frames, and other rough hardware required for the Work, and which are shown or required to be embedded in the concrete.

5. Conduits and sleeves:

   a. Locate so as not to reduce the strength of construction. Do not place pipes, except conduits, in a slab of less than 89mm (3-1/2") thickness.

   b. In supported concrete slabs, do not bury conduit having an outside diameter greater than 33% of the thickness of the slab. Increase slab thickness locally to meet this requirement.

   c. Do not place conduit between the bottom of reinforcing steel and the bottom of supported slab.

   d. In placing conduits at slabs on earth, place below the reinforcement, and encase in concrete by increasing thickness of the slab locally to at least 76mm (3") of concrete around the conduit on all sides.

D. Where openings in floors and walls are required by the various trades, but are not detailed on the Drawings, reinforce as directed by Contractor.

3.4 CONVEYING AND PLACING CONCRETE

A. Before placing concrete, thoroughly clean forms, wash out with water, and make tight.

B. Time of placing:

   1. Do not place concrete until reinforcement, conduits, outlet boxes, anchors, sleeves, hangers, bolts, and other embedded materials are securely and properly fastened in their correct positions.

   2. Secure Contracting Officer’ approval of reinforcement before commencing placement of concrete.

C. Preparation:

   1. Before new concrete is deposited upon or against concrete that has taken its initial set or has hardened, remove all incrustations from forms and reinforcement.

   2. Remove all laitance, oil, and loose particles from concrete and concrete surfaces, and thoroughly clean the forms with water under stiff pressure.
3. Remove laitance after concrete has hardened partially (not less than two hours nor more than four hours after placing) by brushing with stiff bristles, or by directing a stream of water from a 6mm (1/4") nozzle, or by other method approved by the Contracting Officer, to expose the clean top surface of the coarse aggregate.

4. Where cleaning is not satisfactory to Contracting Officer, sandblast the surface and then wash again.

D. Modified concrete mix:

1. Before proceeding with placing the regular specified mix of concrete, cover existing horizontal concrete surface with modified concrete mix.
   a. Use the mix design specified in Paragraph 3.2-D of this Section.
   b. In walls, provide not less than 76mm (3") thickness of modified mix.
   c. Place the modified mix immediately ahead of regular concrete.
   d. Do not permit modified concrete mix to dry out prior to placing the regular mix.

2. Use modified concrete mix where conditions make compaction difficult, and where reinforcement is congested.

3. After placing modified concrete mix, carry on the placing of regular mix at such a rate that concrete is plastic at all times and flows readily into the forms and the spaces between reinforcement.

E. Method of placing:

1. Place concrete only under the degree of inspection described elsewhere in these Specifications.

2. Do not place concrete outside of regular working hours unless required inspection authorities have been notified properly and are present.

3. Spouts, pipes, troughs, belts, chain buckets, and other equipment may be used in conveying concrete, but the manner and method used shall be only as approved by Contracting Officer.

4. Do not permit concrete to free drop more than 2m.

5. Deposit concrete direct into conveyances, and direct from conveyances to final points of repose, except where troughs, buckets, or the like are used, in which case dump concrete into hoppers and then into the conveyances.

6. Where tremie tubes are used, or where the free drop is 2m or more, and through reinforcement, use a dumping box or board, moving the concrete from them by shovels or hoes.

7. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one to another, and place as rapidly as practicable after mixing.

8. Do not use in this Work any concrete not placed within 30 minutes after leaving the mixer.

F. Tamping and conveying:

1. Thoroughly work concrete around reinforcement and embedded fixtures, and into corners of forms, during placing operations.
2. Completely compact with tamping poles and by tapping forms until the concrete is thoroughly compact and without voids. Determine the number of tampers needed by the amount and method of placing concrete.

3. Exercise care to tamp concrete vigorously and thoroughly to obtain maximum density.

4. Use manual tampers as well as mechanical vibrators.
   a. Exercise care to direct the quick handling of vibrators from one position to another.
   b. Do not over-vibrate concrete.
   c. Do not move concrete by use of vibrator.

G. Stoppages:
1. Stop concrete placing only when and where approved by the Contracting Officer.

2. Maintain flow surfaces of freshly placed concrete as level whenever a concrete placement is stopped, providing tight dams to accomplish this.

3. Make construction joints only where unavoidable, and then only at points determined by Contractor.

4. Make horizontal construction joints only where shown on the Drawings or specifically approved by Contracting Officer.

5. Provide keys and dowels at construction joints where indicated on the Drawings, and where concrete placement is interrupted.

3.5 STEPS, SLABS, WALKS, AND PAVING ON EARTH

A. Preparation for slabs on earth:
   1. Prepare the subgrade as specified in other Sections.

2. Dampen the subgrade for exterior slabs and paving prior to placing concrete, but do not dampen subgrade at interior floor slabs.

3. Provide the specified vapor barrier membrane, with the bedding and covering shown on the Drawing, beneath floor slabs on grade.
   a. Place the membrane in as large sheets as practicable, lapping 305mm (12"), with the top lap placed in the direction concrete will be spread.
   b. Carefully cut, fit, and seal the membrane to all pipes and conduits projecting through the membrane, using small sheets, where necessary, and pressure-sensitive tape.
   c. Make necessary repairs to the membrane, and secure to Contracting Officer’ approval before placing concrete.
   d. Do not permit membrane to be punctured except at screed stakes and utility risers.

B. Placing and finishing:
   1. Tamp the freshly placed concrete, except slabs to receive separate topping finish or mortar setting bed, using a heavy tamper, until at least 9.5mm (3/8") of mortar is brought to the surface.

   2. Use tampers having a face consisting essentially of a grid of parallel metal bars.
3. Tamp with a light tamper, and screed with a heavy straightedge, until depressions and irregularities are worked out and the surface is true to finish grades and elevations.

4. Remove excess water and debris worked to the surface in compacting and screeding.

5. At slabs to receive separate topping finish or mortar setting beds, do not continue tamping to raise the mortar described in above.

6. Remove laitance as described in subparagraph above.

7. When concrete has hardened sufficiently, float to a compact and smooth surface.

8. Provide the finish surfaces shown on the Drawings or otherwise directed by Contracting Officer, in accordance with pertinent provisions of Section 03345 “Concrete Finishing” of these Specifications.

C. Cure and protect concrete in accordance with pertinent provisions of Section 03345 “Concrete Finishing” of these Specifications.

3.6 DEFECTIVE CONCRETE

A. The following concrete will be deemed to be defective, and shall be removed promptly from the job site.

1. Concrete which is not formed as indicated, is not true to intended alignment, is not plumb or level where so intended, is not true to intended grades and levels;

2. Has voids or honeycomb that have been cut, resurfaced, or filled, unless with the approval of Contracting Officer;

3. Has sawdust, shavings, wood, or embedded debris;

4. Or does not conform fully to provisions of the Contract Documents.

B. Repairs and replacements:

1. Defective concrete may be cut out and repaired with approved methods, when and as directed by Contracting Officer.

2. Where defective concrete is found after removal of the forms, cut out the defective concrete, if necessary, and make the surfaces match adjacent surfaces.

3. Work uneven surfaces and angles of concrete to a surface matching adjacent concrete surfaces.

3.7 GROUTING AND CEMENT POINTING

A. After steel columns have been installed and leveled, drypack the space between the bottom of the plate and concrete, using cement grout driven in to completely fill the space and forming solid bearing for the column base plate.

3.8 MISCELLANEOUS CONCRETE ITEMS

A. Walls and curbs:

1. Construct header walls and curbs as shown on the Drawings.

2. Trowel exposed concrete surfaces smooth.
B. Leave openings in floor slabs and future foundations for machines and equipment, where so indicated on the Drawings, and in dimensions and arrangements required for the approved machines and equipment.

---End of Section---
SECTION 03 34 50
CONCRETE FINISHING

PART 1 - GENERAL

1.1 DESCRIPTION
A. Provide finishes on cast-in-place concrete where shown on the Drawings, specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.
   2. Section 03300: Cast-In-Place Concrete.

1.2 QUALITY ASSURANCE
A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Except as may be modified herein or otherwise directed by Contracting Officer, comply with ACI 301, "Specifications for Structural Concrete for Buildings."

1.3 SUBMITTALS
A. Product data: Within 30 calendar days after the Contractor has received the Contracting Officer’s Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements.
   3. Manufacturer's recommended installation procedures which, when approved by Contracting Officer, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.4 PRODUCT HANDLING
A. Comply with pertinent provisions of Section 01640: “Storage and Protection”.

PART 2 - PRODUCTS

2.1 MATERIALS
A. General:
   1. Carefully study the Drawings and these Specifications, and determine the location, extent, and type of required concrete finishes.
   2. As required for the Work, provide the following materials, or equals approved in advance by Contracting Officer.

B. Concrete materials:
   1. Comply with pertinent provisions of Section 03300 “Cast-In-Place Concrete”, except as may be modified herein.
C. Liquid bonding agent:
   1. Provide a locally available product meeting Contracting Officer requirements.

D. Curing and protection paper:
   1. Approved products complying with ASTM C171
   2. Where concrete will be exposed and will be subjected to abrasion, such as floor slabs, use non-staining paper or equal paper faced with polyethylene film.

E. Liquid curing agents:
   1. Where application of specified finish materials will be inhibited by use of curing agents, cure the surface by water only; do not use chemical cure.
   2. For curing other areas, provide a locally available product meeting Contracting Officer requirements.

F. Floor sealer:
   1. Provide a locally available product meeting Contracting Officer requirements.

G. Slip-resistant abrasive aggregate:
   1. Provide aluminum oxide, 14/36 grading.
   2. Acceptable manufacturers: provide a locally available product meeting Contracting Officer requirements

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISHING OF FORMED SURFACES

A. After removal of forms, give the concrete surfaces on or more of the finishes specified below where so indicated on the Drawings.
   1. Revise the finishes as needed to secure the approval of Contracting Officer.

B. As-cast finish:
   1. Rough form finish:
      a. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.
      b. Remove fins exceeding 6mm (1/4") in height.
2. Smooth form finish:
   a. Coordinate as necessary to prepare for construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.
   b. Patch tie holes and defects.
   c. Remove fins completely.

C. Rubbed finishes:

1. Provide these finishes only where specifically called for, and then only on a "smooth form finish" base as described above.

2. Smooth rubbed finish:
   a. Produce on newly hardened concrete no later than the day following form removal.
   b. Wet the surfaces, and rub with carborundum brick or other abrasive until uniform color and texture are produced.
   c. Do not use a cement grout other than the cement paste drawn from the concrete itself by the rubbing process.

3. Grout cleaned finish:
   a. Do not start cleaning operations until all contiguous surfaces to be cleaned are completed and accessible.
   b. Do not permit cleaning as the work progresses.
   c. Mix one part Portland Cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint.
   d. Substitute white Portland Cement for part of the gray Portland Cement as required to produce a color matching the color of surrounding concrete, as determined by a trial patch.
   e. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout, and apply the grout uniformly with brushes or spray gun.
   f. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.
   g. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack or other means.
   h. After the surface whites from drying (about 30 minutes at normal temperatures), rub vigorously with clean burlap.
   i. Keep the surface damp for at least 36 hours after final rubbing.

4. Cork floated finish:
   a. Remove forms at an early stage, and no later than three days after placement of concrete.
   b. Remove ties.
c. Remove burrs and fins.
d. Mix one part Portland Cement and one part fine sand with sufficient water to produce a stiff mortar.
e. Dampen the wall surface.
f. Apply mortar with a firm rubber float or with a trowel, filling all surface voids.
g. Compress mortar into voids using a slow-speed grinder or stone.
h. If the mortar surface dries too rapidly to permit proper compacting and finishing, apply a small amount of water with a fog sprayer.
i. Produce the final texture with a cork float using a swirling motion.

D. Unspecified finish: If the finish of formed surfaces is not specifically called out elsewhere in the Contract Documents, provide the following finishes as applicable.

1. Rough form finish:
   a. For all concrete surfaces not exposed to public view.

2. Smooth form finish:
   a. For all concrete surfaces exposed to public view.

3.3 FINISHING SLABS

A. Definition of finishing tolerances:

1. Class „A“: True plane within 3mm (1/8") in 3m (10 ft.) as determined by a 3m (10 ft.) straightedge placed anywhere on the slab in any direction.

2. Class „B“: True plane within 6mm (1/4") in 3m (10 ft.) as determined by a 3m (10 ft.) straightedge placed anywhere on the slab in any direction.

3. Class „C“: True plane within 6mm (1/4") in 610mm (2 ft.) as determined by a 610mm (2 ft.) straightedge placed anywhere on the slab in any direction.

B. Scratched finish:

1. After the concrete has been placed, consolidated, struck off, and leveled to a Class „C“ tolerance, roughen the surface with stiff brushes or rakes before the final set.

C. Floated finish:

1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.

2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.

3. During or after the first floating, check the plane of the surface with a 3m (10 ft.) straightedge applied at not less than two different angles.

4. Cut down high spots and fill low spots, and produce a surface with a Class „B“ tolerance throughout.

5. Refloat the slab immediately to a uniform sandy texture.
D. Troweled finish:

1. Provide a floated finish as described above, followed by a power troweling and then a hand troweling.
   a. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.
   b. Provide hand troweling when a ringing sound is produced as the power trowel is moved over the surface.
   c. Thoroughly consolidate the surface by hand troweling.

2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class "A" tolerance.
   a. For concrete on metal deck, Class "B" plane tolerance is acceptable.
   b. On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor covering.

E. Broom finish:

1. Provide a floated finish as described above.

2. While the surface is still plastic, provide a textured finish by drawing a fiber bristle broom uniformly over the surface.

3. Unless otherwise directed by Contractor, provide the texturing in one direction only.

4. Provide "light," "medium," or "coarse" texturing as directed by Contractor or otherwise called for on the Drawings.

F. Exposed aggregate finish:

1. Provide a floated finish as described above.

2. While the surface is still plastic, embed an approved aggregate uniformly into the surface by light tamping.

3. Provide complete coverage to the depth of a single stone.

4. Float the surface until the embedded stone is fully coated with mortar and the surface has been brought to a true plane with Class "B" tolerance.

5. After the matrix has hardened sufficiently to prevent dislodgement of aggregate, begin exposure.
   a. Allow copious quantities of water, without force, to flow over the surface of the concrete while the matrix encasing the aggregate is removed by brushing with a fine bristle brush.
   b. Continue this operation until the aggregate is uniformly exposed but not dislodged.

6. An approved chemical retarder sprayed onto the freshly floated surface may be used to extend the working time for exposure of aggregate.

G. Unspecified finish: If the finish of slab surfaces is not specifically called for elsewhere in the Contract Documents, provide the following finishes as applicable.
1. Scratched finish:
   a. For surfaces scheduled to receive bond-applied cementitious applications.

2. Float finish:
   a. For surfaces intended to receive roofing.

3. Troweled finish:
   a. For floors intended as walking surfaces;
   b. Floors scheduled to receive floor coverings or waterproof membrane;
   c. Parking areas;

4. Broom finish:
   a. Garage ramps.

5. Non-slip finish:
   a. Exterior platforms, steps, and landings;
   b. Interior and exterior pedestrian ramps.

3.4 CURING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.

B. Preservation of moisture:

1. Unless otherwise directed by Contracting Officer, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing.
   a. Ponding or continuous sprinkling;
   b. Application of absorptive mats or fabric kept continuously wet;
   c. Application of sand kept continuously wet;
   d. Continuous application of steam (not exceeding 150 degrees F) or mist spray;
   e. Application of waterproof sheet materials specified in Part 2 of this Section;
   f. Application of other moisture-retaining covering as approved by Contracting Officer;
   g. Application of an approved curing agent specified elsewhere in the Contract Documents.

2. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.

3. Cure concrete by preserving moisture as specified above for at least seven days.

C. Temperature, wind, and humidity:

1. Cold weather:
a. When the mean daily temperature outdoors is less than 4 degrees C (40 degrees F), maintain the temperature of the concrete between 10 degrees C (50 degrees F) and 21 degrees C (70 degrees F) for the required curing period.

b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.

c. Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

2. Hot weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.

3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of -15 degrees C (5 degrees F) in any one hour period, or 10 degrees C (50 degrees F) in any 24 hour period.

D. Protection from mechanical injury:

1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.

2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods, by application of curing procedures, and by rain and running water.

3. Do not load self-supporting structures in such a way as to overstress the concrete.

---End of Section---
PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide concrete unit masonry where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work specified elsewhere:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Contractor qualifications.

C. Codes and standards:
   1. The Manufacturer is responsible for researching and complying with all applicable codes and standards.

1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’ “Notice to Proceed” submit the following
   1. Product data:
      a. Materials list of items proposed to be provided under this Section;
      b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;
      c. Manufacturer’s recommended installation procedures. Once approved by the Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.
   2. Samples:
      a. Submit samples of each of the following:
         (1) Submit full set of finish color samples for color selection.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: Storage and Protection

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the work whether or not these are specifically described herein.
2.2 CONCRETE MASONRY UNITS

A. Provide lightweight hollow load-bearing concrete masonry units complying with ASTM C90, grade N, type I, in color "natural gray."

B. Dimensions:
   1. Provide units of the dimensions shown on the Drawings.
   2. Where dimensions are not shown on the Drawings, provide units having nominal face dimensions of 406mm (16") long by 203mm (8") high by the depth shown or otherwise required.

C. Provide accessory shapes as indicated or otherwise required.

2.3 REINFORCEMENT AND ACCESSORIES

A. Comply with the following as minimums.
   1. Bars: ASTM A615, grade 40, unless otherwise shown on the Drawings, using deformed bars for number 3 and larger.
   3. Wire reinforcement: ASTM A82.

B. Fabricate reinforcement in accordance with recommendations contained in CRSI "Manual of Standard Practices."

2.4 MORTAR

A. Use mortar ASTM C270 type S.

B. Ingredients:
   1. Portland Cement: Comply with ASTM C150, type I or II.
   2. Aggregate: Provide clean, sharp, well graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter, and complying with ASTM C144.
   3. Admixtures: Do not use admixtures unless specifically approved in advance by Contracting Officer.

C. Mixing:
   1. Mechanically mix in a batch mixer for not less than three minutes, using only sufficient water to produce a mortar, which is spreadable and of a workable consistency.
   2. Retemper mortar with water as required to maintain high plasticity.
      a. On mortar boards, retemper only by adding water within a basin formed with mortar, and by working the mortar into the water.
      b. Discard and do not use mortar, which is unused after 1-1/2 hours following initial mixing.
2.5 GROUT

A. Ingredients:

1. Portland cement:
   a. Comply with ASTM C150, type I.

2. Aggregate:
   a. Provide clean, sharp, well graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter.

3. Admixtures:
   a. Do not use admixtures unless specifically approved in advance by Contracting Officer.

4. Water:
   a. Provide water free from injurious amounts of acids, alkalis, and organic materials.

B. Mixing:

1. Provide "fine grout" or "coarse grout" as designated on the Drawings or otherwise directed by Contracting Officer, and in accordance with ASTM C476.

2. When the minimum grout compressive strength is required to be more than 2000 psi, provide laboratory design mix prepared as required for design mixes of concrete under Section 03300 of these Specifications.

3. Proportions:
   a. For "fine grout," provide one part Portland Cement to 2-1/4 parts minimum to 3 parts maximum of damp loose sand, with sufficient water to achieve fluid consistency.
   b. For "coarse grout," provide one part Portland Cement to 3 parts maximum of damp loose sand to two parts coarse aggregate, with sufficient water to achieve fluid consistency.

4. "Fluid consistency" is interpreted as meaning as fluid as possible for pouring intimately in place without segregation.

C. Use "fine grout" where called for on the Drawings, where the grout space is less than 76mm in its least dimension, and where otherwise directed by Contractor.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:

1. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
2. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer’s recommended installation procedures as approved by Contracting Officer, anchoring all components firmly into position for long life under hard use.

3. Do not commence installation of the work of this Section until horizontal and vertical alignment of foundation is within 25mm of plumb and the lines shown on the Drawings.

4. Lay only dry masonry units.

5. Use masonry saws to cut and fit masonry units.

6. Set units plumb, true to line, and with level courses accurately spaced.

7. Clean the top surface of foundation free from dirt, debris, and laitance, and expose the aggregate prior to start of installing first course.

8. Accurately fit the units to plumbing, ducts, openings, and other interfaces, neatly patching all holes.

9. Keep the walls continually clean, preventing grout and mortar stains. If grout does run over, clean immediately.

B. Unless otherwise shown on the Drawings, provide running bond with vertical joints located at center of masonry units in the alternate course below.

C. Do not use chipped or broken units. If such units are discovered in the finished wall, Contractor may require their immediate removal and replacement with new units at no additional cost.

D. Laying up:

1. Place units in mortar with full shoved bed and head joints.

2. Align vertical cells of hollow units to maintain a clear and unobstructed system of flues.

3. Hold racking to an absolute minimum.

4. Provide cleanouts at the bottom of each cell of hollow units for removing mortar droppings. Do not close the cleanouts until they have been inspected and approved by Contracting Officer.

E. Reinforcement:

1. Provide reinforcement as shown on the Drawings, fully embedded in grout and not in mortar or mortar joints.

2. Provide required metal accessories to ensure adequate alignment of steel during grout filling operations.

F. Tooling:

1. Tool joints to a dense, smooth surface.

2. Unless otherwise shown on the Drawings, provide joints of "concave" pattern throughout.

3.4 GROUTING

A. Perform grouting in strict accordance with the provisions of the governing building code.
1. Solidly fill vertical cells containing reinforcement.
2. Consolidate grout at time of pour by hand rod.

3.5 CLEANING

A. Inspection and adjustment:

1. Upon completion of the work of this Section, make a thorough inspection of installed masonry and verify that units have been installed in accordance with the provisions of this Section.

2. Make necessary adjustments.

B. Clean surfaces of masonry as required for proper application of the specified finishes.

---End of Section---
SECTION 05 50 00  
METAL FABRICATION

PART 1 - GENERAL

1.1 INSPECTION

Notice
Give sufficient notice so that inspection may be made of the following:

• Shop fabricated or assembled items ready for delivery to the site.
• Site erected assemblies on completion of erection.

1.2 SUBMISSIONS

Samples
Submit samples to the Sample table for approval by the Contracting Officer.

Sample Table

<table>
<thead>
<tr>
<th>Description</th>
<th>No. of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each type of metal item to be purchased</td>
<td>2</td>
</tr>
<tr>
<td>Typical joints of welded or fabricated items</td>
<td>2</td>
</tr>
<tr>
<td>Finished sample of each type of painted or anodised metalwork indicating</td>
<td>2</td>
</tr>
<tr>
<td>range within color specified and finish</td>
<td></td>
</tr>
<tr>
<td>The finish to all stainless steel items</td>
<td>2</td>
</tr>
</tbody>
</table>

Manufacturer’s data: Submit manufacturer’s published product data and details for purchased items.

Stainless steel: For each batch of stainless steel supplied to the works, submit the certificate of compliance specified for the applicable standard.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Metals
Performance: Provide metals suited to their required function, finish and method of fabrication, in sections of strength and stiffness adequate for their purpose.

B. Rivets
Use blind rivets where available in the required metal.

C. Masonry Anchors
Proprietary types comprising screws or bolts in self-expanding sockets.

D. Masonry Plugs
Screws in purpose-made resilient plastic sockets or fixed to timber plugs built into the wall surface.

PART 3 - EXECUTION

3.1 CONSTRUCTION GENERALLY

A. Metals
Provide metals so that they transmit the loads imposed and ensure the rigidity of the assembly without causing deflection or distortion of finished surfaces.

B. Fasteners
Materials: Provide fasteners in materials of mechanical strength and corrosion resistance at least equal to that of the lowest resistant metal joined.

To copper and copper alloys: Provide copper or copper-alloy fixing devices only.

To aluminium and aluminium alloys: Provide aluminium alloy or stainless steel fixing devices only. To stainless steel: Provide appropriate stainless steel materials only.

C. Fabrication
Workshop: Fabricate and pre-assemble items in the workshop wherever practicable.

Edges and surfaces: Keep clean, neat and free from burrs and indentations. Remove sharp edges without excessive radiusing.


D. Fabrication Tolerances
Structural work generally: ± 2 mm from design dimensions.

E. Joints
Fit joints to an accuracy appropriate to the class of work. Finish visible joints made by welding, brazing or soldering using grinding, buffing or other methods appropriate to the class of work, before further treatment.


F. Marking
Provide suitable and sufficient marks or other means for identifying each member of site-erected assemblies, and for their correct setting out, location, erection and connection.

G. Splicing
Provide structural members in single lengths where possible. Obtain approval of the Contracting Officer for locations of joints where splices in metalwork cannot be avoided.

3.2 WELDING AND BRAZING

A. General
Quality: Provide finished welds which are free of surface and internal cracks, slag inclusion, and porosity.

B. Brazing:
General: Ensure brazed joints have sufficient lap to provide a mechanically sound joint. Do not used butt joints relying on the filler metal fillet only.

3.3 STAINLESS STEEL FABRICATION

A. Welding Stainless Steel
All tube, angle or thick plate material is to be welded unless noted otherwise on the drawings. Ensure that welds do not discolor the final surface finish in the welding process.

B. Riveting
Riveting may be used only to join stainless steel sheet or strip less than 1 mm thick. Drill (not punch)
the rivet hole, and drive the rivet cold. On completion, clean and passivate the riveted assembly.

C. Soldering
Do not solder stainless steel.

3.4 METAL FIXTURES

A. General
Provide metal fixtures where noted on drawings and in the Metal fixtures schedule as follows:

Components such as toilet roll holders, towel rails, soap dishes and their location, indicative construction details, trims, materials, dimensions and thicknesses, and finishes shall be as detailed or described in the schedule.

All dimensions noted on drawings shall be confirmed on site.

3.5 PIPE HANDRAILS, STAIRS, LADDERS AND BALUSTRADES

A. Assembly
Material: Refer to drawings and BOQ for details of member sizes and assembly of components.

B. Fabrication
Method: Welding.

Joints: Produce smooth unbroken surfaces at joints. Make end-to-end joints over an internal sleeve.
Bends: Make changes of direction in rails by evenly curved pipe bends.
Free ends: Seal the free ends of pipes with fabricated or purpose-made end caps.

C. Fixing to Structure
Provide fabricated predrilled or purpose-made brackets or post bases, and attach the pipework to the building structure with fixings, including bolts into masonry anchors, and coach screws or bolts into timber, of metal compatible with the pipework.

D. Galvanizing
If possible, complete fabrication before galvanizing; otherwise apply a zinc-rich primer to affected joint surfaces.

E. Painting
If possible, complete fabrication before painting; otherwise apply paint to affected joint surfaces after fixing on site. Make good all damaged painted surfaces before completion of the building works. Paint finish in accordance with the Exterior and Interior painting schedules.

PART 4 - COMPLETION

4.1 CLEANING
Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

---End of Section---
SECTION 05 72 00
HANDRAILS and GUARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all labor, materials, equipment and services necessary to design, fabricate and install handrails and guards where shown on the Drawings, as specified herein and as needed for a complete and proper installation.

B. Related work specified elsewhere:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:
   1. The Contractor is responsible for researching and complying with all applicable codes.

C. Publications are referenced in the text by basic designation only. To the extent referenced, publications form a part of this specification.

1.3 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Contracting Officer’ Notice to Proceed, submit:
   1. Shop Drawings:
      a. Provide Shop Drawings as required.
   2. Product data:
      a. Materials list of items proposed to be provided under this Section;
      b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;
      c. Manufacturer’s recommended installation procedures. Once approved by the Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.
   3. Samples:
      a. Submit samples of each of the following:
         1. Color samples illustrating available choices for selection.
   4. Manufacturer's Certificates:
      a. Anodized finish as specified.
      b. Live load designs as specified.
1.4 PRODUCT HANDLING
   A. Comply with pertinent provisions of Section 01640: Storage and Protection

1.5 WARRANTY
   A. Provide Manufacturers' Structural one year warranty.

PART 2 - PRODUCTS

2.1 GENERAL
   A. Furnish all materials, tools, equipment, services and incidentals necessary to complete
   the work of this Section as described in the Contract Documents and required by the work
   whether or not these are specifically described herein.

2.2 DESIGN CRITERIA
   A. In addition to the dead loads, design fabrications to support the following live loads unless
   otherwise specified or required by code:
      1. Railings and Handrails: 91kg (200 pounds) in any direction at any point.

2.3 MATERIALS
   A. Structural Steel: ASTM A36.
   B. Steel Pipe: ASTM A53.
      1. Galvanized for exterior locations.
      2. Type S, Grade A unless specified otherwise.
      3. NPS (inside diameter) as shown.
   E. Cast-Iron: ASTM A48, Class 30, commercial pattern.
   F. Malleable Iron Castings: A47.
   G. Primer Paint: As required to match.
   H. Stainless Steel Tubing: ASTM A269, type 302 or 304.
   J. Grout: ASTM C1107, pourable type.

2.3 HARDWARE
   A. Rough Hardware:
      1. Furnish rough hardware with a standard plating, applied after punching, forming and
         assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process.
         Galvanized G-90 where specified.
      2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or
         stainless is used.
   B. Fasteners:

2. Expansion Bolts (Shields): Fed. Spec. FF-B-588 or FF-S-325, Group II, type 1 or 2. Lead, fiber and plastic shields are not acceptable. Furnish with bolts or screws.

3. Toggle Bolts: Fed. Spec. FF-B-588, Type I, Class A, Style 1, wire wings are not acceptable.

4. Bolts with Nuts:
   b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
   c. ASTM F468 for nonferrous bolts.
   d. ASTM F593 for stainless steel.


6. Washers: ASTM F436, type to suit material and anchorage.

7. Nails: Fed Specs. FF-N-105, Type II, style 6 or 14 for finish work.

2.4 FABRICATION GENERAL

A. Material

1. Use material as specified.

2. For material that is not named or it's standard of quality not specified, use material of commercial quality and suitable for the intended purpose.

3. Use material free of defects that could affect the appearance or service ability of the finished product.

B. Size:

1. Size and thickness of members as shown on the drawings, specified herein and further detailed and described in the Contractor’s fabrication drawings or required by code.

2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections:

1. Except as otherwise specified, connections may be made by welding, riveting or bolting.

2. Field riveting will not be approved.

3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.

4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.

5. Weld in accordance with requirements of the American Welding Society (AWS).

6. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
7. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.

8. Use stainless steel connectors for removable members, machine screws or bolts.

D. Fasteners and Anchors:

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.

2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.

3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.

4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.

5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship:

1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
   d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
   e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
   f. Prepare members for the installation and fitting of hardware.
   g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
   h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.

2. Welding:
   a. Weld in accordance with AWS.
   b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.

d. Finish welded joints to match finish of adjacent surface.

3. Joining:

a. Miter or butt members at corners.

b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.

4. Anchors:

a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.

b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.

5. Cutting and Fitting:

a. Accurately cut, machine and fit joints, corners, copes, and miters.

b. Fit removable members to be easily removed.

c. Design and construct field connections in the most practical place for appearance and ease of installation.

d. Fit pieces together as required.

e. Fabricate connections for ease of assembly and disassembly without use of special tools.

f. Joints firm when assembled.

g. Conceal joining, fitting and welding on exposed work as far as practical.

h. Do not show rivets and screws prominently on the exposed face.

i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

2.5 SUPPORTS

A. General:

1. Fabricate ASTM A36 structural steel shapes as required to suit field conditions.

2. Use clip angles or make provisions for welding hangers and braces to overhead construction.

3. Field connections may be welded or bolted.
PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate the work of this Section in strict accordance with the approved Shop Drawings and referenced standards.

3.4 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

3.5 CLEANING

A. Daily Cleanup:

1. Upon the completion of work each day Contractor shall clean the work area.

B. Final Cleanup:

1. Upon completion of all work the Contractor shall conduct a Final Clean-up.

---End of Section---
SECTION 06 20 00
FINISH CARPENTRY OR JOINERY

PART 1 - GENERAL

1.1 TOLERANCES

Responsibilities

Fabricate and install joinery items. Items to be undamaged, plumb, level, straight and free of distortion and to the Tolerances table.

Tolerances Table

<table>
<thead>
<tr>
<th>Property</th>
<th>Tolerance criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plumb and level</td>
<td>2 mm in 800 mm</td>
</tr>
<tr>
<td>Offsets in flush adjoining surfaces</td>
<td>&lt; 1 mm</td>
</tr>
<tr>
<td>Alignment of adjoining doors</td>
<td>&lt; 1.5 mm</td>
</tr>
</tbody>
</table>

1.2 INSPECTION

Notice

Give sufficient notice so that inspection may be made of the following:

- Shop fabricated or assembled items ready for delivery to the site.
- Site erected assemblies on completion of erection.

1.3 SUBMISSIONS

Samples

Submit samples to the Sample Table for approval by the Contracting Officer.

Sample Table

<table>
<thead>
<tr>
<th>Description</th>
<th>No. of samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Each type of board to be used complete with finish and edge stripping</td>
<td>2</td>
</tr>
<tr>
<td>Typical item of hardware indicating each finish</td>
<td>2</td>
</tr>
<tr>
<td>Stone benchtop indicating range of colours</td>
<td>2</td>
</tr>
<tr>
<td>Timber balustrade section</td>
<td>1</td>
</tr>
<tr>
<td>The finish to all stainless steel items</td>
<td>2</td>
</tr>
<tr>
<td>Complete timber bench cupboard door, including hardware</td>
<td>1</td>
</tr>
<tr>
<td>Complete drawer front, including hardware</td>
<td>1</td>
</tr>
</tbody>
</table>
PART 2 - PRODUCTS

2.1 JOINERY MATERIALS AND COMPONENTS

A. Joinery Timber
All joinery timber shall be to approval of the Contracting Officer.

B. Plywood
All plywood shall be to approval of the Contracting Officer.

C. Decorative Overlays
Timber veneer or laminate to approval of the Contracting Officer. Thickness (minimum):
For horizontal surfaces fixed to a continuous background: 1.2 mm minimum. For vertical surfaces fixed to a continuous background: 0.8 mm.
For edge strips: 0.8 mm.

D. Stone Facings
Provide stone slabs to bench tops within the visual range of the approved samples.

E. Timber Veneers
Provide veneers falling within the visual range of the approved samples.

2.2 JOINERY ITEMS

General
Provide materials noted on drawings as follows:
Joinery components and their location, indicative construction details, trims, materials, dimensions and thicknesses, and finishes shall be as detailed.
All dimensions noted on drawings shall be confirmed on site before construction of the joinery.
Finishes selections and hardware are noted in the Joinery Fixtures schedule.

2.3 KITCHEN ASSEMBLIES

A. Plinths
Material: Construct from exterior grade general purpose plywood unless already in place as a concrete plinth.

Thickness: 16 mm.

Fabrication: Form up with front and back members and full height cross members at not more than 900 mm centers.

Finish: Decorative laminated sheet or ceramic/ stone tile finish unless otherwise specified. Installation: Fix to floor and secure to wall to provide level platform for carcasses.

B. Carcasses
Material: Select from the following:

Melamine overlaid high moisture resistant particleboard. Approved solid timber sections.
Thickness: 16 mm minimum. Joints: Select from the following:
Proprietary mechanical connections. Screws and glue.
Shelves: Support on battens or fix directly into grooves in side walls of joinery units. Finish: Decorative laminated sheet or solid timber finish.
Fasteners: Conceal with finish.

Installation: Secure to walls at not more than 600 mm centers.

C. Drawer Fronts and Doors

Material: Refer to the drawings for specific details of joinery or select from the following: Melamine overlaid high moisture resistant particleboard. Approved solid timber sections with or without inset glass panels. Metal grille or sheet metal panels fixed over timber frames
Thickness: 16 mm minimum.
Maximum door size: 2400 mm high, 900 mm wide, 1.5 m² on face. Finish: Decorative laminated sheet, solid timber finish or paint.

D. Drawer Backs, Sides and Bottoms

Material: Select from the following:
Melamine overlaid high moisture resistant particleboard. Approved solid timber sections.
Thickness: 12 mm minimum.
Finish: Decorative laminated sheet or solid timber finish.

E. Laminated Benchtops

Material: High moisture resistant particleboard. Benchtop thickness: 33 mm.
Finish: Decorative laminated sheet.
Exposed edges: Extend laminate over shaped nosing, finishing > 50 mm back on underside or provide solid timber edge trim.
Installation: Fix to carcass at least twice per 600 mm length of benchtop.
Joint sealing: Clamp with proprietary mechanical connectors to ensure high quality connection between benchtop sections. Ensure joints in benchtops are clear of sinks to avoid water damage to joint.

F. Stone or Concrete Benchtops

Material:
Thickness is to be minimum of 40mm unless noted otherwise on the drawings. Concrete benchtops may have a polished finish or be covered with ceramic tiles.

G. Splashback:

Material is identical to benchtop unless noted otherwise in the Joinery fixtures schedule. Thickness is to be 16mm for high moisture resistant particleboard with laminate finish. Thickness is to be 20mm minimum for stone.

Thickness is to be 40mm minimum for concrete. Alternatively use ceramic tile splashback for concrete benchtops.
Waterproof silicone sealant is to be used as a continuous seal between the benchtop and splashback.

H. Drawer and Door Hardware
Hinges, drawer runners, door handles and locks are to be to the approval of the Contracting Officer.

PART 3 - EXECUTION

3.1 JOINERY

A. General

Joints: Provide materials in single lengths whenever possible. If joints are necessary make them over supports.

Framing: Frame and trim where necessary for openings, including those required by other trades.

B. Accessories and Trim

Provide accessories and trim necessary to complete the installation.

C. Fasteners

Visibility: Do not provide visible fixings except in the following locations: Inside cupboards and drawer units. Inside open units.

Visible fixings: Where fastenings are unavoidable on visible joinery faces, sink the heads below the surface and fill the sinking flush with a material compatible with the surface finish. In surfaces which are to have clear or tinted timber finish provide matching wood plugs showing face (not end) grain. In surfaces which are to have laminate finish provide proprietary screws and caps finished to match.

Fixings: Screws with washers into timber or steel framing, or masonry anchors to brickwork.

D. Adhesives

Provide adhesives to transmit the loads imposed and to ensure the rigidity of the assembly, without causing discolouration of finished surfaces.

E. Finishing

Edge strips: Finish exposed edges of sheets with edge strips which match sheet faces or use solid timber trims as noted on the drawings.

Matching: For surfaces which are to have clear or tinted finish, arrange adjacent timber pieces to match the grain and colour.

Hygiene requirements: To all food handling areas and voids at the backs of units to all areas, seal all carcass junctions with walls and floors, and to cable entries, with silicone sealant for vermin proofing. Apply water resistant sealants around all plumbing fixtures and ensure the sealants are fit for purpose.

3.2 DELIVERY AND STORAGE

A. General

Deliver joinery units to site in unbroken wrapping or containers so that its moisture content is not adversely affected. Do not store in areas of wet plaster. Keep storage to a minimum by delivering items only when required for installation.

Examine joinery units for completeness and repair defects before installing in place.

B. Background

Clean all background surfaces that will be permanently concealed behind joinery before installing in
place.

3.3 TIMBER BALUSTRADES

A. General

Provide a balustrade to the stair and landing, consisting of posts, handrail, infill panels, and associated moldings as noted in the BOQ and drawings.

3.4 COMPLETION

A. Cleaning

Temporary coatings: On or before completion of the works, or before joining up to other surfaces, remove all traces of temporary coatings used as a means of protection.

General: Remove all dust, marks and rubbish from all surfaces and internal spaces. Clean and polish all surfaces such as solid timber, anodised or painted metals, glass, stone, concrete, ceramic tiles and laminates.

Refer to the Joinery fixtures schedule for locations, type and finishes of joinery items.

---End of Section---
SECTION 07 01 10
WATERPROOFING

PART 1 - GENERAL

1.1 INTERPRETATIONS

A. Definitions

Performance Requirements:
Provide waterproofing that prevents the passage of water through surfaces. For the purposes of this work section the definitions given below apply. Substrates: The surfaces on which membrane systems are laid.
Bitumen: A viscous material comprising complex hydrocarbons which is soluble in carbon disulphide, softens when it is heated, is waterproof and has good powers of adhesion. It is produced as a refined by-product of oil.
Bond breakers: Layers which prevent membranes from bonding to the backgrounds. Membranes: Impervious barriers to liquid water which may be:
Liquid applied: Membranes applied in liquid or gel form and air cured to form a seamless film.
Sheet applied: Membranes applied in sheet form with joints lapped and bonded.
Membrane systems: Combinations of membranes, flashings, drainage and accessories which form waterproof barriers and which may be:

1.2 INSPECTION

Notice:
Give sufficient notice so that inspection may be made as follows:
• Background preparation completed.
• Before membranes are finished, covered up or concealed.

PART 2 - PRODUCTS

2.1 MEMBRANES

A. Membrane Systems

To be proprietary membrane systems where possible having certification from an international testing organization.

B. Internal Roof Outlets for Membrane Roof

Proprietary funnel shaped sump cast into the roof slab, set flush with membrane, with a flat removable grating and provision (e.g. clamp ring) for sealing the membrane into the base of the outlet.

PART 3 - EXECUTION

Refer to Single layer, Multi layer and Liquid Waterproofing System schedules for details of systems.

3.1 PREPARATION

A. General

Prepare backgrounds as follows:
• Check that pipes, conduits and other penetrations of waterproofing membrane have been installed before beginning this work.
• Fill all cracks in backgrounds wider than 1.5 mm with a filler compatible with the membrane system. Remove ridges and fins, leaving a smooth, clean surface.
• Fill voids and hollows in concrete backgrounds with a concrete mix not stronger than the background.

• Remove excessive projections.

• Remove deleterious and loose material.

• Check that areas to be waterproofed slope to drain, are clean and dry. Leave the surface free of contaminate, clean and dust free.

B. Moisture Content

Concrete backgrounds: Cure for > 21 days.

C. Falls

Verify that falls in backgrounds are > 1:100.

D. Joints and Fillets

Internal corners: Provide 45° fillets. External corners: Round or arris edges. Movement control joints: Prepare all background joints to suit the membrane system.

E. Priming

If required, prime the backgrounds with compatible primers to ensure adhesion of membrane systems.

3.2 APPLICATION

A. Job Conditions

• Apply waterproofing materials when the temperature in the space to be waterproofed and the substrate to be waterproofed are above 5-degree C.

• Do not apply waterproofing materials to damp, wet or frost covered surfaces.

• Illuminate work areas during installation to provide the same or greater level of illumination required to properly perform this work, and as will occur in the room or space after the building is in operation.

• Examine surfaces to be waterproofed.

• Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

B. Protection

Protect membrane from damage during installation.

C. Drains

Prevent moisture from tracking under the membranes at drainage locations. Drains and cages: Provide grates or cages, to prevent blockage from debris.

Overflows: Turn the membranes into the overflow to prevent moisture from tracking behind the membrane.

D. Sheet joints

Bituminous sheet membranes: Side laps > 50 mm. End laps > 100 mm.
Synthetic rubber membranes: Factory-vulcanized laps > 40 mm.
Field side laps > 50 mm for side laps.
Field end-laps > 100 mm for end laps.

E. Curing of liquid applied systems
To the manufacturers’ instructions.

F. Movement Control Joints
Locate over movement control joints in the substructure.
Fillets and bond breakers: Provide of sufficient dimension to allow the membrane to accommodate the movement.
Bonded membranes: Carry movement joints in the substrate through the surface finish.

G. Membrane Terminations
Edge protection: Provide upturns above the maximum water level expected from the exposure conditions of rainfall intensity and wind.
Minimum height of 200mm for all upturns above membrane level unless noted otherwise on the drawings.
Anchoring: Secure sheet membranes along the top edge. Edge protection: Protect edges of the membrane.
Waterproofing above terminations: Waterproof the structure above the termination to prevent moisture entry behind the membrane using cappings, waterproof membranes or waterproof coatings.

H. Membrane Vertical Penetrations
Pipes, ducts, and vents: Provide separate sleeves for all pipes, ducts, and vents and have them fixed to the substrate. Minimum height of 200mm for all sleeves above membrane level unless noted otherwise on the drawings.

I. Overlaying Finishes on Membranes
Compatibility: If a membrane is to be overlaid with another system such as tiles, pavers, ballast, insulation, soil, and the like, provide an overlaying system that is compatible with and not cause damage to the membrane.
Ensure that no damage is caused to the membrane during the laying of the overlay material. If any damage occurs immediately stop work and repair the damage before proceeding with the overlay process.
Bonded or partially bonded systems: If the topping or bedding mortar requires to be bonded to the membrane, provide sufficient movement joints in the topping or bedding mortar to reduce the movement over the membrane.

J. Warranty
Submit sample copies of warranty for waterproofing membrane to be provided under this Section, clearly defining terms, conditions, and time periods for the warranty.

---End of Section---
SECTION 07 16 14
ACRYLIC MODIFIED CEMENTITIOUS ROOFING WATERPROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, tools and equipment as necessary to perform Acrylic Latex Modified Cement Waterproofing on new and existing structures as shown on drawings and as specified in this section.

1.2 REFERENCES

Industry Standards

1.3 SUBMITTALS

A. General: Submit manufacturer's certification that proposed materials, details and systems as indicated and specified fully comply with manufacturer's details and specifications. If any portion of Contract Documents do not conform to manufacturer's standard recommendations, submit notification of portions of design that are at variance with manufacturer's specifications.

B. Product Data: Submit manufacturer's literature and installation instructions for each product.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Company specializing in marketing or manufacturing products specified in this Section with minimum 10 years documented experience.

B. Installer Qualifications:
   1. Acceptable to manufacturer with documented experience on at least 5 projects of similar nature in past 5 years and/or training provided by the product manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver and store in a dry area between 40°F (5°C) and 90°F (32°C). Handle and protect from freezing and direct sun light in accordance with manufacturer's instructions.

B. Deliver materials in manufacturer's unopened containers, fully identified with brand, type, grade, class and all other qualifying information. Provide Material Safety Data Sheets for each product.

C. Take necessary precautions to keep products clean, dry and free of damage.

1.6 SYSTEM REQUIREMENTS

A. Coordinate waterproofing installation with other trades.

B. Provide materials and accessories in timely manner so as not to delay Work.

1.7 PROJECT CONDITIONS

A. Maintain surfaces to be waterproofed and surrounding air temperature at not less than 40°F (5°C). Apply only when temperatures are steady or rising.

B. Do not apply materials to frozen or frost-filled surfaces.

C. Exercise caution when temperatures exceed 90°F (32°C).
1.8 WARRANTY

Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official. Term of warranty shall be 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Approved Manufacturers: AQUAFIN, Inc. 505 Blue Ball Road, #160. Elkton, MD, 21921. Phone (866) 278-2346, or (410) 392-2300, Fax (410) 392-2324; e-mail info@aquafin.net.

Requests for substitutions will be considered only if submitted to the architect/engineer in writing and must include substantiation of product performance, 10 days prior to the original bid date.

2.2 MATERIALS

A. Waterproofing Material - Acrylic Modified Cement Waterproofing: Cementitious, two-component, acrylic emulsion based, highly flexible, crack bridging waterproof membrane barrier against positive water pressure, with the following characteristics:

1. Product: AQUAFIN-2K/M
2. Color: Gray
3. Dry Component-A: Precise blend of cementitious material
4. Liquid Component-B: White acrylic emulsion and admixtures
5. Working Time: Approximately 45 minutes
6. Shore A Hardness: (ASTM D-2240) ~ 85
7. VOC 0 g/L
9. Bond/Adhesion: (ASTM C-321) 215 psi (1.5 MPa) @ 28 days
10. Tensile Strength: (ASTM C-412) 600 psi (4.1 MPa) @ 28 days @ 80 mils
11. Elongation: (%) 70 (gray); 40 (white) at 68oF (20oC)
12. Static crack bridging capacity: 1/16-inch (gray) (1.5 mm)
13. Vapor Permeability: (ASTM E-96) 1.4 perms at 3/32" (2.4 mm) thickness
14. Waterproofing; (CRD C 48-92) Withstands 200 psi = 460 feet (14 bar = 140 m) hydrostatic pressure (positive side) at 3/32" (2.4 mm) thickness.

2.3 ACCESSORY MATERIALS

A. Patching Compound: Pre-blended, cementitious structural waterproofing and repair mortar recommended or approved by waterproofing manufacturer for patching honeycombs, installing coves, etc.

1. Product: AQUAFIN MORTAR-LN or MORTAR-40
2. Color: Gray
3. Aggregate: Powder
4. Compressive Strength: (ASTM C-109) 6000 psi (41.3 MPa) @ 28 days
5. Flexural Strength: (ASTM C-348) 1160 psi (8.0 MPa) @ 28 days

B. Crack and static joint sealing tape: Elastomeric, tear resistant, breathable waterproofing tape.

1. Product: AQUAFIN JOINT SEALING TAPE-2000
2. Thickness: approx. 14 mils (0.35 mm)
3. Width: 4.75” (120 mm) or 8” (200 mm)
4. Elongation: 60%
5. Tear Strength: 725 psi (5.0 MPa)

C. Expansion joint sealing tape: Elastomeric, tear resistant, breathable waterproofing tape.

1. Product: AQUAFIN JOINT SEALING TAPE-2000-S
2. Thickness: approx. 16 mils (0.4 mm)
3. Width: 4.75” (120 mm) or 8” (200 mm)
4. Elongation: 600%
5. Tear resistance: 2,175 psi (15.0 MPa)

D. Sealing Gasket for PVC pipe and other penetrations: Elastomeric, tear resistant, breathable waterproofing sealing gasket.
1. Product: AQUAFIN-GASKET 18/18
2. Thickness: approx. 1/64" (0.4 mm)
3. Color: White
4. Size: approx. 18" x 18" (45 cm x 45 cm)

E. One-component Waterproofing Material for negative side water pressure in combination with two-component Waterproofing Material with the following characteristics:
1. Product: AQUAFIN-1K
2. Color: Gray
3. Aggregate: Powder
4. Compressive Strength: (ASTM C-109) 4000 psi (27.6 MPa) @ 28 days
5. Flexural Strength: (ASTM C-348) 440 psi (3 MPa) @ 28 days
6. Bond/Adhesion: (ASTM C-321) 220 psi (1.5 MPa) @ 28 days
7. Vapor Permeability: (US Perms) 8 (ASTM E-96) (control = 10)

F. Protective Clear Sealer: V.O.C. compliant, ready-to-use 100% acrylic liquid applied over two-component Waterproofing Material, protecting it from environmental influences.
1. Product: AQUAFIN-CS/250
2. Color: Milky
3. Aggregate: Liquid
4. Solids Content: 25%
5. Bond/Adhesion: Cohesive film failure
6. Abrasion Resistance: (ASTM D-658-44) 225 to 350 g/mil on glass

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all construction substrates and conditions under which waterproofing materials are to be installed. Do not proceed with the waterproofing application until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Substrate preparation:
   - Remove oil, grease, dirt, loose particles, remains of form oils, water repellents, rust or other coatings by high-pressure water blasting (>3000 psi), wet or dry sand blasting, or other mechanical means to produce surface profile ICRI CSP 3 to 5 for application of waterproofing.
   - Follow manufacturer’s instructions to clean and prepare surfaces and seal cracks and joints.
   - Voids in concrete substrates: 1/4-inch (6 mm) diameter and larger, pre-treat with patching compound. Less than 1/4-inch (6 mm) diameter can be filled with a scratch coat of one-component waterproofing material.

C. Rinse surfaces to be waterproofed (excluding drywall or similar) with clean water to saturated surface dry (SSD) condition, with no standing water on horizontal surfaces.

3.3 INSTALLATION

Mix two-component waterproofing material in proportions recommended by manufacturer. Follow manufacturer’s instructions.
3.4 CURING

Follow manufacturer's general instructions for curing and hardening of waterproofing material. Do not use water for curing. Waterproofing material is self-curing.

Protect surfaces from rain, frost and premature dehydration.

3.5 TESTING OF WATER INCLUDING STRUCTURES

Following application and completion of related work, as required, but well prior to completion of entire project, fill tanks to capacity and allow to stand not less than 3 days. Fill larger structures at a uniform rate not greater than 6.5 feet (2 m) in 24 hours. The temperature of the fill water shall be plus or minus 10 degrees F of the ambient air and/or the tank structure at the time of filling. Extreme caution is urged if the temperature is greater than 10 degree F. Should leakage occur after this period, drain tanks to perform repairs. Notify Owner prior to draining tanks.

3.6 ACCEPTANCE

A. Remove left over materials and any foreign material resulting from the work from the site.
B. Clean adjacent surfaces and materials.

--- End of Section ---
PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all materials, labor, tools, equipment and other items necessary to install metal doors, and metal door and window frames in locations shown on the Drawings, as specified herein, and as needed for a complete and proper installation of the work described in this Contract.

B. Related work specified elsewhere:

1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:

1. The Manufacturer is responsible for researching and complying with all applicable codes.

2. Publications: Publications are referenced in the text by basic designation only. To the extent referenced, publications form a part of this specification.

3. All products submitted for review under this section shall meet or exceed the requirements of the project scope of work as well as accepted local Afghanistan standards for products and installations of the type covered by this section.


1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’ “Notice to Proceed” submit the following:

1. Shop Drawings: G,

   a. Show details of each frame type (door and window), elevations of door designs, details of openings, and details of construction, installation, and anchorage;

      (1.) Include sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

      (2.) Include standard details showing recommendations for installation.

      (3.) Include size of fasteners, maximum spacing from each end, center-to-center spacing on all four sides, frame clearance and rough opening sizes.

   b. Include an Identification Schedule as further described under paragraph 1.4 “Product Handling” (below).

   c. An approved copy of the Shop Drawings must be maintained at the Job Site.
d. At a minimum, Shop Drawings for the following items shall be submitted for this project:
   
   (1.) Doors and Door Frames;
   
   (2.) Window Frames;

2. Product data:
   
   a. Materials list of items proposed to be provided under this Section;
   
   b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;
   
   c. Manufacturer’s recommended installation procedures.
      
      (1.) Once approved by Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.

   d. At a minimum, product literature for the following items, demonstrating compliance with contract requirements, shall be submitted for this project:
      
      (1.) Doors and Door Frames;
      
      (2.) Window Frames;

3. Quality Assurance and Control Submittals:
   
   a. Certificates:
      
      (1.) Manufacturer's written third party certification that metal doors and frames meet or exceed local Afghanistan standards, applicable referenced standards and other specified requirements.

4. Samples:
   
   a. Submit samples of each of the following:
      
      (1.) Submit full set of finish color samples for color selection;

5. Operation and Maintenance Manuals
   
   a. Submit pertinent data relative to care and maintenance as part of Closeout requirements.
   
   b. Include cleaning and stain removal methods and recommended cleaning materials, polishes, and waxes.

6. Mock-ups
   
   a. Install one full size mock-up of each type of metal door and frame with specified finish for acceptance.
   
   b. Location(s) shall be as directed by Contracting Officer
   
   c. Once approved by Contracting Officer the Mock-up(s) shall be the standard for rest of the work.
   
   d. Approved Mock-up(s) may remain as part of the completed project.
1.5 WARRANTY

A. Provide Manufacturer’s standard one (1) year Warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products specified within this Section are subject to local availability in markets accessible to Afghanistan.

B. In the absence of local Afghanistan product standards or laboratory certifications against which to review sample products, the Contractor and the manufacturer shall provide a letter certifying that the submitted product and installation will conform to the requirements of the project scope of work and will meet or exceed accepted local standards for products and installations of the type covered by this Section.

C. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the scope of work whether or not these are specifically described herein.

D. Unless specifically otherwise approved by Contracting Officer, provide all products of this Section from a single manufacturer.

2.2 STANDARD PRODUCTS

A. Provide components and equipment that are “standard products” of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship.

B. For the purposes of this project “standard products” is defined as products that have been in satisfactory commercial or industrial use for at least 2 years.

2.3 METAL DOORS

A. Provide in the dimensions and types shown on the Drawings, and with the following attributes:

1. Face sheets:
   a. Interior doors: 20 gage.
   b. Exterior doors: 18 gage.

2. Minimum thickness:
   a. 45 mm (1-3/4").

3. Stiffeners:
   a. Two @ 22 gage.

4. Vertical edges:
   a. Continuous weld or interlocking seam welded at top and bottom of door.

5. Top and bottom edges:
   a. Closed with 16 gage continuous recessed steel channel.

6. Glass moldings and stops:
a. Fixed moldings welded to door on security side;

b. Loose stops: 20 gage;

7. Louvers: Welded blade-type construction; with replaceable metal screen at exterior doors.

B. At the factory, pre-clean and shop prime each door for finish painting that will be performed at the job site under Section 09900 of these Specifications.

2.2 METAL FRAMES

A. Acceptable products: See Paragraph 1.3-B above.

B. Provide in the dimensions and types shown on the Drawings, and with the following attributes:

1. For interior openings:
   a. For metal doors: 16 gage;
   b. For solid core wood doors: 18 gage;
   c. For hollow core wood doors: 20 gage;
   b. For exterior openings:
      a. 16 gage.
      c. Construction:
         a. Welded or knock-down, with integral stop and trim.
      d. Floor anchors:
         a. 16 gage, welded inside jambs;

2. Jamb anchors:
   a. In masonry walls, provide with 0.156" thick wire-type or with adjustable 16 gage T-strap not less than 50 mm x 250 mm (2” x 10”);
   b. In stud partitions, provide 18 gage steel anchors welded inside jambs;
   e. Dust covers:
      a. 26 gage, where required.

3. Loose glazing stops:
   a. Exterior openings: 20 gage cold-rolled steel;
   b. For interior openings: Snap-on glazing stops.

C. At the factory, pre-clean and shop prime each frame for finish painting that will be performed at the job site under Section 09900 of these Specifications.
2.3 FINISH HARDWARE

A. Secure templates from the finish hardware supplier, and accurately install, or make provision for, all finish hardware at the factory.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this section will be performed.

B. Correct conditions detrimental to timely and proper completion of the work.

C. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Placing frames:

1. Where practicable, place frames prior to construction of enclosing walls and ceilings.

2. Set frames accurately into position, plumbed, aligned, and braced securely until permanent anchors are set.

3. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

4. At in-place construction, set frames and secure to adjacent construction with machine screws and suitable anchorage devices. Provide “Z” fillers at each screw location.

5. When installed in prepared openings in concrete construction, provide sealant between frame and concrete in accordance with provisions of Section 07920 of these Specifications.

3.3 ADJUST AND CLEAN

A. Final adjustments:

1. Check and readjust operating finish hardware items in hollow metal work just prior to final inspection.

2. Leave work in complete and proper operating condition.

3. Remove defective work and replace with work complying with the specified requirements.

B. Immediately after erection, sand smooth all rusted and damaged areas of prime coat, and apply touchup of compatible air-drying primer.

---End of Section---
SECTION 08410
ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY
Section Includes: storefront system, including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of storefront units.

1.2 REFERENCES
Industry Standards

1.3 SYSTEM DESCRIPTION
See above.

1.4 SUBMITTALS
A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."
B. Quality Assurance/Control Submittals:
   1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.5 WARRANTY
A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
B. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for entrance system as follows:
   1. Warranty Period: See contract.

1.6 QUALITY ASSURANCE
A. Qualifications:
   1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
   2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.
B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
B. Packing, Shipping, Handling, and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront against damage from elements, construction activities, and other hazards before, during and after entrance installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers: Turkish or UAE products.
B. Alternate (Manufacturers/Products): In lieu of providing below specified base bid/contract manufacturer, provide below specified alternate manufacturers. Refer to Contract.

2.2 MATERIALS

A. Aluminum (Storefront and Components):
1. Material Standard: Extruded Aluminum, ASTM B 221; 6063-T6 alloy and temper.
2. Member Wall Thickness: Each framing member shall provide structural strength to meet specified performance requirements.
3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA Aluminum Standards and Data.

2.3 ACCESSORIES

A. Fasteners: Where exposed, shall be Stainless Steel.
B. Gaskets: Glazing gaskets shall be extruded EPDM rubber.
C. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.4 RELATED MATERIALS

A. Sealants: Refer to Joint Treatment (Sealants) Section.
B. Glass: Refer to Glass and Glazing Section.

2.5 FABRICATION

A. General:
1. Fabricate components per manufacturer’s installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
2. Accurately fit and secure joints and corners.
3. Prepare components to receive anchor devices.
4. Arrange fasteners and attachments to be concealed from view.

2.6 FINISHES

Factory Finishing

2.7 SOURCE QUALITY CONTROL

A. Source Quality: Provide aluminum storefronts specified herein from a single source.
1. Building Enclosure System: When aluminum storefronts are part of a building enclosure system, including entrances, entrance hardware, curtain wall system and related products, provide building enclosure system products from a single source manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions. Verify openings are sized to receive storefront system and sill plate is level in accordance with manufacturer’s acceptable tolerances.
1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.
3.2 INSTALLATION

A. General: Install storefront systems plumb, level, and true to line, without warp or rack of frames with manufacturer’s prescribed tolerances and installation instructions. Provide support and anchor in place.
1. Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion or electrolytic action contact points.
2. Weather tight Construction: Refer to installation instructions & consult sealant manufacture for project specific application. Coordinate installation with wall flashings and other components of construction

3.3 FIELD QUALITY CONTROL

A. Field Tests: Architect shall select storefront units to be tested as soon as a representative portion of the project has been installed, glazed, perimeter caulked and cured. Test units having deficiencies shall be corrected as part of the contract amount.
1. Testing: Conduct test in the presence of the Contracting Officer.

3.4 PROTECTION AND CLEANING

A. Protection: Protect installed product’s finish surfaces from damage during construction. Protect aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance. Remove construction debris from project site and legally dispose of debris.

--- End of Section ---
SECTION 08 56 00
PVC WINDOWS and DOORS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide and install new PVC windows and doors as shown on the drawings and specified here in.

B. Related work specified elsewhere:

1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:

1. The Manufacturer is responsible for researching and complying with all applicable codes.

1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’s “Notice to Proceed” submit the following:

1. Shop Drawings:
   As required.

2. Product data:
   a. Materials list of items proposed to be provided under this Section;
   b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;

3. Quality Assurance and Control Submittals:
   a. Certificates:
      (1.) Manufacturer's written third party certification that PVC windows/doors meet or exceed applicable standards.

4. Samples:
   a. Submit one full-size window and one door of each type, complete with certification label indicating conformance to AAMA 101 or ASTM D 4099, glazing, hardware, anchors, and other accessories; G
   b. Where screens or weather stripping are required, fit sample windows and doors with such items that are to be provided.
   c. After approval, install each sample in the work, clearly identified, and record its location.
1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”

1.5 WARRANTY

A. Provide standard Manufacturer’s one (1) year Warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the work whether or not these are specifically described herein.

B. Acceptable products:
   1. Window and doors shall be equal to the products of: Qasemi Win House; Sarak-e-Now Park Hai sanati, Kabul, Afghanistan; Cell: 079-920-0814 or 070-029-3199; E-Mail: info@qasemiwinhouse.com; Web: www.qasemiwinhouse.com.
   2. Equal products of other manufacturers

2.2 MATERIALS

A. Windows and Doors:
   1. Provide PVC, reinforcing members, fasteners, hardware, weather stripping, and anchors conforming to AAMA 101 or ASTM D 4099 and as specified herein.

B. Glass and Glazing:
   1. Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work.
   2. Glazed panels shall comply with the safety standards, as indicated in accordance with ANSI Z97.1.
   3. Glazed panels shall comply with indicated wind/snow loading in accordance with ASTM E 1300.
   4. Glass shall comply with ASTM C 1036, unless specified otherwise.
   5. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

C. Insulating Glass Units:
   1. Two panes of glass separated by a dehydrated airspace and hermetically sealed.
   2. Dimensional tolerances shall be as specified in SIGMA A1202.
   3. The units shall conform to ASTM E 773 and ASTM E 774, Class A.
   4. Spacer shall be roll-formed, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners.
5. Primary seal shall be compressed poly isobutylene and the secondary seal shall be a specially formulated silicone.

6. Provide 6 mm airspace.

7. The inner light shall be ASTM C 1048, Grade B (fully tempered), Style I (uncoated), Type I, Class 1 (transparent), Quality q4, 6 mm thick.

8. The outer light shall be ASTM C 1036, Type I, Class 1 (transparent), Quality q4, 8 mm thick.

D. Caulking and Sealing:

1. For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, Use NT.

2. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T.

3. Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

E. Accessories:

1. As standard with the manufacturer and as specified herein.

2.3 WINDOW AND DOOR TYPES

A. Windows and doors shall be of the following types, as indicated:

1. Casement Windows and Doors:
   a. Conform to AAMA 101, Type C- R 15 or ASTM D 4099.
   b. Ventilators shall be handle operated.
   c. Provide ventilators over 1675 mm high with two separate locking devices or a two-point locking device operated by rods from a single lever handle.
   d. Conceal rods where possible.
   e. Provide casement windows in combination with fixed windows specified below.

2. Horizontal Sliding Windows:
   a. Conform to AAMA 101, Type HS- R 15 or ASTM D 4099.

3. Fixed Windows:
   a. Conform to AAMA 101, Type HS- R 15 or ASTM D 4099.

B. Construction:

1. Ventilators shall have one or more stabilizing arms attached to the frame when ventilator is opened from top.

2. When ventilator is in the tilt-open position, stabilizing arms shall provide positive positioning of the ventilator.

C. Hardware:
1. Equip each ventilator with one handle to provide both tilt and swing operation.

2. The tilt or swing operation shall be individually selected and rendered operable only from the closed sash position.

3. Provide a secondary locking device for each ventilator to prevent accidental swing operation.

2.4 FABRICATION

A. Conform to AAMA 101 or ASTM D 4099 and to the requirements specified herein:

1. Sub-frames, Mullions and Transom Bars:
   a. Provide sub-frames, transom bars and mullions between multiple window units which meet the design pressure of 72 kilograms per square meter (kg/sq m).
   b. Fabricate mullions and transom bars in such a manner as to permit expansion and contraction between adjoining construction and window units and to form a weather tight joint.

2. Combination Windows:
   a. Windows provided in combination shall be the same grade and performance class and shall be factory assembled.
   b. Where factory assembly of individual windows into larger units is limited by transportation considerations, prefabricate, match mark, transport, and field assemble.

3. Frames and Sash:
   a. Corners and Reinforcement
      (1.) Corners of PVC frames and sashes shall be welded. Reinforce frames and sash as necessary to meet the requirements for the performance classes or grades specified herein.
   b. Adjustability
      (1.) Ventilating sash shall be adjustable vertically and horizontally to ensure smooth operation.
   c. Drips and Weep Holes
      (1.) Provide drips and weep holes as required to return water to the outside.
   d. Provisions for Glazing
      (1.) Design windows and rabbets suitable for glass thickness specified. Design sash for double glazing and for securing glass with glazing gaskets.

4. Hardware:
   a. The item, type, and functional characteristics shall be the manufacturer’s standard for the particular window type.
   b. Provide hardware of suitable design and of sufficient strength to perform the function for which it is used.
   c. Equip operating ventilators with a lock or latching device which can be secured from the inside.
5. Weather stripping:
   a. Provide for ventilating sections of windows to ensure a weather tight seal meeting the
      infiltration requirements specified in AAMA 101 or ASTM D 4099.
   b. Provide easily replaceable factory-applied weather stripping.

6. Color:
   a. Window (PVC) color shall be white. Color shall be integral or co-extruded to the PVC
      to prevent heat build-up.

7. Fasteners:
   a. Provide fastener types as standard with the window manufacturer for windows, trim,
      and accessories.

8. Accessories:
   a. Provide windows complete with clips, fins, anchors, and other appurtenances
      necessary for complete installation and proper operation.
      (1.) Anchors:
         (a.) Provide concealed anchors of the type recommended by the window
              manufacturer for the specific type of construction.
         (b.) Anchors and fasteners shall be compatible with the window and the
              adjoining construction.
         (c.) For each jamb 900 mm or longer, provide a minimum of three anchors
              located approximately 150 mm from each end and at midpoint.
         (d.) For jambs less than 900 mm long, provide two anchors.
      (2.) Grills:
         (a.) Provide the manufacturer's standard grills for the windows indicated.
         (b.) Grills shall be removable or shall be sealed within insulating glass units.
         (c.) Unless otherwise indicated, grill pattern shall be the manufacturer's
              standard design or as approved.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General
   1. Install in accordance with the window manufacturer's printed instructions and details.
   2. Build in windows as work progresses or install without forcing into prepared window
      openings.
   3. Set windows at proper elevation, location, and reveal; plumb, square, level, and in
      alignment; and brace, strut, and stay properly to prevent distortion and misalignment.
   4. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-
      in fins, and sub-frames in mastic sealant of a type recommended by the window manufacturer.
5. Install windows in a manner that will prevent entrance of water and wind.

6. Fasten hardware to windows.

B. Anchors and Fastenings:
   1. Secure units to each other, to masonry, and to other adjoining construction with clips, fins, screws, or other devices recommended by the window manufacturer.

3.2 ADJUSTING

A. After installation of windows and completion of glazing and field painting, adjust ventilators and hardware to operate smoothly and to provide weather tight sealing when ventilators are closed and locked.

B. Lubricate hardware and operating parts as necessary.

3.3 CLEANING

A. Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weather stripping, and to prevent interference with operation of hardware.

B. Replace stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

3.4 PROTECTION

A. Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame.

---End of Section---
SECTION 08 71 00
FINISH HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION
A. Provide finish hardware throughout the Work as specified herein and as needed for a complete and proper installation.

B. Related work:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE
A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS
A. Product data: Within 30 calendar days after the Contractor has received the Contracting Officer’ Notice to Proceed, submit:
   1. A “Door Schedule” listing all doors in the Work, and all other locations requiring finish hardware (a copy of the Door Schedule included in the Drawings may be used for this purpose), and assigning a “Hardware Group” to each such door and other location.

   2. A “Finish Hardware Schedule” listing each of the proposed “Hardware Groups,” and defining in detail the proposed contents of each Hardware Group.
      a. Show the quantity of each type of item proposed to be supplied within each Hardware Group;
      b. Show the dimensions, when pertinent, and the manufacturer's catalog number;
      c. Show the finish of each item;
      d. Show the manufacturer’s name by a suitable legend.

B. Samples: Within 30 calendar days after the Contractor has received the Contracting Officer’ Notice to Proceed, submit:
   1. Samples of each finish hardware item.

   2. All Samples will be returned to the Contractor, provided those Samples which are approved by Contracting Officer are positively identified and are installed in the Work at locations agreed to by Contractor.

C. In a timely manner to assure orderly progress of the Work, deliver templates or physical samples of the approved finish hardware items to pertinent manufacturers of interfacing items such as doors and frames.

1.4 PRODUCT HANDLING
A. Comply with pertinent provisions of Section 01640: “Storage and Protection”.

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B. Individually package each unit of finish hardware, complete with proper fastenings and appurtenances, clearly marked on the outside to indicate contents and specific locations in the Work.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fasteners:

1. Furnish necessary screws, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use.

2. Where necessary, furnish fasteners with expansion shields, toggle bolts, sex bolts, and other anchors approved by Contracting Officer, according to the material to which the hardware is to be applied and according to the recommendations of the hardware manufacturer.

B. Where butts are required to swing 180 degrees, furnish butts of sufficient throw to clear the trim.

C. Furnish silencers for door frames at the rate of three for each single door and two for each door of pairs of doors; except weather-stripped doors and doors with light seals or sound seals.

D. All personnel entrance, exit and room doors shall be provided with hardware as follows:

1. Provide door handles and deadbolt locksets that can be locked with a key on all doors (key locks on the outside only)

2. All door locks to have thumb latch on inside of door such that no key is necessary to exit a building.

3. Commercial grade lock sets and hardware shall be used on all doors.

4. Provide minimum of 3 hinges per jamb on all doors.

5. Coordinate the final keying schedule prior to ordering lock sets.

2.2 KEYING

A. Factory key, grand-master key, sub-master key, and locks and cylinders as directed by Contracting Officer.

B. Furnish keys for each building as follows:

1. Eight grand-master keys fitting all locks;

2. Eight sub-master keys fitting all exterior doors; and

3. Three keys each for each interior door

4. Include 25% spare key blanks for the amount of keys provided per building.

5. Provide numbering system identifying key to associated room door.

C. Identification and delivery:

1. Factory stamp permanent keys, “DO NOT DUPLICATE.”

2. Identify permanent keys with tags, and send direct to Contractor by registered mail.
2.3 MANUALS

A. With the delivery of permanent keys, deliver to Contractor one set of maintenance manuals for locksets, latch sets, closers, and panic devices.

2.4 ACCEPTABLE PRODUCTS

A. Single source for items:

1. Except as specifically otherwise approved by Contracting Officer, furnish for each item only the product of a single manufacturer such as Simplex Ltd.

2. To the maximum extent practicable, furnish similar items (such as “door butts”) only as the product of a single manufacturer such as Simplex Ltd.

B. Provide each of the required items of finish hardware from the following list of acceptable products or equals approved in advance by Contracting Officer.

1. Door butts; G
   a. Simplex Ltd.
   b. Union Architectural Hardware
   c. Hoppe AG

2. Locksets; G
   a. Simplex Ltd.
   b. Union Architectural Hardware
   c. Hoppe AG

3. Latch sets; G
   a. Simplex Ltd.
   b. Union Architectural Hardware
   c. Hoppe AG

4. Door closers; G
   a. Union Architectural Hardware
   b. Yank.

5. Door stops; G
   a. Union Architectural Hardware;

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of Contracting Officer.
PART 3 - EXECUTION

3.1 DELIVERIES

A. Stockpile items sufficiently in advance to assure their availability, and make necessary deliveries to the job site in a timely manner to assure orderly progress of the total Work.

3.2 COORDINATION

A. Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Upon completion of the Work, and as a condition of its acceptance, provide inspection and adjustment of all finish hardware.

---End of Section---
SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 INSPECTION

Notice

Inspection: Give sufficient notice so that inspection may be made of the following:
- Glass products before they are installed.

PART 2 - PRODUCTS

2.1 GLASS

Glass and Glazing Materials:

Glass and glazing materials generally: Free from defects which detract from appearance or interfere with performance under normal conditions of use.

Glazing plastics: Free from surface abrasions, and warranted by the manufacturer for 10 years against yellowing or other colour change, loss of strength and impact resistance, and general deterioration.

2.2 GLAZING MATERIALS

A. General

Glazing materials (including putty, glazing compounds, sealants, gaskets, glazing tapes, spacers, setting blocks): Appropriate for the conditions of application and the required performance.

B. Jointing Materials

Provide recommended jointing and pointing materials which are compatible with each other and with the contact surfaces and non staining to finished surfaces. Do not provide bituminous materials on absorbent surfaces.

C. Pile Weather Strips

Materials: Polypropylene or equivalent pile and backing, low friction silicone treated, ultra violet stabilized.

Finned type: A pile weather seal with a central polypropylene fin bonded into the center of the backing rod and raised above the pile level.

D. Extruded Gaskets and Seals

Type: Non cellular (solid) seals to exclude water from glass/frame junctions. Material: Rubber products to be neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber. Flexible polyvinyl chloride (PVC).

E. Priming

Apply the recommended primer to the surfaces in contact with sealant materials.

F. Movement Joints
Depth of elastomeric sealant: One half the joint width, or 6 mm, whichever is the greater.

Foamed materials (in compressible fillers and backing rods): Closed-cell or impregnated types which do not absorb water.

Bond breaking: Provide backing rods, and other back-up materials for sealants, which do not adhere to the sealant.

G. Glazing Films

Supply films identified in the schedules to approval of the Contracting Officer. All films are to be proprietary products installed strictly in accordance with the manufacturers instructions.

2.3 MIRRORS

Refer to Mirrors schedule for details.

Reflective surface

Type: Silver layer deposited on the glass or glazing plastic.

PART 3 - EXECUTION

3.1 GLASS PROCESSING

General

Perform required processes on glass, including cutting, obscuring, silvering and bending. Form necessary holes, including for fixings, equipment, access holes and speaking holes. Process exposed glass edges to a finish that will reduce the risk of injury.

3.2 INSTALLATION

General

Install the glass so that:

- Each piece is held firmly in place by permanent means which enable it to withstand the normal loadings and ambient conditions at its location without distortion or damage to glass and glazing materials.

- Building movements are not transferred to the glass.

- External glazing is watertight and airtight.

Toughened glass: Do not cut, work, or permanently mark after toughening. Use installation methods which prevent the glass making direct contact with metals or other non-resilient materials.

Frameless installations: Join the vertical edges of adjacent glass panels with silicone jointing compound.

External timber framed glazing: Glaze with putty. Do not dry bead into timber frames.

3.3 FIXING MIRRORS

A. Screw Fixing:

Direct to wall plugs with dome-headed chromium-plated screws in each corner and at 900 mm maximum centers around perimeter. Provide polyethylene sleeves and washers to prevent contact between screw and glass. Do not over-tension the screws.
B. Frame fixing

Proprietary aluminum frames to mirror perimeter, corners mitred. Attach the frame to the wall with concealed screw fixings. Frames and finish to approval of the Contracting Officer.

C. Bead fixing

Rebated timber beads to mirror perimeter, corners mitred. Screw fix the beads to the substrate.

3.4 GLAZED SHOWER SCREENS

A. Type

Proprietary system comprising frames of extruded aluminium, stainless steel, or PVC, assembled around safety glass to form fixed panels and sliding, hinged or pivoted doors.

B. Water Shedding

Provide an assembly which sheds water to the inside without retaining it on the frame surfaces. Seal the edge of the frame to adjoining surfaces with a resilient strip.

C. Sliding Assemblies

Hanging: Hang the sliding sash on stainless steel or nylon sheaves on overhead channel track formed in the frame head, and fit nylon or equivalent bottom guides.

Hardware: Pull handles on both sides of sash, or of leading sash in multiple sash arrangements.

PART 4 - COMPLETION

4.1 CLEANING

Replace damaged glass and leave the work clean, polished, free from defects, and in good condition.
SECTION 09 11 00
METAL STUD SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide metal studs and accessories as indicated on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:
   1. The Manufacturer is responsible for researching and complying with all applicable codes.
   2. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with applicable recommendations contained in "Specifications for Metal Lathing and Furring" published by the Metal Lath/Steel Framing Association.

1.3 SUBMITTALS

A. Product data: Within 30 calendar days after the Contractor has received the Contracting Officer’ Notice to Proceed, submit:
   1. Shop Drawings:
      As required.
   2. Product data:
      a. Materials list of items proposed to be provided under this Section;
      b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;
      c. Manufacturer’s recommended installation procedures. Once approved by Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.
   3. Samples: G,
      a. Submit samples of each of the following:
         (1.) Sample of each type.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: Storage and Protection
1.5 WARRANTY (or GUARANTEE)

A. Provide Manufacturers' Structural Warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the work whether or not these are specifically described herein.

2.2 METAL STUDS AND ACCESSORIES

A. Meet or exceed minimum requirements of Class ‘D’, for the item and use intended.

B. Metal studs:

1. At interior metal stud partitions, unless otherwise shown on the Drawings, provide standard punched steel studs of the gages shown on the Drawings, either hot-dip galvanized or factory pre-painted.

2. Use only one type throughout the Work, unless otherwise shown on the Drawings or specifically approved in advance by Contracting Officer.

3. At exterior metal stud walls, unless otherwise shown on the Drawings, provide 14 gage standard punched steel "C" studs, either hot-dip galvanized or factory pre-painted.

C. Accessories: Provide all accessories including, but not necessarily limited to, tracks, clips, anchors, fastening devices, sound attenuation pencil rods and resilient clips, and other accessories required for a complete and proper installation, and as recommended by the manufacturer of the steel studs used.

2.3 GROUT

A. Provide a good grade of commercial grout for leveling the floor runner member of steel stud partitions as required.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of Contracting Officer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Accurately layout partition and wall lines from the dimensions shown on the Drawings.

B. Install metal studs and accessories in strict accordance with the manufacturer's recommendations as approved by Contracting Officer, anchoring all components firmly into position.
C. Align partition and wall assemblies to a tolerance of one in 200 horizontally and one in 500 vertically.

D. Coordination:

1. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

2. Space the studs as required for compliance with pertinent regulations, to give proper support for the covering material, and as indicated on the Drawings.

3. Coordinate and provide required backing and other support for items to be mounted on the finished covering.

4. Coordinate requirements for pipes and other items designed to be housed within the partition and wall systems.

3.3 LEVELING

A. By use of the specified grout, or by other means approved by Contracting Officer, provide continuous solid bearing under floor runner members of steel stud partitions and walls.

B. Level in a manner to provide uniform interface with ceilings and other overhead construction.

3.4 CLEANING

A. Daily Cleanup: Upon the completion of work each day Contractor shall clean the work area.

---End of Section---
PART 1 - GENERAL

1.1 INSPECTION

Notice:

Give sufficient notice so inspection may be made of the following: Backgrounds immediately before applying base coats.

Finish treatments before decoration.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Accessories

Beads: To be metal proprietary sections manufactured to be fixed to backgrounds and/or embedded in the plaster to form and protect plaster edges and junctions.

B. Aggregates

Sand: To be fine, sharp, well-graded sand with a low clay content and free from efflorescing salts.

C. Bonding products

To be proprietary products manufactured for bonding cement-based plaster to solid backgrounds.

D. Cement

Cement shall conform to the requirements of ASTM specification C-150 Type 1 or similar approved standard for normal Portland cement.

E. Coloring Products

To be proprietary products manufactured for colouring cement plaster. Integral pigment proportion: 5% by mass of cement.

F. Curing Products

To be proprietary products manufactured for use with the plaster system.

G. Gypsum Plaster

To be a proprietary product containing calcium sulfate hemihydrate with additives to modify setting.

H. Lime

Confirm source of Lime with Contracting Officer to ensure highest quality Lime is used in the mortar. Protect from damage on site and store minimum 300mm above ground in waterproof storage facility.

Preparing lime putty:

Using hydrated lime: Add lime to water in a clean container and stir to a thick creamy consistency. Leave undisturbed for at least 16 hours. Remove excess water and protect from drying out.
Using quicklime: Run to putty as soon as possible after receipt of quicklime. Partly fill clean container with water, add lime to half the height of the water, then stir and hoe ensuring that no lime remains exposed above the water. Continue stirring and hoeing for at least 5 minutes after all reaction has ceased, then sieve into a maturing bin. Leave undisturbed for at least 14 days. Protect from drying out.

I. Mixes

Measurement: Measure binders and sand by volume using buckets or boxes. Do not allow sand to bulk by absorption of water.

Plaster mixing: Machine mix for greater than 3 minutes and less than 6 minutes.

Strength of successive coats: Ensure successive coats are no richer in binder than the coat to which they are applied.

J. Movement Control Joint Products

To be proprietary products manufactured for use with the plastering system and to accommodate the anticipated movement of the backgrounds and/or the plaster.

K. Water

To be clean and free from any deleterious matter.

PART 3 - EXECUTION

3.1 PREPARATION

A. Substrates

Ensure substrates have:

Any deposit or finish which may impair adhesion of plaster cleaned off.
If solid or continuous, excessive projections hacked off and voids and hollows filled with plaster stronger than the first coat and not weaker than the background.
Absorbent substrates: If suction is excessive, control it by dampening but avoid over-wetting and do not plaster backgrounds showing surface moisture.

Dense concrete: If not sufficiently rough to provide a mechanical key, roughen by scratching or hacking to remove 2 mm of the surface and expose the aggregate then apply a bonding treatment.

Painted surfaces: Remove paint and hack the surface at close intervals.

Untrue substrates: If the substrate is not sufficiently true to ensure conformity with the thickness limits for the plaster system or has excessively uneven suction resulting from variations in the composition of the background, apply additional coats.

B. Beads

Location: Fix beads as follows:

Angle beads: At all external corners.
Drip beads: At all lower terminations of external plaster.
Mechanical fixing to background: at 300 mm centers.
Movement control beads: At all movement control joints.
Stop beads: At all terminations of plaster and junctions with other materials or plaster systems.
C. Bonding Treatment

If bonding treatment is required, throw a wet mix onto the background as follows: Cement plaster: 1 part cement to 2 parts sand. Gypsum plaster: 1 part gypsum to 2 parts sand. Curing: Keep continuously moist for 5 days and allow to dry before applying plaster coats. Thickness: From greater than 3mm but less than 6 mm.

D. Embedded Items

If there are water pipes and other embedded items, sheath them to permit thermal movement. Ensure embedded items will have a suitable level of corrosion resistance prior to embedment.

3.2 APPLICATION

A. Plastering

General: Provide plaster finishes as follows: Resistant to impacts expected in use. Free of irregularities. Consistent in texture and finish.

Firmly bonded to substrates for the expected life of the application. As a suitable substrate for the nominated final finish.

Base coats: Scratch-comb each base coat in two directions when it has stiffened.

A bonding agent is required before the application of Gypsum Plaster – Medium (GPM) on concrete surfaces.

B. Finishing Treatments

Bag: To be a finish mainly free from sand by rubbing the finish coat with a Hessian pad when it has set firm.

Carborundum stone: To be a smooth finish free from sand by, rubbing the finish coat with a fine carborundum stone when it has set hard.

Steel trowel: To be a smooth dense surface by steel trowelling which is not glass-like and is free from shrinkage cracks and crazing.

Wood or plastic float: To be an even surface by wood or plastic floating the finish coat on application.

C. Incidental Work

Return plaster into reveals, beads, sills, recesses and niches. Plaster faces, ends, and soffits of projections in the background, such as string courses, sills, and other wall features. Trim around openings. Plaster exposed inside of built-in cupboards.

D. Joining-Up

If joining up is required, ensure joints will not be visible in the finished work after decoration.

E. Movement Control Joints

Provide movement control joints in the finish to coincide with movement joints in the background. Ensure that the joint in the background is not bridged during plastering.
Depth: Extend the joint right through the plaster and reinforcement to the background.
Width: 3 mm, or the same width as the background joint, whichever is greater.

Damp-proof courses: Do not continue plaster across damp-proof courses.

V-joints: Provide V-joints, cut right through the plaster to the background, at the following locations: Abutments with metal door frames.

Abutments with other finishes. Junctions between different backgrounds.

F. Plaster Thickness
Conform to the Plaster Thickness table.

G. Temperature
If the ambient temperature is less than 10ºC or more than 30ºC ensure that the temperature of mixes, backgrounds and reinforcement are, at the time of application, greater than 5ºC or less than 35ºC.

3.3 COMPLETION
Curing
General: Prevent premature or uneven drying out and protect from the sun and wind.
Keeping moist: If a proprietary curing agent is not used, keep the plaster moist as follows:

Cementitious Base coats and single coat systems: Keep continuously moist for 2 days and allow to dry for 5 days before applying further plaster coats.

Cementitious finish coats: Keep continuously moist for 2 days.

---End of Section---
PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide gypsum drywall and accessories where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:

1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 SUBMITTALS

A. Product data: Within 30 calendar days after the Contract or has received Contracting Officer’ Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.

2. Manufacturer’s specifications and other data needed to prove compliance with the specified requirements;

3. Manufacturer’s recommended methods of installation which, when approved by Contracting Officer, will become the basis for acceptance or rejection of actual installation procedures used on the Work.

B. Mock-ups:

1. At an area on the site where approved by Contracting Officer, provide a mock-up gypsum wallboard panel.
   a. Make the panel approximately 4’-0” square.
   b. Provide one mock-up panel for each gypsum wallboard finish used on the Work.
   c. The mock-ups may be used as part of the Work, and may be include in the finished Work, when so approved by Contracting Officer.
   d. Revise as necessary to secure Contracting Officer’ approval.

2. The mock-up panels, when approved by Contracting Officer, will be used as datum points for comparison with the remainder of the work of this Section for the purpose of acceptance or rejection.

3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”.

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PART 2 - PRODUCTS

2.1 GYPSUM WALLBOARD

A. General:
   1. Regular wallboard: Provide type III, grade R, class 16mm (5/8") thick except as may be shown otherwise on the Drawings.
   2. Fire-retardant wallboard: Provide type III, grade X, class 16mm (5/8") thick.
   3. Water-resistant wallboard: Provide type VII, grade W or X as required, class 16mm (5/8") thick except as may be shown otherwise on the Drawings.

2.2 METAL TRIM

A. Form from zinc-coated steel not lighter than 26 gauge

B. Casing beads:
   1. Provide channel-shapes with an exposed wing, and with a concealed wing not less than 22mm (7/8") wide.
   2. The exposed wing may be covered with paper cemented to the metal, but shall be suitable for joint treatment.

C. Edge beads for use at perimeter of ceilings.
   1. Provide angle shapes with wings not less than 19mm (3/4") wide.
   2. Provide concealed wing perforated for nailing, and exposed wing edge folded flat.
   3. Exposed wing may be factory finished in white color.

2.3 JOINTING SYSTEM

A. Provide a jointing system, including reinforcing tape and compound, designed as a system to be used together and as recommended for this use by the manufacturer of the gypsum wallboard approved for use on this Work.

B. Jointing compound may be used for finishing if so recommended by its manufacturer.

2.4 FASTENING DEVICES

A. For fastening gypsum wallboard in place on metal studs and metal channels, use flat-head screws, shouldered, specially designed for use with power-driven tools, not less than 25.4mm (1") long, with self-tapping threads and self-drilling points.

B. For fastening gypsum wallboard in place on wood, use 32mm (1-1/4") type W bugle-head screws, or use annular ring type nails complying with ASTM C514 and of the length required by governmental agencies having jurisdiction.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of Contracting Officer.
PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:

1. Install the gypsum wallboard in accordance with the Drawings and with the separate boards in moderate contact but not forced into place.

2. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.

3. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.

B. Ceilings:

1. Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.

2. Wallboard may be installed with the long dimension parallel to supporting members that are spaced 16” on centers when attachment members are provided at end joints.

C. Walls:

1. Install the gypsum wallboard to studs at right angles to the furring or framing members.

2. Make end joints, where required, over framing or furring members.

D. Attaching:

1. Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 305mm (12”) on centers at ceilings and 406mm (16”) on centers at walls.

2. Where framing members are spaced 609mm (24”) apart on walls, space screws 305mm (12”) on centers.

3. Attach double layers in accordance with the pertinent codes and the manufacturer’s recommendations as approved by Contracting Officer.

4. Attach to wood as required by governmental agencies having jurisdiction.

3.3 JOINT TREATMENT

A. General:

1. Inspect areas to be joint treated, verifying that the gypsum wallboard fits snugly against supporting framework.

2. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the treatment, and until joint and finishing compounds have dried.

3. Apply the joint treatment and finishing compound by machine or hand tool.
4. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.

B. Embedding compounds:

1. Apply to gypsum wallboard joints and fastener heads in a thin uniform layer.

2. Spread the compound not less than 76mm (3") wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape.

3. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 153mm (6") wide at joints, and feather edged.

4. Sandpaper between coats as required.

5. When thoroughly dry, sandpaper to eliminate ridges and high points.

C. Finishing compounds:

1. After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to joints and fastener heads.

2. Feather the finishing compound to not less than 305mm (12") wide.

3. When thoroughly dry, sandpaper to obtain a uniformly smooth surface, taking care not to scuff the paper surface of the wallboard.

3.4 CORNER TREATMENT

A. Internal corners: Treat as specified for joints, except fold the reinforcing tape lengthwise through the middle and fit neatly in the corner.

B. External corners:

1. Install the specified corner bead, fitting neatly over the corner and securing with the same type fasteners used for installing the wallboard.

2. Space the fasteners approximately 305mm (6") on centers, and drive through the wallboard into the framing or furring member.

3. After the corner bead has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 203mm (8") to 254mm (10") on each side of the corner.

3.5 OTHER METAL TRIM

A. General:

1. The Drawings do not purport to show all locations and requirements for metal trim.

2. Carefully study the Drawings and the installation, and provide all metal trim normally recommended by the manufacturer of the gypsum wallboard approved for use in this Work.

3.6 CLEANING UP

A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust, and to prevent tracking gypsum and joint finishing compound onto floor surfaces.
B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scrap, debris, and surplus material of this Section.

---End of Section---
PART 1 - GENERAL

1.1 SUMMARY

A. Provide new tiles as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 SUBMITTALS

A. Provide copies of the proposed mixes of mortar and grout to Contracting Officer for review and approval.

B. Provide sample of tiles for approval.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. When appropriate to the Scope of Work for the project, as determined by Contracting Officer, provide access for, and cooperate with, representatives of Contractor.

C. Do not commence placement until approval of submittals have been received from Contracting Officer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Materials shall be kept dry, protected from weather, and stored under cover in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 CERAMIC TILES

A. Ceramic tile and trim shall be unglazed with the colour extending uniformly through the body of the tile.
   1. Tile size shall be free by 8 mm thick.

B. Setting Bed:
   1. The setting-bed shall be composed of the following:
      a. Aggregate for Concrete Fill
      b. Maximum size of coarse aggregate shall not be greater than one-half the thickness of concrete fill.

2 Portland Cement:
   a. Cement shall conform to ASTM C 150, Type I, white for wall mortar and gray for other uses.
3 Sand:
   a. Construct forms to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished concrete.

4 Water:
   a. Water shall be potable.

5 Mortar, Grout, and Adhesive:
   a. Mortar, grout, and adhesive shall conform to the following:

6 OTHER MATERIALS:
   a. Provide other materials not specifically described but required for a complete and proper installation, subject to the approval of Contracting Officer.

PART 3 - EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

A. Surface to receive tile shall be inspected and shall conform to the requirements of ANSI A108.1 for surface conditions for the type setting bed specified and for workmanship.

B. Variations of surface to be tiled shall fall within maximum values shown below:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>WALLS</th>
<th>FLOORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry-Set Mortar</td>
<td>3 mm in 2.4 meters</td>
<td>3.0 mm in 3 meters</td>
</tr>
<tr>
<td>Organic Adhesives</td>
<td>3 mm in 2.4 meters</td>
<td>1.5 mm in 1 meter</td>
</tr>
<tr>
<td>Latex Portland cement mortar</td>
<td>3 mm in 2.4 meters</td>
<td>3.0 mm in 3 meters</td>
</tr>
<tr>
<td>Epoxy</td>
<td>3 mm in 2.4 meters</td>
<td>3.0 mm in 3 meters</td>
</tr>
</tbody>
</table>

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Tile work shall not be started until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested.

B. Floor tile installation shall not be started in spaces requiring wall tile until after wall tile has been installed.

C. Tile in colours and patterns indicated shall be applied in the area shown on the drawings.

D. Tile shall be installed with the respective surfaces in true even planes to the elevations and grades shown.

E. Special shapes shall be provided as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation.

F. Tile bases and coves shall be solidly backed with mortar.

3.3 INSTALLATION OF WALL TILE

A. Wall tile shall be installed in accordance with the TCA Hdbk.
1. Workable or Cured Mortar Bed:
   
   a. Tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor.

B. Organic Adhesive


3.4 INSTALLATION OF FLOOR TILE

A. Floor tile shall be installed in accordance with TCA Hdbk.

B. Shower receptors shall be installed in accordance with TCA Hdbk, method B414.

C. Workable or Cured Mortar Bed:

1. Floor tile shall be installed over a workable mortar bed or a cured mortar bed at the option of the Contractor.
   
   a. Workable mortar bed materials and installation shall conform to ANSI A108.1.

   b. Cured mortar bed and materials shall conform to ANSI A108.1.

   c. Joints between quarry tiles shall be between 6.35 mm and 9.53 mm in width and shall be uniform in width.

D. Ceramic Tile Grout:

1. Ceramic Tile grout shall be prepared and installed in accordance with ANSI A108.1.

3.5 EXPANSION JOINTS

A. Joints shall be formed and sealed as specified as indicated by the Manufacturer.

B. Walls:

1. Expansion joints shall be provided at control joints in backing material. Wherever backing material changes, an expansion joint shall be installed to separate the different materials.

C. Floors

1. Expansion joints shall be provided over construction joints, control joints, and expansion joints in concrete slabs.

2. Expansion joints shall be provided where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 7.2 to 10.8 m each way in large interior floor areas and 3.6 to 4.8 m each way in large exterior areas or areas exposed to direct sunlight or moisture.

3. Expansion joints shall extend through setting-beds and fill.

3.6 CLEANING AND PROTECTING

1. Upon completion, tile surfaces shall be thoroughly cleaned in accordance with manufacturer's approved cleaning instructions.

2. Acid shall not be used for cleaning glazed tile.
3. Floor tile with resinous grout or with factory mixed grout shall be cleaned in accordance with instructions of the grout manufacturer.

4. After the grout has set, tile wall surfaces shall be given a protective coat of a non-corrosive soap or other approved method of protection.

5. Tiled floor areas shall be covered with building paper before foot traffic is permitted over the finished tile floors.

6. Board walkways shall be laid on tiled floors that are to be continuously used as passageways by workmen.

7. Damaged or defective tiles shall be replace.

---End of Section---
SECTION 09 66 13
TERRAZZO TILE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide all materials, labor, tools, equipment and other items necessary to install terrazzo tile in locations shown on the Drawings, as specified herein, and as needed for a complete and proper installation of the work described in this Contract.

B. Related work specified elsewhere:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Contractor qualifications

C. Codes and standards:
   1. The Manufacturer is responsible for researching and complying with all applicable codes.

   2. Publications: Publications are referenced in the text by basic designation only. To the extent referenced, publications form a part of this specification.

   3. All products submitted for review under this section shall meet or exceed the requirements of the project scope of work as well as accepted local Afghanistan standards for products and installations of the type covered by this section.

1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’ “Notice to Proceed” submit the following:

   1. Product data:

   2. Quality Assurance and Control Submittals:
      a. Certificates:
         (1.) Manufacturer’s written third party certification that terrazzo tile meet or exceed local Afghanistan standards, applicable referenced standards and other specified requirements.

   3. Samples:
      a. Submit samples of each of the following:
         (1.) Terrazzo tile samples of sizes and finishes
         (2.) Submit full set of finish color samples for color selection.

   4. Operation and Maintenance Manuals:
a. Submit pertinent data relative to care and maintenance as part of Closeout requirements.

b. Include cleaning and stain removal methods and recommended cleaning materials, polishes, and waxes.

5. Mock-ups:

a. Install one full size mock-up of each type of terrazzo tile with specified finish for acceptance.

b. Location(s) shall be as directed by Contractor.

c. Once approved by Contracting Officer the Mock-up(s) shall be the standard for rest of the work.

d. Approved Mock-up(s) may remain as part of the completed project.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”

1.5 WARRANTY

A. Provide Manufacturer’s standard one (1) year Warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products specified within this Section are subject to local availability in markets accessible to Afghanistan.

B. In the absence of local Afghanistan product standards or laboratory certifications against which to review sample products, the Contractor and the manufacturer shall provide a letter certifying that the submitted product and installation will conform to the requirements of the project scope of work and will meet or exceed accepted local standards for products and installations of the type covered by this Section.

C. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the scope of work whether or not these are specifically described herein.

D. Unless specifically otherwise approved by Contracting Officer, provide all products of this Section from a single manufacturer.

2.2 STANDARD PRODUCTS

A. Provide components and equipment that are “standard products” of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship.

B. For the purposes of this project “standard products” is defined as products that have been in satisfactory commercial or industrial use for at least 2 years.

2.3 TERRAZZO TILE

A. General:
1. Terrazzo tile shall be of the indicated colors and shall consist of marble or granite chips embedded in a flexible or rigid thermoses resin matrix.

2. Tiles shall be 5 mm thick and nominal 300 by 300mm.

3. Tiles shall have a polished and honed finish with uniform color distribution of chips.

4. Marble chips shall be graded to 10 mm maximum size.

5. Granite chips shall be manufacturer's standard gradation.

B. OTHER MATERIALS

1. Provide other materials not specifically described but required for a complete and proper installation, subject to the approval of Contracting Officer.

PART 3 - EXECUTION

3.1 SUBSTRATE PREPARATION

A. Holes and cracks shall be filled with mortar.

B. Floors shall be free of curing compounds, grease, dirt, loose particles and other foreign matter that would prevent adhesion.

C. Projecting irregularities shall be chipped or ground smooth.

D. Depressions shall be filled and uneven surfaces leveled.

E. Subfloors shall then be rinsed and allowed to dry prior to applying adhesive.

3.2 INSTALLATION

A. Tile:

1. Tile shall be installed in accordance with the manufacturer's approved installation instructions, except as specified herein.

2. Tile shall be laid symmetrical about center lines of rooms or areas.

3. Joints shall be tight, inconspicuous as possible, and in alignment.

4. Tile shall be cut to fit snugly at pipes and other vertical surfaces.

5. Joints at pipes shall be sealed with adhesive.

6. Remove spots or smears of adhesive immediately.

7. Entire surface of finished tile floor shall be smooth, straight, and free from bleeding adhesive, buckles, waves, or projecting tile edges upon completion.

8. Bleeding of adhesive on finished floors is cause for rejection by Contracting Officer.

9. Damaged or rejected tiles shall be removed and replaced.

B. Terrazzo Base /Strips:

1. Terrazzo base /strips shall be continuous and adhesively applied.
2. Joints shall be tight and inconspicuous in same manner as floor tile.

C. Base:

1. Standard length resilient base of height shown shall be set straight, level and with close flush joints hermetically sealed by adhesive.

2. Wherever resilient base is used in conjunction with wall covering, adhesive shall be spread to within 6 mm from top of base and wall covering shall be cut off at a point 6 mm below top of base.

3. Straight base shall be used in rooms or areas that have carpets.

4. All spots or smears of adhesive shall be immediately removed from exposed surfaces.

3.3 MOISTURE TEST

A. After concrete floor surfaces have been cleaned, small patches of adhesive to be used shall be spread in several locations in each room or area to receive tile and allowed to dry overnight.

B. If the adhesive can be peeled easily from the floor surfaces, the surface is not sufficiently dry.

C. The steps shall be repeated until the adhesive adheres properly.

D. Tiles shall not be applied until adhesive adheres tightly to the floor.

3.4 CLEANING

A. Upon completion of the installation and after adhesive has cured, flooring shall be thoroughly cleaned in accordance with the manufacturer's recommendations.

3.5 PROTECTION

A. The terrazzo tile work shall be covered and protected from damage until completion of the work of all other trades.

B. Defects which develop, such as loose, broken, or curled tiles, shall be removed and replaced.

C. The Contractor shall submit Manufacturer's Maintenance Instructions.

---End of Section---
SECTION 10 44 16
FIRE EXTINGUISHERS and CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers hand fire extinguishers, including wall brackets, cabinets, and accessories, complete.

B. Related work specified elsewhere:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:

   1. The Manufacturer is responsible for researching and complying with all applicable codes.


   3. Publications: Publications are referenced in the text by basic designation only. To the extent referenced, publications form a part of this specification.

   4. All products submitted for review under this section shall meet or exceed the requirements of the project scope of work as well as accepted local Afghanistan standards for products and installations of the type covered by this section.

1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’ “Notice to Proceed” submit the following:

   1. Shop Drawings:

      a. Include sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

      b. Include standard details showing recommendations for installation of fire extinguishers.

   2. Product data:

      a. Materials list of items proposed to be provided under this Section;

      b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;

      c. Manufacturer’s recommended installation procedures. Once approved by Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.

   3. Quality Assurance and Control Submittals:
a. Certificates:

(1.) Manufacturer's written third party certification that fire extinguishers meet or exceed local Afghanistan standards, applicable referenced standards and other specified requirements.

4. Samples:

a. Submit samples of each of the following:

(1.) Fire Extinguishers, one (1) of each type to be installed.

(2.) Wall Brackets and Accessories, three (3) of each type to be used

(3.) Adjuncts

b. Approved samples may be used for installation with proper identification.

5. Operation and Maintenance Manuals:

a. Submit pertinent data relative to care and maintenance as part of Closeout requirements.

6. Mock-ups:

a. Install one full size Mock-up of each type of fire extinguisher with specified finish for acceptance.

b. Location(s) shall be as directed by Contractor

c. Once approved by Contracting Officer the Mock-up(s) shall be the standard for rest of the work.

d. Approved Mock-up(s) may remain as part of the completed project.

B. Comply with pertinent provisions of Section 01640: “Storage and Protection”

C. Identification Schedule:

1. Create a numbered fire extinguisher identification schedule. Use a different number for each and every new fire extinguisher. Coordinate fire extinguisher numbering system with room numbers found on the Contract Drawings.

2. Provide a copy of the schedule format, including numbering system, for Contracting Officer’ approval prior to filling it in. Also provide a copy of the completed schedule prior to commencing fire extinguisher installation. An approved copy of the schedule is to be kept on the Job Site at all times.

3. The approved Identification Schedule will be kept current as to units completed and units remaining to be completed. The schedule will also be used to verify Stored Materials. No payment application for Stored Materials will be considered unless it is accompanied by an Identification Schedule showing the actual Units being stored in the mutually agreed upon storage location.

D. Delivery:

1. Deliver all materials to the Job Site in original, undamaged, packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical information.

E. Storage:
1. Storage of non-hazardous, non-flammable construction related materials and equipment at the Job Site is authorized at the Contractor’s own risk.

F. Protection:

1. Materials for work of this Section shall be properly and appropriately protected in accordance with manufacturer’s instructions and accepted standards.

2. Store materials indoors.

3. Security for delivered materials is the responsibility of the Contractor. No claim for theft or damage to stored materials relevant to this project will be recognized by Contracting Officer. All such claims are the responsibility of the Contractor's Insurance Company and should be so directed.

4. Damaged or deteriorating materials shall not be used and shall be removed from the Job Site.

1.4 WARRANTY

A. Provide Manufacturer’s standard one (1) year Warranty.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fire extinguishers shall conform to NFPA 10.

B. All products specified within this Section are subject to local availability in markets accessible to Afghanistan.

C. In the absence of local Afghanistan product standards or laboratory certifications against which to review sample products, the Contractor and the manufacturer shall provide a letter certifying that the submitted product and installation will conform to the requirements of the project scope of work and will meet or exceed accepted local standards for products and installations of the type covered by this Section.

D. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the scope of work whether or not these are specifically described herein.

2.2 FIRE EXTINGUISHERS

A. Types and Quantities

1. Provide fire extinguishers of the following types and quantities in quantities shown on the Drawings:
   a. Fire extinguishers shall be carbon-dioxide and dry-chemical type

B. Materials

1. Extinguisher shell shall be corrosion-resistant steel.

C. Size

1. Provide fire extinguishers of 5 and 8 kilogram size.

D. Adjuncts

1. Forged brass valve
2. Fusible plug
3. Safety release

E. Clip

1. Dimensions of clips for hanging extinguishers on brackets shall be as indicated.

2.3 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of Contracting Officer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Design Professional, anchoring all components firmly into position for long life under hard use.

C. Extinguishers shall be installed where indicated. Exact locations shall be verified prior to installation.

D. Installation of extinguishers shall comply with the manufacturer's recommendations.

E. Extinguishers shall be fully charged and ready for operation upon installation.

3.3 CLEANING

A. Surfaces of the work, and adjacent surfaces soiled as a result of the work, shall be cleaned in an approved manner.

B. Equipment, surplus materials, and rubbish from the work shall be removed from the site daily.

---End of Section---
PART 1 GENERAL

All equipment shall be of commercial and industrial grade and as per design drawings of the project.

1.1 REFERENCES

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1.2 SUBMITTALS

Product Data
Kitchen equipment

Manufacturer's Instructions
Kitchen equipment
Exhaust hood

Operation and Maintenance Data
Submit OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 KITCHEN EQUIPMENT

2.1.1 Materials

Except as modified herein, provide manufacturer's standard materials for kitchen equipment. Provide quantities, physical dimensions, colors, and electrical characteristics as indicated.

2.1.2 Cooking Top

Spill catching, seamless, with cast-iron or tubular plug-in surface elements. Provide indicating "on" lights.

2.1.3 Freezer

Minimum [0.28] cubic meter [10], chest model with manual defrost, moisture-proof upright model with left swing door, foam or fiberglass insulation, adjustable temperature control to maintain minus 18 degrees C zero degree storage conditions, sliding removable storage basket, and vertical dividers minimum three package door shelves, minimum five full width removable interior shelves, and sliding bottom basket for odd shaped and bulky items, and adjustable leg levelers]. Provide safety indicating light for power failure or temperature fluctuation, magnetic door gasket, and lock with pop-out key. For freezer capacity larger than 0.42 cubic meters 15 cubic feet, provide interior light.

2.1.4 Refrigerator

Refrigerator with frostproof top freezer, minimum 0.41 cubic meter 14.6 cubic feet, automatic defrosting, two vegetable bottom baskets, four adjustable shelves, two door shelves and minimum 12 egg container in the door, separate interior shelves, multiple door shelves, and two ice trays. The Refrigerator shall be energy efficiency. Provide reversible left swing and right swing interchangeable doors. Provide four fixed rollers or adjustable leg levelers.

2.1.9 Oven

Shall be self-cleaning.
Equip oven with black glass window door, safety door lock during self-cleaning cycle, broiler pan, self-locking oven racks, digital clock with one-hour timer, automatic oven light, oven "on" light, oven cycling light and tempered glass control panel.

2.1.10 KITCHEN RANGE

Supply and installation of the Kitchen Range including all connections, all fittings, seals and transportation.
Measurement: Per unit.
Submittals: Certificate of the Kitchen Range.

2.1.13 Food Cabinet Cart

Shall be factory assembled, aluminum construction under counter model with 270 degree swing door, door latch, minimum 100 mm 4 inch swivel casters, and angle ledge pan supports. Provide storage capacity for seven 450 by 660 mm pans.

2.1.14 Kitchen Exhaust Hood

Shall be factory fabricated, island or wall-mounted model of minimum 1.2 mm thick 18 gage stainless steel construction, with replaceable grease filters.

2.1.14.1 Hood Construction

Welded joints and seams, grounded and polished to match adjacent exterior surfaces. Provide stainless steel duct collars and risers.

2.1.14.2 Grease Gutter

1.2 mm thick 18 gage stainless steel gutter down center of hood and directly below filter frame sloping to drain outlet.

2.1.14.3 Accessories

Provide filter frame, minimum 405 by 510 by 50 mm stainless steel grease extractor, hanger rods, vapor proof light fixtures, and wiring in conduit between light fixtures.

2.1.14.4 Exhaust Fan

Shall be centrifugal fan with maximum kitchen sound pressure level 45 dB. Provide adjustable roof curbs.

2.1.15 RANGE HOOD

Shall be with two-speed fan, permanent washable filter, top or rear exhaust, and eye level controls.

2.1.16 KITCHEN UNIT

Shall be according to design drawings consisting of refrigerator, range, wall cabinets, and sink and countertop.

2.1.17 DISHWASHER

Shall be with detergent dispenser. Provide automatic control to cycle machine through wash, rinse, dry or heat, and stop phases. Include manual setting to repeat or skip phases of cycle. Equip machine with safety switch which automatically stops spraying action when door is open. Provide stainless-steel commercial grade with approximately 300 dish capacity per hour and 540-glasses per hour ratings. For medium duty dishwasher, provide household grade, with minimum 500-watt input for drying dishes.
PART 3 EXECUTION

3.1 INSTALLATION
Install kitchen equipment in accordance with manufacturers' instructions.

3.2 FIELD QUALITY CONTROL
Conduct inspection and testing in the presence of the Contracting Officer.

3.2.1 Field Inspection
Before and after installation, inspect each piece of kitchen equipment for compliance with specified requirements.

3.2.2 Operation Tests
Upon completion, but before final acceptance, perform operation tests on each piece of equipment to determine that components, including controls, safety devices, and attachments, operate properly and in accordance with specified requirements.

--- End of Section----
PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
NSF INTERNATIONAL (NSF)

1.2 GENERAL REQUIREMENTS

N/A

1.3 DESCRIPTION OF WORK

The work includes furnishing and installing refrigerated and frozen food service equipment and related work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Include coordination of delivery through existing finished opening and vertical handling limitations within the building. Advise the Contracting Officer of all discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting. Provide rough-in and connect utilities to equipment in accord with requirements specified in other sections of this specification and in accord with the physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished.

1.4 SUBMITTALS

Custom fabricated equipment
Installation Instructions and Diagrams
Walk-in freezers Design Data
Manufacturer's descriptive and technical literature
Manufacturer's Test Data
Manufacturer's Instructions

PART 2 - PRODUCTS

2.1 MATERIALS

Comply with EPA sustainable acquisition (SA) requirements; regarding insulation materials for all equipment designated within this section.

2.2 LIST OF EQUIPMENT

Submit detailed Food Service Equipment List.

2.3 CONSTRUCTION OF FABRICATED EQUIPMENT

Construction and finish of fabricated equipment must conform to the specifications.

2.4 PREFABRICATED WALK-IN REFRIGERATORS AND FREEZERS

Provide walk-in units manufactured for food service use conforming to NSF 7 UL 207, and UL 471.[Floorless, with insulated floor screeds, installed over insulated floors's.[Floor panel walk-in refrigerators and freezers with appropriate insulated floor assembly and [polished aluminum][galvanized skin] finish floor.] Prefabricated dispensing freezers must conform to the requirements of NSF 6.
2.4.1 Panel Construction

Interchangeable, 1200 mm 4 feet maximum width, 100 mm 4 inch thick, filled with insulation. Provide preformed corner panels extending not less than 300 mm 12 inches in each direction. Panels to have tongue and groove edges or flush joints with double seal serrated neoprene rubber gaskets to assure air and vapor tight joints. Provide panels for separating sections.

a. Insulation: 100 mm 4 inch minimum foamed-in-place polyurethane with manufacturer's rated "K" factor of not more than 0.15, free rise density of not less than 27 kg per cu meter 1.7 pounds per cubic foot, or in-place density of not less than 32 kg per cu meter 2 pounds per cubic foot. Provide floor screeds with minimum of 63 mm 2 1/2 inches of foamed insulation.

b. Closures: Close the exposed exterior of the walk-in unit adjacent to walls and ceiling with panels of same material as used for exterior of walk-in unit panels.

c. I-Beam Supports: Wherever compartment dimension exceeds the clear-span ability of ceiling panels, provide I-beam supports on the exterior of the ceiling or supported by spline-hangers. Install thirteen mm half inch diameter steel rods through beam/hangers and secure to the structure above. Beams or posts within compartments are not be acceptable.

d. Finish:
   - Exterior: Stainless steel on all exposed surfaces and doors, aluminum on unexposed surfaces.
   - Interior: Stainless steel

2.4.4 Doors

Provide one per section, with 100 mm 4 inch thickness, filled with insulation. Provide vinyl hanging strips, able to be replaced individually and anchored at head. Provide each door panel with an outside pilot light, a light switch and a remote bulb sensor with exterior flush-mounted, waterproof thermometer for registering box inside temperature. Provide anti-condensing strip heaters around perimeter of door panel jambs. Provide top and each side of door with a resilient, non-magnetic or thermoplastic with magnetic steel core gasket installed. On bottom edge of door, provide a replaceable, adjustable rubber or vinyl wiper gasket.

Hardware Polished Stainless Steel: Provide two self-closing, spring-loaded hinges for each door. Include plated steel pin and cam-lift type bearing. Provide door latch with cylinder lock and with provisions for padlock. Include safety-release handle to permit opening from inside when locked.

Door Stops: Provide door stops where necessary, to prevent walk-in refrigerator and freezer doors from striking adjacent walls, plumbing fixtures or food service equipment when door is open.

Protective Bumpers: Equip the exterior sides of refrigerator that are not installed against each other or against a wall with protective bumpers.

Gasket: Provide either natural or synthetic rubber gaskets and conform to NSF 2. Where frames are used, the panels must fit together with gaskets that are designed for 50 percent compression.

2.4.5 Air-flow Inhibiting Strip Curtains

Provide transparent flexible vinyl reinforced strip curtains anchored at top and able to be replaced individually. Strips must be a minimum of 200 mm 8 inch in width and 2 mm 0.08 inch thick.

2.4.6 Lights

Provide high-efficiency rated two-tube fluorescent lamps in vapor-proof fixtures with safety shields. Lighting must conform to UL 1598. Provide diffuser and ballast capable of operating in minus 23 degrees C 10 degree F temperature. Lights must run full length of walk-in unit starting 600 mm 2 feet from front panel and extending within 600 mm 2 feet of back panel. Run[ between shelf rows][ as indicated].
2.4.7 Identification Signs

Mount engraved phenolic plastic compartment identification signs 300 by 50 mm 12 by 2 inch high in selected color with 25 mm 1 inch high letters on door above view window.

2.4.8 Pressure Relief Port

Provide pressure relief port in each section, heated electrically and insulated.

2.5 REFRIGERATION UNIT SYSTEMS

Conform to ASHRAE 15. Provide pre-assembled remote condensing unit assembly with all necessary components factory-installed and wired including electrical box, time clock, drier, sight glass. Set meat chiller to operate at minus one degree C 30 degrees F and other refrigerators to operate at one degree C 33 degrees F; set freezers to operate at minus 18 degrees C 0 degrees F. Mercury is prohibited for use in thermometers. Refrigerant compressors, packaged compressors and condenser units, and refrigerant condensers must be as specified in Division 23.

2.5.1 Monitoring Alarm System

Provide an electronic monitoring and alarm system for each unit. Alarm is to warn of abnormally low and high temperatures. System components: Detecting thermostat, master control panel, interconnecting wiring, and defrost compensator. Provide dials showing temperatures and pilot lights, warning lights, switches, transformer, and buzzer, all as a part of the master control panel. Locate master control panel as indicated. Provide power fuse to protect system components.

System operation: Set alarms at 5 degrees C 10 degrees F above and below specified operating temperatures.

2.5.2 Personnel Alarm

For each unit, provide separate audible alarm system operable from inside unit, for use of personnel unable to exit unit. Locate remote audible alarm where indicated.

2.6 FACTORY TESTS AND CERTIFICATIONS

Submit 3 copies of all Manufacturer's Test Data and certifications, to the Contracting Officer prior to the commencement of any installation work.

PART 3 - EXECUTION

3.1 INSTALLATION

Prior to commencement of installation, perform a complete walk down of the facility with the Contracting Officer to verify readiness for installation. Provide adequate protection of all finished surfaces, fixtures, furnishings and other equipment to prevent any damage during the installation work.

3.1.1 Equipment Connections

Complete equipment connections for all utilities. Unless otherwise specified, provide [chromium-plated copper alloy] [stainless steel] exposed piping.

3.1.2 Plumbing Work

Tag all plumbing final connection points of equipment, indicating item number, name of devices or components, and type of utility (water, gas, steam, drain). Provide extensions of indirect waste fitting to open-sight hub drain, floor sink or floor drains from food service equipment.
3.2 TESTS

Perform the tests and provide everything required.

3.2.1 Initial Start-Up and Operational Test

Provide all lubricants and accessories before initial start-up. Start and operate all equipment. Follow the manufacturer's procedures and place the systems under all modes of operation. Supplement initial charges of lubricating oil to assure maximum operating capacity. Adjust all safety and automatic control instruments. Record manufacturers recommended readings hourly.

3.2.2 Test Reports

Submit the final field test reports for each system tested, describing test apparatus, instrumentation calculations, and equipment data based on industry standard forms or reasonable facsimiles thereof. Include in data: compressor suction and discharge pressure; refrigerant charge pump, compressor and air moving device ampere readings; power supply characteristics, including phase imbalance, with 1/2 percent accuracy; thermostatic expansion valve superheat-value as determined by field test; subcooling; high and low refrigerant temperature switch set-points; low oil pressure switch set-point; [defrost system timer and thermostat set-points] moisture content; ambient, condensing and coolant temperatures; capacity control set-points; field data and adjustments which affect unit performance and energy consumption. Where final adjustments and settings cannot be permanently marked or drilled and pinned as an integral part of device, include adjustment and setting data in test report.

3.3 MANUFACTURER'S WARRANTY.

Submit all manufacturers' signed warranties to Contracting Officer prior to final commissioning and acceptance.

3.4 CONTRACTOR'S WARRANTY for INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

--- End of Section ---
PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
NSF INTERNATIONAL (NSF)

1.2 GENERAL REQUIREMENTS

N/A

1.3 DESCRIPTION OF WORK

The work includes furnishing and installing refrigerated and frozen food service equipment and related work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Include coordination of delivery through existing finished opening and vertical handling limitations within the building. Advise the Contracting Officer of all discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting. Provide rough-in and connect utilities to equipment in accord with requirements specified in other sections of this specification and in accord with the physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished.

1.4 SUBMITTALS

Custom fabricated equipment
Installation Instructions and Diagrams
Walk-in freezers Design Data
Manufacturer's descriptive and technical literature
Manufacturer's Test Data
Manufacturer's Instructions

PART 2 - PRODUCTS

2.1 MATERIALS

Comply with EPA sustainable acquisition (SA) requirements; regarding insulation materials for all equipment designated within this section.

2.2 LIST OF EQUIPMENT

Submit detailed Food Service Equipment List.

2.3 CONSTRUCTION OF FABRICATED EQUIPMENT

Construction and finish of fabricated equipment must conform to the specifications.

2.4 PREFABRICATED WALK-IN REFRIGERATORS AND FREEZERS

Provide walk-in units manufactured for food service use conforming to NSF 7 UL 207, and UL 471.[ Floorless, with insulated floor screeds, installed over insulated floors's.][ Floor panel walk-in refrigerators and freezers with appropriate insulated floor assembly and [polished aluminum][galvanized skin] finish floor.] Prefabricated dispensing freezers must conform to the requirements of NSF 6.
2.4.1 Panel Construction

Interchangeable, 1200 mm 4 feet maximum width, 100 mm 4 inch thick, filled with insulation. Provide preformed corner panels extending not less than 300 mm 12 inches in each direction. Panels to have tongue and groove edges or flush joints with double seal serrated neoprene rubber gaskets to assure air and vapor tight joints. Provide panels for separating sections.

a. Insulation: 100 mm 4 inch minimum foamed-in-place polyurethane with manufacturer's rated "K" factor of not more than 0.15, free rise density of not less than 27 kg per cu meter 1.7 pounds per cubic foot, or in-place density of not less than 32 kg per cu meter 2 pounds per cubic foot. Provide floor screeds with minimum of 63 mm 2 1/2 inches of foamed insulation.

b. Closures: Close the exposed exterior of the walk-in unit adjacent to walls and ceiling with panels of same material as used for exterior of walk-in unit panels.

c. I-Beam Supports: Wherever compartment dimension exceeds the clear-span ability of ceiling panels, provide I-beam supports on the exterior of the ceiling or supported by spline-hangers. Install thirteen mm half inch diameter steel rods through beam/hangers and secure to the structure above. Beams or posts within compartments are not be acceptable.

d. Finish:
   - Exterior: Stainless steel on all exposed surfaces and doors, aluminum on unexposed surfaces.
   - Interior: Stainless steel

2.4.4 Doors

Provide one per section, with 100 mm 4 inch thickness, filled with insulation. Provide vinyl hanging strips, able to be replaced individually and anchored at head. Provide each door panel with an outside pilot light, a light switch and a remote bulb sensor with exterior flush-mounted, waterproof thermometer for registering box inside temperature. Provide anti-condensing strip heaters around perimeter of door panel jambs. Provide top and each side of door with a resilient, non-magnetic or thermoplastic with magnetic steel core gasket installed. On bottom edge of door, provide a replaceable, adjustable rubber or vinyl wiper gasket.

Hardware Polished Stainless Steel: Provide two self-closing, spring-loaded hinges for each door. Include plated steel pin and cam-lift type bearing. Provide door latch with cylinder lock and with provisions for padlock. Include safety-release handle to permit opening from inside when locked.

Door Stops: Provide door stops where necessary, to prevent walk-in refrigerator and freezer doors from striking adjacent walls, plumbing fixtures or food service equipment when door is open.

Protective Bumpers: Equip the exterior sides of refrigerator that are not installed against each other or against a wall with protective bumpers.

Gasket: Provide either natural or synthetic rubber gaskets and conform to NSF 2. Where frames are used, the panels must fit together with gaskets that are designed for 50 percent compression.

2.4.5 Air-flow Inhibiting Strip Curtains

Provide transparent flexible vinyl reinforced strip curtains anchored at top and able to be replaced individually. Strips must be a minimum of 200 mm 8 inch in width and 2 mm 0.08 inch thick.

2.4.6 Lights

Provide high-efficiency rated two-tube fluorescent lamps in vapor-proof fixtures with safety shields. Lighting must conform to UL 1598. Provide diffuser and ballast capable of operating in minus 23 degrees C 10 degree F temperature. Lights must run full length of walk-in unit starting 600 mm 2 feet from front panel and extending within 600 mm 2 feet of back panel. Run[ between shelf rows][ as indicated].
2.4.7 Identification Signs

Mount engraved phenolic plastic compartment identification signs 300 by 50 mm 12 by 2 inch high in selected color with 25 mm 1 inch high letters on door above view window.

2.4.8 Pressure Relief Port

Provide pressure relief port in each section, heated electrically and insulated.

2.5 REFRIGERATION UNIT SYSTEMS

Conform to ASHRAE 15. Provide pre-assembled remote condensing unit assembly with all necessary components factory-installed and wired including electrical box, time clock, drier, sight glass. Set meat chiller to operate at minus one degree C 30 degrees F and other refrigerators to operate at one degree C 33 degrees F; set freezers to operate at minus 18 degrees C 0 degrees F. Mercury is prohibited for use in thermometers. Refrigerant compressors, packaged compressors and condenser units, and refrigerant condensers must be as specified in Division 23.

2.5.1 Monitoring Alarm System

Provide an electronic monitoring and alarm system for each unit. Alarm is to warn of abnormally low and high temperatures. System components: Detecting thermostat, master control panel, interconnecting wiring, and defrost compensator. Provide dials showing temperatures and pilot lights, warning lights, switches, transformer, and buzzer, all as a part of the master control panel. Locate master control panel as indicated. Provide power fuse to protect system components.

System operation: Set alarms at 5 degrees C 10 degrees F above and below specified operating temperatures.

2.5.2 Personnel Alarm

For each unit, provide separate audible alarm system operable from inside unit, for use of personnel unable to exit unit. Locate remote audible alarm where indicated.

2.6 FACTORY TESTS AND CERTIFICATIONS

Submit 3 copies of all Manufacturer's Test Data and certifications, to the Contracting Officer prior to the commencement of any installation work.

PART 3 - EXECUTION

3.1 INSTALLATION

Prior to commencement of installation, perform a complete walk down of the facility with the Contracting Officer to verify readiness for installation. Provide adequate protection of all finished surfaces, fixtures, furnishings and other equipment to prevent any damage during the installation work.

3.1.1 Equipment Connections

Complete equipment connections for all utilities. Unless otherwise specified, provide [chromium-plated copper alloy] [stainless steel] exposed piping.

3.1.2 Plumbing Work

Tag all plumbing final connection points of equipment, indicating item number, name of devices or components, and type of utility (water, gas, steam, drain). Provide extensions of indirect waste fitting to open-sight hub drain, floor sink or floor drains from food service equipment.
3.2 TESTS

Perform the tests and provide everything required.

3.2.1 Initial Start-Up and Operational Test

Provide all lubricants and accessories before initial start-up. Start and operate all equipment. Follow the manufacturer's procedures and place the systems under all modes of operation. Supplement initial charges of lubricating oil to assure maximum operating capacity. Adjust all safety and automatic control instruments. Record manufacturers recommended readings hourly.

3.2.2 Test Reports

Submit the final field test reports for each system tested, describing test apparatus, instrumentation calculations, and equipment data based on industry standard forms or reasonable facsimiles thereof. Include in data: compressor suction and discharge pressure; refrigerant charge pump, compressor and air moving device ampere readings; power supply characteristics, including phase imbalance, with 1/2 percent accuracy; thermostatic expansion valve superheat-value as determined by field test; subcooling; high and low refrigerant temperature switch set-points; low oil pressure switch set-point; [defrost system timer and thermostat set-points] moisture content; ambient, condensing and coolant temperatures; capacity control set-points; field data and adjustments which affect unit performance and energy consumption. Where final adjustments and settings cannot be permanently marked or drilled and pinned as an integral part of device, include adjustment and setting data in test report.

3.3 MANUFACTURER'S WARRANTY.

Submit all manufacturers' signed warranties to Contracting Officer prior to final commissioning and acceptance.

3.4 CONTRACTOR'S WARRANTY for INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

--- End of Section ---
PART 1 - GENERAL

1.1 DESIGN REQUIREMENTS

A. Work included:

1. Provide all materials, labor, tools, equipment and other items necessary to install a complete plumbing system including water supply, waste and vent and all required plumbing fixtures and fittings as shown on the drawings, as specified herein, and as needed for a complete and proper installation of the work described in this Contract.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:

1. The Manufacturer is responsible for researching and complying with all applicable codes.

2. Publications: Publications are referenced in the text by basic designation only. To the extent referenced, publications form a part of this specification.

3. All products submitted for review under this section shall meet or exceed the requirements of the project scope of work as well as accepted local Afghanistan standards for products and installations of the type covered by this section.

1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’ “Notice to Proceed” submit the following:

1. Shop Drawings:

   As required.

2. Product data:

   a. Materials list of items proposed to be provided under this Section;

   b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;

   c. Manufacturer’s recommended installation procedures. Once approved by Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.

3. Quality Assurance and Control Submittals:

   a. Certificates:

      (1.) Manufacturer's written third party certification that materials provided under this Section meet or exceed local Afghanistan standards, applicable referenced standards as well as other specified requirements.
4. Samples:
   a. Submit samples of each of the material.

5. Operation and Maintenance Manuals:
   a. Submit pertinent data relative to care and maintenance as part of Closeout requirements.
   b. Include cleaning and stain removal methods and recommended cleaning materials, polishes, and waxes.

1.4 PRODUCT HANDLING
   A. Comply with pertinent provisions of Section 01640: “Storage and Protection”

1.5 WARRANTY
   A. Provide Manufacturer’s standard one (1) year Warranty.

PART 2 - PRODUCTS

2.1 GENERAL
   A. All products specified within this Section are subject to local availability in markets accessible to Afghanistan.
   B. In the absence of local Afghanistan product standards or laboratory certifications against which to review sample products, the Contractor and the manufacturer shall provide a letter certifying that the submitted product and installation will conform to the requirements of the project scope of work and will meet or exceed accepted local standards for products and installations of the type covered by this Section.
   C. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the contract documents and required by the scope of work whether or not these are specifically described herein.
   D. Plumbing fixtures and fittings shall be selected in accordance with local Afghanistan water conservation guidelines.

2.2 WATER SUPPLY SYSTEM COMPONENTS
   A. Pipe and Fittings
      1. Plastic Pipe and Fittings
         a. Hot & cold pipe shall be extruded of polypropylene random co-polymer (PPRC) virgin pipe compound.
            (1.) Pipe and fittings shall conform to TS 9937, TS 1145 (DN8077-8078).
         b. Pipe and fittings shall bear the following markings: manufacturer's name, nominal pipe size, schedule or class, pressure rating in kilopascal, and NS International (NS) seal of approval.
            (1.) Manufacturer shall also mark the date of extrusion on the pipe.
         c. Solvent cement or rubber-gasket joints for pipe and fittings shall be made in accordance with the manufacturer's instruction.
d. Fittings shall be PPRC Schedule 40.

e. Fittings shall be injection-molded of an improved PPRC compound.

   (1.) Fittings shall conform to DN8077-8078.

f. Tees and ells shall be side gated.

g. Fittings shall bear the company's name or trademark, material designation, size, applicable iron pipe size (rips) schedule, and NS seal of approval.

h. Threaded nipples shall be standard weight Schedule 80 with molded threads.

B. Valves and Specialties:

1. Gate Valves:

   a. Valves shall be designed for a minimum of 1034 kilopascal.

      (1.) Valves shall have bell-and-spigot ends screw joints.

      (2.) Valves DN25 shall be all PPRC and shall conform to TS 9937, TS1145 (DIN 8077-8078).

      (3.) Valves larger than DN25 shall be brass and conform to MSSSP-80, TYPE 1.

2. Vacuum and Relief Valves:

   a. Vacuum and relief valves shall be size and type to relieve pressure and prevent the formation of a vacuum.

      (1.) Valves shall automatically remove air from the lines when the lines are being filled and admit air into the lines when water is being withdrawn in excess of the inflow.

3. Hose Faucets:

   a. Hose faucets shall be constructed with 15 millimeter male inlet threads, hexagon shoulder, and 20 millimeter hose connection, conforming to ANSI A112.18.1M.

      (1.) Hose-coupling screw threads shall conform to ASME B1.20.7 and ASME B1.21M.

4. Globe Valves:

   a. Valves shall be 862 kilopascal, bronze body, conforming to MSS SP-80.

   b. Disk shall be free to swivel on the stem.

   c. Composition seating surface disk construction may be substituted for all metal disk construction.

   d. Packing shall be a woven non-asbestos material, impregnated with not less than 25 percent, by weight, tetrafluoroethylene resin.

5. Check Valves:

   a. Standard check valves in sizes DN50 and smaller shall be 862 kilopascal swing check conforming to MSS SP-80. Lift checks (lift check horizontal) and 862 kilopascal valves conforming to MSS SP-80, shall be provided.
b. Check valves in sizes DN90 and larger shall be cast iron, bronze trim, swing type.
   
   (1.) Valve bodies shall be cast iron, conforming to ASTM A 126/A 126M, Class A ductile iron, conforming to ASTM A 536.
   
   (2.) Valve ends shall be flanged in conformance with ASME B16.1.
   
   (3.) Swing-check pin shall be AISI Type 304 corrosion-resistant steel.
   
   (4.) Valves shall have bolted and gasketed covers.

c. Grooved end check valves may be used provided that the manufacturer certifies to the performance requirements of MSS SP-80.

6. Backflow Prevention Devices:

   a. Backflow prevention devices shall conform to AWWA C510 and AWWA C511.

   b. Devices DN50 ips and smaller with moving components defined in AWWA C511, shall be constructed of nonferrous metals.

   c. Nonmetal components of such devices shall be rated for the applicable service temperature.

   d. Bodies of devices DN65 and larger shall be corrosion resistant ferrous material or bronze, with flanged connections.

   e. Metallic operating components and trim shall be nonferrous.

   f. Nonmetallic parts shall be rated for the applicable service temperature.

   g. External surfaces of devices used in conjunction with equipment with polished or chrome-plated surfaces shall be similarly finished.

   h. External surfaces of devices may be rough castings where these devices are used outside of the building or in equipment rooms.

   i. Devices shall be protected from freezing and shall be installed, tested, and used in strict conformance with the manufacturer’s instructions.

   j. Air gaps shall be at least two times the supply pipe diameter, but not less than 25 millimeter, as measured vertically, from the flood rim of the supplied device.

       (1.) There shall be no provision for a temporary bypass line around the air gap or water supply tank and pump.

   k. Atmospheric Vacuum Breakers (AVB) shall be used only where no back-pressure may occur.

       (1.) Atmospheric vacuum breakers will only provide protection against backsiphonage of nontoxic pollutants.

       (2.) AVB shall be installed downstream of the last shutoff valve and at least 300 millimeter above the highest sprinkler head or outlet.

       (3.) Under no circumstances shall the AVB be installed where it will be under continuous pressure for more than 12 hours in any 24-hour period.
(4.) AVB shall be installed in an accessible location to facilitate inspection and servicing.

I. Pressure Vacuum Breakers (PVB) shall be used only where there is no possibility of back-pressure.

(1.) PVB shall be installed a minimum of 300 millimeter above the highest outlet, shall conform to ASSE 1010, and shall have tightly closing shutoff valves on each end, and be fitted with properly located test cocks.

(2.) PVB devices may have pressure on downstream side and may be used for back-siphonage only, against pollutants or contaminants.

(3.) PVB shall be installed in an accessible location to facilitate inspection and servicing.

m. Type DC backflow devices or assemblies are used for low degree of hazard nonpollutants or contaminants.

(1.) This device shall conform to AWWA C510 ASSE 1015, and FCCCHR Manual standard.

(2.) This unit shall be installed a minimum of 300 millimeter above the ground or flood level.

(3.) When installed in a pit, a drain must be provided.

(4.) This assembly device must be furnished with tightly closing shutoff resilient seated valves on each end and be fitted with properly located test cocks.

(5.) Outside locations shall include protection against freezing.

(6.) Critical facility potable water systems and DN65 and larger shall have dual-parallel installation which should be installed in accessible locations.

(7.) When DC backflow assemblies are used on fire suppression water systems, the shutoff valves must be OS&Y resilient seated gate valves.

n. Reduced pressure principle devices shall conform to ASSE 1013 AWWA C511 and FCCCHR Manual. This unit shall be installed a minimum of 300 millimeter above ground or flood level.

(1.) This unit shall include tightly closing shut-off valves on each end and be fitted with properly located test cocks.

(2.) Indoor installations shall include an air gap equipped drain adequate for relief valve discharge.

(3.) Outside installations shall include protection against freezing.

(4.) Critical water supplies shall have dual-parallel installations which shall be installed in accessible locations.

7. Service Stops:

a. Service stops shall be waterworks ground-key type, oval flow way, T-handle, without drain.

b. Pipe connections shall be suitable for the type of service pipe used.
c. Parts shall be cast red brass having a nominal composition of 85 percent copper, 5 percent tin, 5 percent lead, and 5 percent zinc, with female is connections designed for a minimum pressure of 1379 kilopascal.

8. Valve Manholes:
   a. Valve manholes shall be constructed in accordance with the design details.

C. Storage Type Water Heaters
   1. Storage-type water heaters shall be electric type.
   2. Electric water heaters shall be UL listed.
   3. Water heaters shall be commercially available models.
   4. Model selected shall be of the energy efficient type insulated to an R value of at least 1.8 square meter Celsius per watt (10 square foot Fahrenheit per Btu) and shall have efficiencies in accordance with the levels specified in DOE RE-4 and/or DOE RE-5.
   5. Submit equipment and performance data for verification of storage capacity and energy efficiency.
   6. Temperature- and pressure-relief valves shall conform to AGA Z21.22.
      a. Type I, combination pressure- and temperature-relief valves shall be installed when the heat input is less than 30 kilowatt and when the storage is less than 454 liter.
      b. When either or both of the specified conditions are reached or exceeded:
         (1.) Type II, temperature relief, water rated, or
         (2.) Type III, temperature relief, steam rated valves shall be installed, as required
   7. Vacuum-relief valves shall be installed on each cold water branch connection on the bottom of the water heaters at an elevation above the top of the heater.
      a. Vacuum relief valve shall be designed to prevent water heater damage from a reverse flow vacuum.

D. Plumbing Fixtures and Trim:
   1. General:
      a. Vitreous-china and enameled cast-iron plumbing fixtures shall be white, and shall be the product of the same manufacturer.
      b. Exposed traps and double cone supply tubes for fixtures and equipment shall be connected to rough-piping at the wall, unless shown or specified otherwise on the drawings.
      c. Floor and wall plates shall be as specified herein or as covered by the outfit numbers.
      d. Exposed-to-view fixture trimmings, fittings, and fasteners shall be chromium-plated or nickel-plated brass with polished, bright surfaces.
      e. Supplies and wastes for lavatories shall be to wall, except as otherwise indicated on the construction drawings. Sleeves are not required at penetrations.
      f. Rubber compression type connections are not acceptable.
g. Brass ferrule type fittings are required.

2. Fixture Supports
   a. Wall-hung fixtures shall be supported by ferrous metal carriers suited to the particular installation conditions.
   b. Carriers may be combination type with adjustable fittings.
      (1.) Water closets and urinals shall have supporting feet not less than 250 millimeters long.
      (2.) Lavatories shall be supported from the wall by wall-carriers with concealed arms.

3. Lavatories
   a. Lavatories and fittings shall conform to ANSI A112.19.2M.
   b. Type L-S lavatories shall be Type V, slab type, Class 4, wall hung, 508 by 457 millimeter. Inside opening shall be substantially rectangular.
   c. Type L-B lavatories shall be Type I, straight back, 508 by 457 millimeter. Inside opening shall be substantially rectangular.
   d. Type L-C lavatories shall be Type IV, countertop, Class 2, oval, flat rim, beadless, self-rimming with rounded rim corner and back ledge, front overflow, oval shaped, seamless, and mirror finish.
      (1.) Materials shall be 1.3 millimeter corrosion-resistant steel conforming to ASTM A 176, Class 302, A, annealed. Internal size of the lavatory shall be 384 by 289 by 152 millimeter deep.
      (2.) Bowls shall be coated externally with sound deadening, non-marring mastic.
   e. Supply fittings shall conform to applicable requirements for faucets in ANSI A112.19.2M and shall be in accordance with the recommended levels specified in DOE WS-1.
      (1.) Supply fitting shall be a 100 millimeter, centerset type with a vandal proof aerator.
      (2.) Automatic supply fittings shall conform to ANSI A117.1 and UL 8730, for faucets.
      (3.) Supply fitting spout angle and length over the bowl shall provide a water-free back ledge.
      (4.) Horizontal distance from the centerline of the spoutless aerator to the centerline of the supply piping shall be not less than 111 millimeter, and the vertical distance between the centerline of the spout, less aerator, and the fitting base shall be not less than DN65.
      (5.) Supply fittings with handles capable of being turned 360 degrees are not acceptable.
      (6.) Supply piping shall be chrome-plated brass and threaded in accordance with the requirements of ANSI A112.19.2M.
f. Drain fittings shall conform to ANSI A112.19.2M, strainer drain, but with perforated removable strainer and DN32 tailpiece.
   
   (1.) Adjustable P-trap, with cleanout, shall be Type I.
   
   2.) Corrosion-resistant steel lavatories shall be equipped with corrosion-resistant steel drain fittings.

g. Each lavatory shall be provided with a stainless steel or nickel coated paper holder and soap tray.

4. Service Sinks


b. Type SS-W service sinks shall be single bowl, mounting trap standard with high no drilled back, and without a finished apron.

c. Supply fittings shall be a DN250 chrome-plated spout, Type SS-W, single, compression, with vacuum breaker and 1220 millimeter hose with holding bracket.

d. Waste shall be to the wall.

e. P-trap shall be cast iron with acid-resisting enamel inside, brass clean-out plug, and strainer.

f. Type SS-F service sinks shall be single bowl, mounting floor with high nondrilled back, floor-corner mounted, curved or straight front, and enameled cast iron with rim guard.

g. Sinks shall be 711 by 711 millimeter overall, 330 millimeter back height from the floor, and 150 millimeter deep.

h. Supply fittings shall be single, compression, with vacuum breaker and 1220 millimeter hose with holding bracket.

i. Supply fittings shall be in accordance with the recommended levels specified in DOE WS-1. Drain fittings shall be 80 millimeter.

j. Type SS-T service sinks shall be single bowl, three-side access, floor mounted, terrazzo, with four-side cap-tiling flange, and fabricated from Class 302, annealed corrosion-resistant steel.

k. Fixtures shall be 914 by 600 millimeter overall and 300 millimeter high.

l. Supply fittings shall be a DN250 spout, chrome-plated, single, compression, with vacuum breaker and 4-foot hose with holding bracket.

m. Drain fittings shall be 80 millimeter.

5. Water Closets

a. Western Type:

   (1.) Water closet, Type WC-1, shall be office and industrial type, elongated bowl with flush valve, siphon, jet, and wall outlet, in conformance with ANSI A112.19.5, constructed for quiet operation.
(2.) Seat shall be elongated, open-front, solid-molded, high-impact, polystyrene, white, with check hinge, less cover.

(3.) Flush valve shall be exposed flush meter, large diaphragm and large piston, side oscillating handle with vacuum breaker and screwdriver stop, constructed for quiet operation.

(4.) Women's room outfit, Type WC-2, shall be identical, except that seat shall be elongated bowl, industrial, open front with cover.

(5.) Bumper shall be provided on flush valve.

(6.) All water closets shall be in accordance with recommended levels specified in DOE WS-3.

b. Eastern Type:

   (1.) Water closet, shall be Medium size office and industrial type, elongated bowl with water tank, flush valve, siphon, jet, and floor outlet.

   c. Each water Closet shall be provided with a stainless steel or nickel coated paper holder and soap tray.

6. Shower Fittings:

   a. Shower fittings shall conform to ANSI Z358.1 with concealed piping and pressure-balancing mixing valve.

   b. Shower head shall be Type I, Class 2, and adjustable spray.

      (1.) Showerheads shall be in accordance with recommended levels specified in DOE WS-2.

7. Shower Tray:

   a. Fiberglass; 800 mm x 800 mm (31-1/2” x 31-1/2”)

   b. Acceptable products:

      (1.) Available from: Mirzad Trading Center, Share now Charahi Ansari, Kabul Afghanistan; phone: 020-220-2370; mobile: 070-002-7797 or 079-035-1634

      (2.) Equal products of other Manufacturers approved in advance by Contracting Officer.

8. Mirror:

   a. Shall be 600 x 800x5 mm plate glass and mounted as indicated on design drawings.

2.3 SANITARY DRAIN, WASTE, AND VENT SYSTEM (DWV)

A. DWV Piping:

   1. Polyvinylchloride (PVC):

      a. Polyvinylchloride drain, waste, and vent piping-system materials shall be manufactured from Type I normal impact resins in conformance with ASTM D 2665 and with ASME B16.12.
b. Pipe and fittings shall be white and specifically suited for joining socket interfaces into a homogeneous mass by solvent-cement welding.

c. Fittings shall be molded to produce upon insertion of pipe interference fit at two-thirds depth of socket.

d. No thread cutting shall be permitted.

B. Sanitary Drain Waste and Vent Fixtures:

1. Floor Drains (FD):
   a. Floor drains shall be complete with traps, and bottom outlets.
   b. Floor drains located in slabs on earth shall have hub outlets.
   c. Drains in slabs not on earth shall have threaded outlets or hub outlets, as required to match piping used.
   d. Floor drains shall have integral seepage pans and weep holes.
   e. Floor drains fitted with membrane or metal-pan waterproofing shall have clamping-collar assemblies.
   f. Ferrous floor-drain surfaces, except the top of grates, shall be given a heavy coating of coal-tar enamel.
   g. Coating shall be applied either at the factory or in the field before installation and before any rusting has occurred.
   h. Type FD-1 floor drains shall conform to ASME A112.21.1M and as indicated.
   i. Adjustable collar strainer and fasteners shall be nickel-bronze.
   j. Exposed-to-view surfaces shall be satin polished, except in mechanical rooms.
   k. Strainer holes shall be square.
   l. Strainer diameter shall be nominal 125 millimeter. Strainer and body shall be capable of sustaining specified platen load of not less than 8900 newton, with not more than 1.6 millimeter deflection with load applied within 5 seconds.
   m. Strainer-free area shall be not less than 4516 millimeter square.

2. Cleanouts (CO):
   a. Cleanouts shall be gastight and watertight, sized to provide quick and easy access for plug removal and rodding tools in their specific location.
      (1.) Cleanouts shall be aesthetically located with respect to tile patterns, masonry bond, and alignment.
   b. Cleanouts in ceramic tile and resilient tile flooring and wall finish shall be rectangular.
   c. No cleanout plug shall terminate in or above a finished floor or wall surface except in stack bases and where indicated on the construction drawings.
   d. Cleanouts shall have cast-brass raised-head plugs.
(1.) Not less than two tools for each size and type of plug shall be delivered to Contractor.

e. Cleanout plugs under pressure and where specified in the contract documents shall be lead gasketed.

f. Cleanouts in above ground floors shall have integral seepage pans and weepholes.

g. Cleanouts fitted with membrane or metal pan waterproofing shall have integral seepage pans and weepholes, and clamping collar assemblies.

h. Cleanouts set outside of the building and all cleanouts in building floors shall have adjustable housings.

i. Cast-iron bodies shall be coated with manufacturer's standard material.

j. Type CO-1 shall be cast-iron body and setscrew-adjustable housing with deep-set tractor-type cast-iron scoriated cover. Construction shall be heavy duty, suitable for AASHTO H-10 loading.

k. Type CO-2 shall be cast-iron body and setscrew-adjustable housing with deep-set tractor-type polished nickel-brass or nickel-bronze scoriated cover. Construction shall be heavy duty, suitable for AASHTO H-10 loading.

l. Type CO-3 shall be cast-iron body and adjustable housing with polished nickel-brass or nickel-bronze heavy-duty frame and scoriated secured cover.

(1.) Cover thickness shall be not less than 10 millimeter.

m. Type CO-4 shall be cast-iron body and adjustable housing with cover recessed to a depth to accommodate specified resilient-flooring material.

(1.) Surfaces and fasteners exposed to view shall be constructed of polished nickel-bronze or approved nickel-brass.

n. Type CO-5 shall be cast-iron body and adjustable housing with 19 millimeter minimum recessed anchor cover.

(1.) Surfaces and fasteners exposed to view shall be constructed of nickel-bronze or approved nickel-brass.

(2.) Cover shall be equipped with lifting screw.

2.4 SUPPORTING ELEMENTS

A. General:

1. Necessary piping-system components and miscellaneous supporting elements shall be provided, including, but not limited to, building structure attachments; supplementary steel; hanger rods, stanchions, and fixtures; vertical pipe attachments; horizontal pipe attachments; anchors; and variable and constant supports.

2. Supporting elements shall be suitable for stresses imposed by systems pressures and temperatures, and natural and other external forces.

3. Supporting elements shall be in accordance with FM P7825 and be UL listed, and shall conform to ASME B31.1, MSS SP-58, MSS SP-69, and requirements specified herein.

4. Types of devices specified herein are defined in referenced MSS standards.
B. Building Structure Attachments:

1. Anchor Devices, Concrete and Masonry:
   a. Anchor devices shall conform to requirements of FS FF-S-325, Group I Group II, Type 2, Class 2, Styles 1 2; Group III Group VIII.
   b. Anchor devices for cast-in floor mounted equipment shall provide for adjustable positions.
   c. Masonry anchor devices shall be built-in.
   d. Powder actuated anchoring devices shall not be used to support any mechanical system components.

3. Concrete Inserts:
   a. Concrete inserts shall be constructed in accordance with the requirements of MSS SP-58 for Type 18 and MSS SP-69.
      (1.) When applied to piping in sizes DN50 ips and larger, and where otherwise required by imposed loads, a 305 millimeter length of 13 millimeter reinforcing rod shall be inserted and wired through slots.
   b. Proprietary continuous inserts shall be similarly used.

C. Horizontal Pipe Attachments:

1. Single Pipes
   a. Piping in sizes through DN50 ips shall be supported by MSS SP-58 Type 6 solid malleable-iron pipe rings, except that split-band rings shall be used in sizes up to DN25 ips.
   b. Piping in sizes through DN200 ips inclusive shall be supported by MSS SP-58 Type 1 3 4 attachments.
   c. MSS SP-58 Type 1 and 6 assemblies shall be used on vapor-sealed insulated piping and shall have an inside diameter 1-ips larger than the pipe being supported, to provide adequate clearance during pipe movement.
   d. MSS SP-58 Type 12 devices with double-bolted, angle-iron wall or fixture clips shall be used in pipe chases to support fixture-supply piping.
   e. MSS SP-58 Type 40 shields shall be used on insulated piping.
   f. Area of the supporting surface shall be such that compression deformation of insulated surfaces does not occur.
      (1.) Longitudinal and transverse shield edges shall be rolled away from the insulation.
   g. MSS SP-58 Type 39 saddles shall be used for pipe guiding.
   h. Spring supports shall be provided.

D. Vertical Single Pipe Attachments:

1. Vertical pipe attachments shall be MSS SP-58 Type 8.
E. Hanger Rods:

1. Pipe, straps, or bars of equivalent strength shall be used for hangers only where approved by Contracting Officer.

2.5 INSULATION

A. General:

1. Hot-water-piping insulation shall be fiberglass with factory-applied jacket conforming to ASTM C 547.

2. Wall penetrations shall be sleeved with foamed, flexible insulation, continuous through the sleeve.

3. Potable hot and cold water lines shall be insulated to the extent shown with standard nominal 19 millimeter foamed, flexible insulation.
   a. Insulation shall be slipped onto the pipe prior to making up fittings. Butt joints shall be sealed with adhesive as recommended by the insulation manufacturer.

4. Outdoor insulation shall be coated with an ultraviolet light protective coating recommended by the insulation manufacturer.

5. Seams shall be sealed with suitable adhesive.

6. After the piping system has been installed, tested, and placed in satisfactory operation, the hanger load nut above the clevis shall be firmly tightened to ensure proper hanger performance.

2.6 PROPANE TANKS, PIPING, AND VALVES

A. Propane tanks (cylindrical bottles),

1. Piping, and valve installations shall be furnished and installed under this Contract, including under floor pipe sleeves and sleeve vent piping, in accordance with NFPA 58.

2. Provide standard tank regulating equipment for the bottles.

3. Propane tanks shall be secured in such a manner that they do not move or topple over.

4. The project will require that the contractor provide the agreed to amount of fuel tanks filled with propane fuel at time of completion.

5. The Contractor shall furnish and install propane gas piping shown on design drawings.

6. Make final connections to the tanks.
   a. Surface mounted piping shall not be susceptible to damage or cause any safety hazards.
   b. Piping passing through exterior walls shall be provided with pipe sleeves.
   c. Propane tanks (bottles) shall be of number and capacity shown, steel construction, with automatic MIG/submerged arc welded gas containment welds.
   d. 100% leak tested before/after mechanical valve installation.
   e. Large collars, heavy duty foot rings, and powder coated finish, free-of-scale interiors.
   f. Manufactured to Department of Transportation specifications.
2.7 MISCELLANEOUS MATERIALS

A. Bituminous Coating:

1. Bituminous coating shall be a solvent cutback, heavy bodied material to produce not less than a 0.3 millimeter dry film thickness in one coat, and shall be recommended by the manufacturer as compatible with factory applied coating and rubber joints.

2. For previously coal-tar coated and uncoated ferrous surfaces underground, bituminous coating shall be solvent cutback coal-tar type, conforming to AWWA C203.

B. Bolting:

1. Flange and general purpose bolting shall be hex-head and shall conform to ASTM F 568M, Class 4.8 or above bolts, for flanged joints in piping systems where one or both flanges are cast iron. Heavy hex-nuts shall conform to ASTM A 563M.

2. Square head bolts and nuts shall not be acceptable.

3. Threads shall be coarse thread series.

C. Elastomeric Calk:

1. Polysulfide- Polyurethane-base elastomer calking material shall be two-component type, conforming to ASTM C 920.

D. Pipe Thread Compounds:

1. Tetrafluoroethylene tape 50 millimeter thick shall be used in potable and process water and in chemical systems for pipe sizes to and including DN25 ips.

2. Tetrafluoroethylene dispersions and other suitable compounds may be used for other applications upon approval by the Contracting Officer.

3. Lead-containing compounds shall not be used in potable water systems.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer’s recommended installation procedures as approved by Contracting Officer, anchoring all components firmly into position for long life under hard use.

3.2 UNDERGROUND PIPING INSTALLATION

A. Prior to being lowered into a trench, piping shall be cleaned, visually and audibly inspected for apparent defects.

B. Suspect cast-ferrous piping shall be further inspected by painting with kerosene on external surfaces to reveal cracks.

C. Defective materials found shall be distinctly marked using road traffic quality yellow paint.
D. Defective material shall be promptly removed from the site.

E. After conduit has been inspected, and not less than 48 hours prior to being lowered into a trench, external surfaces of cast ferrous conduit shall be coated with a compatible bituminous coating for protection against brackish ground water. Application shall be single coat, in accordance with the manufacturer's instructions, to result in a dry-film thickness of not less than 0.3 millimeter.

F. Excavations shall be dry and clear of extraneous materials when pipe is being laid.

G. Laying of pipe shall begin at the low point of a system. When in final acceptance position, it shall be true to the grades and alignment, with unbroken continuity of invert. Blocking and wedging shall not be permitted.

H. Bell or grooved ends of piping shall point upstream, unless otherwise approved by Contracting Officer.

I. Changes in direction shall be made with long sweep fittings unless otherwise approved by Contracting Officer.

J. Necessary socket clamping, piers, bases, anchors, and thrust blocking shall be provided.

K. Rods, clamps, and bolting shall be protected with a coating of bitumen.

L. Underground piping below supported or suspended slabs shall be supported from the slab with a minimum of two supports per length of pipe. Supports shall be protected with a coating of bitumen.

M. On excavations that occur near and below building footings, the backfilling material shall consist of 14 Megapascal cured compressive strength concrete poured or pressure grouted up to the level of the footing.

N. Vertical downspouts and similar work shall be properly supported on approved piers at the base and provided with approved structural supports attached to building construction.

O. When PVC pipe is installed in a trench, single conductor No. 14 AWG wire with Type TW insulation shall be installed above the pipe, not less than 300 millimeter below grade, to facilitate pipe location.

### 3.3 TESTS

A. Test reports shall be submitted in accordance with referenced standards in this section.

B. Plumbing systems shall be tested to prove tightness of piping and connections and proper operation of equipment and fixtures.

C. Hydrostatic tests shall be performed by completely filling the piping system with water and eliminating accumulation of air so that any leakage will be immediately apparent.

D. Pressure shall be maintained until pipe under test has been examined, but in no case for less than 1 hour.

E. Hot and cold water piping shall be hydrostatically tested at 1.5 times the design pressure under 862 kilopascal pressure for not less than 8 hours with no loss of pressure.

F. Leaks shall be eliminated by replacing the pipe or fitting in question.

G. Underground hot and cold water piping shall be tested before backfilling.

H. Drainage and venting piping shall be tested before fixtures are installed.
I. Underground soil and waste piping shall be tested before backfilling.

J. Testing shall be applied to the system in its entirety in sections.

K. When the entire system is tested, openings in the pipes shall be tightly closed except the highest opening, and the system shall be filled with water to the point of overflow.

L. When the system is tested in sections, each opening except the highest opening of the section under test shall be tightly plugged, and each section shall be filled with water and tested with at least a 30 kilopascal of water.

1. In testing successive sections, at least the upper 3050 millimeter of the next preceding section shall be tested so that each joint or pipe except the uppermost 3000 millimeter of the system has been submitted to a test of at least a 30 kilopascal of water.

2. Water shall be kept in the system or in the portion under test for at least 2 hours before the inspection starts.

3. System shall be proved tight at all joints.

3.4 DISINFECTION

A. Water piping, including valves, fittings, and other devices, shall be disinfected with a solution of chlorine and water, and tested according to AWWA C651 KHB 1870.1.

1. Solution shall contain not less than 50 parts per million (ppm) of available chlorine.

2. Solution shall be held for a period of not less than 8 hours, after which time the solution shall contain not less than 10 ppm of available chlorine or the piping shall be disinfected again.

3. After successful disinfection, the piping shall be flushed before placing into service.

B. Water for disinfection will be furnished and disposed of by the Contractor.

3.5 INSULATION

A. After tests have been completed and surfaces cleaned, insulation shall be installed on hot water piping except for chrome-plated brass pipe and other hot water exposed supplies to fixtures.

B. Thickness shall be not less than 19 millimeter for piping DN25 or less and 25 millimeter for piping larger than DN25.

C. Valves and fittings shall be insulated with segments of insulation of the same material and thickness as the adjoining pipe insulation.

3.6 ADJUSTING

A. Automatic control devices shall be adjusted for proper operation.

---End of Section---
NOTE: This guide specification covers the requirements for heating, ventilating, and cooling (HVAC) systems including equipment, ducts, and piping which is located within, on, under, and adjacent to buildings.

PART 1 - GENERAL

1.1 REFERENCES

Various

1.2 SYSTEM DESCRIPTION

Provide new cooling systems complete and ready for operation. HVAC systems include equipment, ducts, and piping which is located within, on, under, and adjacent to buildings.

1.3 SUBMITTALS

Product Data

Product data for integral or appurtenant space temperature controls (STC) supplied with the each equipment shall include point-to-point electrical wiring diagrams for each STC.

Test Report

Field acceptance test plan; field acceptance test report; including plan for related air handling unit.

Certificates

Employer's record documents
Welding procedures and qualifications

Manufacturer's Instructions

Submit manufacturer's instruction for each type of air conditioning system.

Operation and Maintenance Data

Submit for each type and according to the drawings..

1.4 QUALITY ASSURANCE

1.4.1 Welding Requirements

Provide welding work specified this section for piping systems in conformance with ASME B31.9, as modified and supplemented by this specification section and the accompanying drawings. The welding work includes: qualification of welding procedures, welders, welding operators, brazers, brazing operators, and nondestructive examination personnel; maintenance of welding records, and examination methods for welds.

PART 2 - PRODUCTS

Provide HVAC system including equipment, materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with ASME B31.5, ASME B31.9,[and NFPA 70,] as modified and supplemented by the contract specifications and drawings.
2.1 EQUIPMENT

2.1.1 Packaged Air-Conditioners

A 20 ton rated air conditioner located on the facility should be mounted on its own structural steel skid which in turn is supported by spring isolators from structural roof framing. Designers should determine from equipment manufacturers the most practicable method of mounting the equipment on the roof and indicate the configuration on the design drawings.

Provide single package unit factory assembled, designed, tested, and rated in accordance with ARI 210/240 or ARI 340/360 for cooling. Unit shall be ARI certified or rated in ARI DCUP for cooling. Provide guards to protect condenser fins. Unit shall be listed in UL Elec Equip Dir or ETL DLP.

- Filter section: Provide UL listed, [25] [51] mm [1] [2] inch thick 30 percent efficient throwaway fiberglass filters, standard dust-holding capacity, 1.8 m/s 350 fpm maximum face velocity.
- Safety controls: Provide low refrigerant pressure protection and pressure relief device. Provide compressor motor with thermal and overload protection, 5 minute anti-recycle timer, and start capacitor kit. Provide compressor with electrical crankcase heater and internal high pressure protection. The above safety controls are not required when scroll compressors are provided.
- Heating section: Provide ARI 410 hot water coils or non-freeze double tube steam coils as indicated. Provide UL or ETL listed electric resistance heaters including internal fusing integral with heaters; fan shall run until heater cools.
- Space temperature controls: Provide digital electronic controls including adjustable programmable thermostats system switch with AUTO-ON fan switch. Thermostats shall be provided by unit manufacturer. Provide relays, transformers, contactors, and control wiring between thermostats and unit.
- Weatherproof casing: Provide removable gasketed panels designed to exclude driving rain for access to fans, coils, filters, compressors, motors, and controls. Provide weatherproof outside air intake louvers or weatherproof hoods with moisture eliminators.
- Roof curbs: Provide factory-fabricated galvanized steel roof curbs, wood nailers, insulation, and seal strips in accordance with NRCA RWM curb detail for rooftop air-handling units. Roof curbs shall be furnished by unit manufacturer.

2.1.2 Split-System Air-Conditioners

Provide units factory assembled, designed, tested, and rated in accordance with ARI 210/240 or ARI 340/360 for cooling. Provide separate assemblies designed to be used together. Base ratings on the use of matched assemblies. Units shall have a minimum SEER as specified on the drawings when tested in accordance with ARI 210/240 or ARI 340/360 as applicable.

Units shall be ARI certified or rated in ARI DCUP for cooling. Outside unit shall include compressor and condenser. Provide guards to protect condenser fins. Units shall be listed in UL Elec Equip Dir or ETL DLP.

- Filter section: Provide UL listed, [25] [51] mm [1] [2] inch thick 30 percent efficient throwaway fiberglass filters, standard dust-holding capacity, 1.8 m/s 350 fpm fiberglass filters, maximum face velocity. 70 percent efficient bag final filters, 1.8 m/s 350 fpm maximum face velocity. Provide gasketed hinged access panel with quick opening half-twist latches at end of filter rack.
- Safety controls: Provide low refrigerant pressure protection and pressure relief device. Provide compressor motor with thermal and overload protection, 5 minute anti-recycle timer, and start capacitor kit. Provide compressor with electrical crankcase heater and internal high pressure protection. The above safety controls are not required when scroll compressors are provided.
- Space temperature controls: Provide digital electronic controls including adjustable programmable thermostats system switch with AUTO-ON fan switch. Thermostats shall be provided by unit manufacturer. Provide relays, transformers, contactors, and control wiring between thermostats and unit.
2.2 ELECTRICAL

2.1.1 Electrical Motors, Controllers, Contactors, and Disconnects

NOTE: If fan powered variable air volume (VAV) terminals are provided in the HVAC systems, the associated central air handler will probably have a variable frequency drive covered by the requirements in brackets at the end of this paragraph.

Furnish with respective pieces of equipment. Motors, controllers, contactors, and disconnects shall conform to "Interior Distribution System." Provide electrical connections "Interior Distribution System." Provide controllers and contactors with maximum of 120-volt control circuits, and auxiliary contacts for use with controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of providing additional electrical service and related work shall be included under this section.

2.3 METAL DUCT SYSTEMS

Provide shop-fabricated ductwork. Fabricate, construct, brace, reinforce, install, support, and seal ducts and accessories in accordance with SMACNA HVAC Duct Const Stds. Provide rectangular ductwork for low pressure applications; round and flat oval ductwork for medium and high pressure applications as indicated. Cover duct transverse joints with single component synthetic rubber type compound suitable for use with passivated coating on zinc-coated steel. Lap joints in direction of flow. Provide ducts straight and smooth on inside with neatly finished airtight joints. Provide air supply and return openings in ducts with air diffusers, registers, or grilles.

2.3.1 Ducts of Pressure Classes 746 to 2490 Pa (Gage) 3 to 10 Inch WG

Construct ducts of [zinc-coated steel conforming to ASTM A 653/A 653M coating designation G90] [stainless steel].

2.3.1.1 Construction

Duct construction, metal gages, and hangers and support reinforcements shall conform with the SMACNA HVAC Duct Const Stds. Ducts shall not pulsate or vibrate when in operation. Pressure sensitive tape shall not be used as a primary sealant on ductwork. Duct air leakage shall be less than that allowed by SMACNA Leakage Test Mnl for the duct pressure class, duct seal class, and duct leakage class indicated. Curved elbows shall have a centerline radius not less than 1 1/2 times the width of ducts.

2.3.1.2 Joints

Construct joints to meet the requirements of the leakage test specified herein. Duct components shall fit so that joints are not mismatched. Do not use duct sealant and tape to compensate for mismatched connections.

Longitudinal locks or seams known as "button-punch snap-lock" will not be permitted. Apply fire-resistant sealing compound to exposed male part of fittings collars so that sealer will be on inside of joint and fully protected by the metal of the duct and fittings. Apply one brush coat of sealing compound over outside of joint to at least 51 mm 2 inch band width covering screw heads and joint gap. When tape is used, apply a single wrap of a duct tape over the wet sealer. Tape provided shall be recommended by the sealer manufacturer to permit proper curing of the sealer. Dents in the male portion of the slip fitting collar will not be acceptable.

2.3.1.3 Fittings

Square elbows, round elbows, fittings, branch take-offs, transitions, splitters, duct volume dampers, fire dampers, flexible connections, and access doors shall conform with the SMACNA HVAC Duct Const Stds, Section 2.

a. Test holes: Provide factory fabricated, airtight, and noncorrosive test holes with screw cap and gasket. Provide extended neck fittings to clear insulation.
b. Round elbows: Provide 45 degree and 90 degree round elbows of two piece die stamped construction for ducts 203 mm 8 inches or less in diameter. For ducts over 203 mm 8 inches in diameter, provide 5 mitered piece for 90 degrees and 3 mitered piece for 45 degrees.

2.3.1.4 Round and Oval Ducts

SMACNA HVAC Duct Const Stds, Section 3.

2.3.1.5 Rectangular Ducts

Make joints between sections of duct and between ducts and fittings with either gasketed flanged connection, welded flange joints, or other joints recommended in SMACNA HVAC Duct Const Stds, Section 1, and reinforce at the joints and between the joints as recommended.

2.3.1.6 Sound Attenuators

 Provide factory fabricated attenuators that will reduce the rated sound pressure level of the fan down to at least 65 decibels in the 250 Hz (third octave band) center frequency by using a reference sound source calibrated in decibels of sound power at 10 to 12 watts. Maximum permissible pressure drop shall not exceed 157 Pa 0.63 inch of water. Attenuators to be constructed airtight when operating under an internal pressure of 2490 Pa 10 inches of water. The air-side surface shall be capable of withstanding air velocity of 51 m/s 10,000 feet per minute. When attenuators are submitted for approval, provide manufacturer's product data verifying the net sound reduction values. Sound absorbing material shall conform with ASTM C 1071, Type I or II. Provide suitable duct-transition sections for connections to ductwork.

a. Net sound reduction values: Conform with the following: Minimum Net Sound Reduction Values

- Sound Pressure Level dB
- (Reference Sound Power at 10-12 Watts)
- Octave Pass Band 2 3 4 5 6 7
- Center Frequency (Hz) 125 250 500 1000 2000 4000
- Noises Reduction (db) 11 16 19 30 40 32

b. Factory-fabricated sound attenuators (traps): Provide sound attenuators constructed of galvanized sheet steel casing and sound absorbing material covered with an internal perforated zinc-coated metal liner. Sound absorbing materials shall be faced with glass fiber cloth and hold in compression to prevent settling. The internal perforated metal liner shall be not less than 0.7 mm 24 gage, with perforations met larger than 3.97 mm 5/32 inch in diameter providing a net open area not less than 22 percent of the surface. Attenuators shall be insulated to prevent sweating.

c. Factory-fabricated sound-attenuator ducts: Sound-attenuator ducts may be provided in lieu of sound attenuators (traps). Comply with requirements specified herein for sound attenuators. Construct each double-walled duct and fitting of an outer zinc-coated metal pressure shell with 25 mm one inch thick acoustical blanket insulation and an internal perforated zinc-coated metal liner.

d. Install sufficient length of run to obtain the noise reduction value specified. Provide product data from manufacturer verifying that the sound reduction value specified will be obtained within the length of duct run provided. Noise reduction data shall include effects of flanking paths and vibration transmission.

e. The internal perforated zinc-coated metal liner shall be not less than 0.7 mm 24 gage, unless ribbed, not less than 0.47 mm 28 gage for the duct liner and not less than 0.55 mm 26 gage for the fitting liner with perforations not larger than 2.38 mm 3/32 inch diameter. Seal joints as specified in paragraph entitled "Round and Oval Ducts." Rigid molded fiber-glass inserts with the air side surface PVC-coated, when complying with requirements specified herein, may be used in lieu of internal preformed zinc-coated metal liner.

2.3.2.1 Curved Elbows

Make a centerline radius not less than 1 1/2 times the width or diameter of the duct.
2.3.2.2 Laps

Make laps at joints in the direction of airflow. Space button-punch or bolt-connection in standing seams at fixed centers not greater than 152 mm (6 inches). Longitudinal locks or seams, known as "button-punch snap lock," may be in lieu of Pittsburgh Lock.

2.3.2.3 Fittings

Elbows, vaned elbows, take-offs, branch connections, transitions, splitters, volume dampers, fire dampers, flexible connections, and access doors shall conform with SMACNA HVAC Duct Const Stds, Section 2. Provide factory fabricated, airtight, and non-corrosive test holes with screw cap and gasket.

2.3.2.4 Acoustical Duct Lining

Provide where indicated. Provide ASTM C 1071 fiberglass duct lining, minimum of 25 mm (one inch) thick, with black-pigmented fire-resistant coating on side exposed to airstream. Secure to duct interior with 100 percent coverage of adhesive and with mechanical fastening devices, spaced in accordance with SMACNA HVAC Duct Const Stds. Provide metal nosing at duct lining beginnings and endings.

2.3.2.5 Preformed Duct Liner

Provide preformed round duct liner minimum of 25 mm (one inch) thick, with black-pigmented fire-resistant, anti-microbial agent designed for insertion in round ducts may be used in the sizes commercially available. Provide duct liner sections with slip-lap joints not less than 50 mm (2 inches) wide. Make joints in accordance with manufacturer's printed instructions.

Furnish fire-resistant adhesive to field-coated joints when recommended by the manufacturer to prevent delamination or erosion at joints. Tabular sections of duct liner shall fit the metal duct snugly and without gaps between duct-liner sections.

2.3.2.6 Factory-Fabricated Sound-Attenuator Ducts

Provide double-walled duct and fitting of an outer zinc-coated metal pressure shell with 25 mm (one inch) thick acoustical blanket insulation and an internal perforated zinc-coated metal liner. Install sufficient length of run to obtain the noise reduction value specified. Submit product data from manufacturer verifying that the net sound reduction values specified will be obtained within the length of duct run provided. The internal perforated zinc-coated metal-liner shall be not less than 0.7 mm (24 gage), unless ribbed, then not less than 0.47 mm (28 gage) for the duct liner and not less than 0.55 mm (26 gage) for the fitting liner with perforations not larger than 2.38 mm (3/32 inch) diameter. Seal joints as specified in paragraph entitled "Round and Oval Ducts." [Rigid molded fiberglass inserts with the air-side surface [PVC] [neoprene]-coated, if complying with requirements specified herein, may be used in lieu of internal perforated zinc-coated metal liner.] Each sound attenuator duct system shall comply with the following requirements:

- Minimum Net Sound Reduction Values
- Sound Pressure Level dB
- (Reference Sound Power at 10-12 Watts)
- Octave Pass Band 2 3 4 5 6 7
- Center Frequency (Hz) 125 250 500 1000 2000 4000
- Noises Reduction (db) 11 16 19 30 40 32

2.3.3 Flexible Duct Connectors

Provide a minimum of design pressure rated plus 124 Pa (gage) 0.5 inch W.G. static pressure airtight flexible duct connectors at duct connections to each air-conditioning unit, air-handling unit, exhaust fan, and ventilating fan. Support connectors at each end with metal angle frame bands, securely bolt in place. Provide not less than 0.60 L 20 ounce glass fabric duct connectors coated on both sides with neoprene.
2.3.4 Turning Vanes

Provide fabricated tees and square elbows with double walled turning vanes in accordance with SMACNA HVAC Duct Const Stds for vaned elbows.

2.3.5 Dampers

Provide factory manufactured opposed blade adjustable manual dampers where indicated for duct heights of 305 mm 12 inches and larger. Provide factory manufactured single leaf dampers for duct heights less than 305 mm 12 inches.

Provide damper shafts with 51 mm 2 inch standoffs to clear 51 mm 2 inches of duct insulation with bearings at both ends of the shafts. Provide adjustment quadrant with indicator and locking devices. Provide galvanized steel dampers 0.15 mm thicker one gage heavier than duct in which dampers are installed. Provide automatic dampers Space Temperature Control Systems."

2.3.6 Diffusers, Registers, and Grilles

Provide factory-fabricated metal units with edges rolled or rounded where exposed to view, and factory primed with white enamel finish. Do not provide dampers in or on diffusers, registers and grilles. Provide each unit with rubber or plastic installation gaskets. Diffusers in same room shall have same face design.

a. Diffusers: Provide round, square, or rectangular diffusers as indicated. Ceiling diffusers shall be designed to deliver air in a horizontal direction. Provide baffles or other devices as required for proper air distribution pattern.

b. Registers: Provide double deflection supply registers arranged to control air direction, throw, and drop. Exhaust and return air registers shall have single set of non-directional face bars or vanes having the same appearance as supply registers. Provide face bars or vanes spaced not more than 19.05 mm 0.75 inch on center and not less than 15.75 mm 0.62 inch depth.

c. Grilles: Provide as specified for registers without air-volume-control dampers.

2.3.7 Outside Air Intake Louvers

Louvers shall bear AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511. Maximum pressure drop shall be 24.9 Pa (gage) 0.1 inch W.G.. Louvers shall have maximum water penetration of 0.0637 liters per square meter 0.20 ounce per square foot of free area at free velocity of 4.1 m/s 800 fpm. Provide aluminum alloy with anodized finish frames and blades assembled with stainless steel screws, including 12.7 mm 0.5 inch mesh aluminum screen mounted in extruded aluminum frame.

2.3.8 Access Doors

Provide for access to volume dampers, fire dampers, plenum chambers, and where indicated. Provide each door with double wall zinc-coated steel construction, gasketed airtight, with continuous hinges and cam latches. Insulate access doors with 25 mm one inch thick rigid insulation. Provide 305 by 305 mm 12 by 12 inch door, except where larger sizes are indicated, or provide 305 mm 12 inches by height of duct when duct is less than 305 mm 12 inches high. Provide keyed-alike 90 degree turn cam locks on each access door in sleeping rooms; furnish three keys.

2.3.9 Fire Dampers

UL 555 and NFPA 90A. Dampers shall be listed in UL Bld Mat Dir. Dampers when open shall not protrude into the ducts.

2.3.10 Flexible Round Ducts

UL 181 and NFPA 90A with factory-applied insulation, vapor barrier, and end connections. Fire hazard rating of duct assembly shall not exceed 25 for flame spread and 50 for smoke developed. Provide ducts designed for working pressures of 497 kPa (gage) 2 inches W.G. positive and 373 kPa (gage) 1.5 inches W.G. negative. Flexible round duct length shall not exceed 1525 mm5 feet. Secure connections by applying adhesive for 51 mm 2 inches over rigid duct, apply flexible duct 51 mm 2
inches over rigid duct, apply metal clamp, and provide minimum of three No. 8 sheet metal screws through clamp and rigid duct.

a. Inner duct core: Flexible core shall be interlocking spiral or helically corrugated and constructed of zinc-coated steel, aluminum, or stainless steel; or shall be constructed of inner liner of continuous galvanized spring steel wire helix fused to continuous, fire-retardant, flexible vapor barrier film, inner duct core.

b. Insulation: Inner duct core shall be insulated with mineral fiber blanket type flexible insulation, minimum of 25 mm one inch thick. Insulation shall be covered on exterior with manufacturer's standard fire retardant vapor barrier jacket for flexible round duct.

2.3.11 Linear Diffusers

Joints between diffuser sections shall appear as hairline cracks. Provide alignment slots for insertion of key strips or other concealed means to align exposed butt edges of diffusers. [Equip with plaster frames when mounted in plaster ceiling.] Do not use screws and bolts in exposed face of frames or flanges. Frames and flanges exposed below ceiling shall be metal-filled and ground smooth. Furnish separate pivoted or hinged adjustable air-volume-damper and separate air-deflection blades.

2.3.12 Field-Installed TAB Test Ports

Test ports required for testing by the TAB engineer shall be located in the field by the TAB engineer during TAB field work. It shall be the responsibility of the ductwork contractor to provide and install test ports as required by the TAB engineer.

2.3.13 Kitchen Exhaust Ductwork

SMACNA HVAC Duct Const Stds does not cover negative pressures in excess of 3 inches water gauge. If the static pressure within the duct will exceed 3 inches negative, then the spacing and duct thickness must be indicated on the shop drawings and the paragraph accordingly.

Ducts conveying smoke and grease laden vapors shall conform to requirements of NFPA 96 as modified and supplemented by this specification. Seams, joints, penetrations, and duct-to-hood collar connections shall have a liquid tight continuous external weld. Duct material shall be minimum 1.3 mm (18 gauge),18 gauge, Type 304L or 316L, stainless steel. Duct construction shall include external perimeter angle sized in accordance with SMACNA HVAC Duct Const Stds; pitched to drain at low points; welded pipe coupling-plug drains at low points; welded fire protection and detergent cleaning penetration; steel framed, stud bolted, and flexible ceramic cloth gasketed cleaning access provisions where indicated. Angles, pipe couplings, frames, and bolts shall be same material as that specified for the duct.

PART 3 - EXECUTIONS

3.1 INSTALLATION

3.1.1 HVAC EQUIPMENT

Installation of HVAC equipment including materials, installation, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with , ASME B31.5, ASME B31.9,NFPA 70, and in compliance with the manufacturer's written installation instructions, including the following:

(1) Packaged air-conditioners - installation instructions
(2) Split-system air-conditioners - installation instructions
(3) Fire dampers - installation instructions

3.2 AIR DUCTS

Obtain approval before applying insulation.
3.3 ADJUSTMENTS

Adjust controls and equipment so as to give satisfactory operation. Adjust entire water temperature control system and place in operation so that water quantities circulated are as indicated. Air duct systems shall be adjusted and balanced so that air quantities at outlets are as indicated and so that distribution from supply outlets is free from drafts and has uniform velocity over the face of each outlet.

3.4 INSTRUCTING OPERATING PERSONNEL

Upon completion of work and at time designated, provide services of competent technician for period of not less than 8-hour working day for instruction of Government operating personnel in proper operation and maintenance of equipment.

3.5 FIELD QUALITY CONTROL

Upon completion and before final acceptance of work, test each system in service to demonstrate compliance with the contract requirements. Adjust controls and balance systems prior to final acceptance of completed systems. Test controls through every cycle of operation. Test safety controls to demonstrate performance of required function. Correct defects in work provided by Contractor and repeat tests. Furnish steam, fuel, water, electricity, instruments, connecting devices, and personnel for tests. Flush and clean piping before placing in operation. Clean equipment, piping, strainers, ducts, and filters.

3.6 Equipment

3.6.1 Field Acceptance Test Plans

a. Manufacturer's Test Plans: Within 120 calendar days after contract award, submit the following plans:
   (1) Packaged air-conditioners - field acceptance test plan
   (2) Split-system air-conditioners - field acceptance test plan

Field acceptance test plans shall developed by the equipment manufacturer detailing recommended field test procedures for that particular type and size of equipment. field acceptance test plans developed by the installing Contractor, or the equipment sales agency furnishing the equipment, will not be acceptable.

The Contracting Officer will review and approve the field acceptance test plan for each of the listed equipment prior to commencement of field testing of the equipment. The approved field acceptance test plans shall be the plan and procedures followed for the field acceptance tests of the equipment and test reporting.

--- End of Section ---
SECTION 26 10 00
ELECTRICAL DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide interior electrical distribution systems where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work specified elsewhere:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:
   1. The Manufacturer is responsible for researching and complying with all applicable codes.
   2. All products submitted for review under this section shall meet or exceed the requirements of the project scope of work as well as accepted local Afghanistan standards for products and installations of the type covered by this section.

1.3 SUBMITTALS

A. Within thirty (30) calendar days after the effective date of Contracting Officer’ “Notice to Proceed” submit the following:

   1. Shop Drawings: G,
      a. Include sufficient detail to show fabrication, installation, anchorage, and interface of Panel boards, and Wire ways.

   2. Product Data: G,
      b. Manufacturer’s recommended installation procedures. Once approved by Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.

   3. Samples: G,
      a. Submit samples of major items.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”
PART 2 - PRODUCTS

2.1 GENERAL

A. All products specified within this Section are subject to local availability in markets accessible to Afghanistan.

B. In the absence of local Afghanistan product standards or laboratory certifications against which to review sample products, the Contractor and the manufacturer shall provide a letter certifying that the submitted product and installation will conform to the requirements of the project scope of work and will meet or exceed accepted local standards for products and installations of the type covered by this Section.

C. Furnish all materials, tools, equipment, services and incidental necessary to complete the work of this Section as described in the Contract Documents and required by the scope of work whether or not these are specifically described herein.

2.2 CONDUIT and FITTINGS

A. Electrical Metallic Tubing

   1. EMT is generally made of steel with protective coating and shall be supplied with factory elbows and associated fittings.

B. Rigid Nonmetallic Conduit

   1. Conforming to:
      a. PVC Type EPC-40 in accordance with NEMA TC 2, UL 651.

C. Fittings for Rigid Nonmetallic Conduit

   1. Conforming to:
      a. NEMA TC 3 for PVC, and UL 514B.

2.3 OUTLET BOXES AND COVERS

A. Conforming to:

   1. UL 514A, for cadmium or zinc-coated, if ferrous metal.

B. Conforming to:

   1. UL 514C, if nonmetallic.

C. Outlet Boxes for Telecommunications System

   1. Provide standard type 120 mm square by 54 mm deep (4 11/16 inches square by 2 1/8 inches).

   2. Outlet boxes for wall-mounted telecommunications outlets shall be 100 by 54 by 54 mm (4 by 2 1/8 by 2 1/8 inches).

   3. Depth of boxes shall be large enough to allow manufacturers' recommended conductor bend radii.

   4. Outlet boxes for fiber optic telecommunication outlets, if any, shall include a minimum 10 mm (3/8 inch) deep single or two gang plaster ring as shown and installed using a minimum 27 mm (1 inch) conduit system.
2.4 CABINETS, JUNCTION BOXES

A. For volume greater than 1640 mL, conform to:
   1. UL 514C, if nonmetallic.

2.5 WIRES and CABLES

A. Wires and cables shall meet applicable requirements of FPA 70 and UL, for type of insulation, jacket, and conductor specified or indicated.

B. Wires and cables manufactured more than 24 months prior to date of delivery to site shall not be used.

C. Normally wires with PVC insulation and PVC jackets shall be used, responding to requirements of VDE 0276 part 603 (equivalent to IEC 60502), with flammability test performed according to IEC 332.1.

D. Conductors:
   1. Conductors No. 12 AWG (4 sq mm) and larger diameter shall be stranded, unless specifically indicated otherwise.
   2. Conductor sizes and ampacities shown are based on copper, unless indicated otherwise.
   3. Minimum Conductor Sizes
      a. Minimum size for:
         (1.) Branch circuits shall be: No. 12 AWG (4 sq mm);
   4. Color Coding:
      a. Provide color coding accordance to DABM policy.
   5. Insulation:
      a. Unless specified or indicated otherwise or required by NFPA 70:
         (1.) Power and lighting wires shall be 600-volt, RHW conforming to UL 44, except that grounding wire may be type TW conforming to UL 83; or the type available in local market.
   6. Bonding Conductors:
      a. ASTM B 8, Class B, stranded bare copper wire for sizes No. 12 AWG (4 sq mm) and larger diameter.
      b. Bonding Conductor for Telecommunications:
         (1.) Provide a copper conductor Bonding Conductor for Telecommunications between the telecommunications main grounding busbar (TMGB) and the electrical service ground in accordance with TIA J-STD-607-A.
         (2.) The bonding conductor for telecommunications shall be sized the same as the TBB.

2.6 SPLICES AND TERMINATION COMPONENTS

A. UL 486A-486B for wire connectors and UL 510 for insulating tapes.
B. Connectors for No. 10 AWG (6 sq mm) and smaller diameter wires shall be insulated, pressure-type in accordance with UL 486A-486B or UL 486C (twist-on splicing connector).

C. Provide solderless terminal lugs on stranded conductors.

2.7 DEVICE PLATES

A. Provide UL listed, one-piece device plates for outlets to suit the devices installed.

B. For nonmetallic boxes and fittings, other suitable plates may be provided.

2.8 SWITCHES

A. Switches for lighting fixtures:
   1. Flash mounted single light switches shall be 16A/230V.
   2. Two way switch shall be 16A/230V.
   3. Dimmer switch for fans shall be 220V.

2.9 RECEPTACLES

A. Flash Mounted Receptacles shall meet or exceed the following:
   1. Ratings and configurations shall be as indicated.
   2. Bodies shall be of white as per NEMA WD 1.
   3. Face and body shall be thermoplastic supported on a metal mounting strap.
   4. All receptacles shall be German type or other equal type available in Afghanistan market, as described in construction drawings, 16 A, 250 V.

2.10 PANELBOARDS

A. General:
   1. Will be the type manufacturer in local market
   2. Panelboards shall be circuit breaker-equipped, unless indicated otherwise.
   3. Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL.

B. Enclosure:
   1. Enclosures shall meet the requirements of UL 50.
   2. All cabinets shall be fabricated from sheet steel of not less than 1.7 mm with full seam-welded box ends.
   3. Flush doors shall be mounted on hinges that expose only the hinge roll to view when the door is closed.
   4. Each door shall be fitted with a combined catch and lock, except that doors over 600 mm (24 inches) long shall be provided with a three-point latch having a knob with a T-handle, and a cylinder lock.
   5. Two keys shall be provided with each lock, and all locks shall be keyed alike.
6. Finished-head cap screws shall be provided for mounting the panel board fronts on the cabinets.

C. Panel board Buses:
   1. Support bus bars on bases independent of circuit breakers.
   2. Main buses and back pans shall be designed so that breakers may be changed without machining, drilling, or tapping.
   3. Provide isolated neutral bus in each panel for connection of circuit neutral conductors.
   4. Provide separate ground bus identified as equipment grounding bus per UL 67, for connecting grounding conductors; bond to steel cabinet.

D. Circuit Breakers:
   1. UL 489, thermal magnetic-type having a minimum short-circuit current rating equal to the short-circuit current rating of the panel board in which the circuit breaker shall be mounted.
   2. Breaker terminals shall be UL listed as suitable for type of conductor provided.
   3. Multipole Breakers
      a. Provide common trip-type with single operating handle.

2.11 TELECOMMUNICATIONS SYSTEM

A. Provide system of telecommunications wire-supporting structures (pathway), including: outlet boxes, conduits with pull wires, cable trays, and other accessories for telecommunications outlets and pathway in accordance with EIA TIA/EIA-569-A and as specified herein.

2.12 GROUNDING AND BONDING EQUIPMENT

A. Ground Rods:
   1. Conform with UL 467.
   2. Ground rods shall be copper-clad steel, with minimum diameter of 19 mm (3/4 inch) and minimum length of 3050 mm (10 feet).

B. Grounding Electrode Conductor shall be bare / insulated copper cable of sizes indicated in design drawings.

C. Telecommunications Grounding Busbar
   1. Provide corrosion-resistant grounding busbar suitable for indoor installation in accordance with TIA J-STD-607-A.
   2. If not plated, the busbar shall be cleaned prior to fastening the conductors to the busbar, and an anti-oxidant shall be applied to the contact area to control corrosion and reduce contact resistance.
   3. Provide a telecommunications main grounding busbar (TMGB) in the telecommunications entrance facility and a (TGB) in all other telecommunications rooms and equipment rooms.
   4. Provide telecommunications grounding busbars with the following:
      a. Predrilled copper busbar provided with holes for use with standard sized lugs.
b. Minimum dimensions of 6 mm (0.25 inch) thick x 100 mm (4 in) wide for the TMGB and 50 mm (2 in) wide for TGBs with length as indicated;

2.13 MANUFACTURER'S NAMEPLATE

A. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

2.14 WARNING SIGNS

A. Provide warning signs for flash protection in accordance with NFPA 70E and NEMA Z535.4 for switchboards, panelboards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Electrical installations shall conform to requirements of NFPA 70 and IEEE C2 and to requirements specified herein.

B. Underground Service

1. Underground service conductors and associated conduit shall be continuous from service entrance equipment to outdoor power system connection.

C. Wiring Methods

1. Provide insulated conductors installed in non-metallic conduit, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise.

2. Grounding conductor shall be separate from electrical system neutral conductor.

3. Provide insulated green equipment grounding conductor for circuit(s) installed in conduit and raceways.

4. Pull Wire
   a. Install pull wires in empty conduits.
   b. Pull wire shall be plastic having minimum 890-N (200-pound) force tensile strength.
   c. Leave minimum 915 mm (36 inches) of slack at each end of pull wire.

D. Conduit Installation

1. Unless indicated otherwise, conceal conduit under floor slabs and within finished walls, ceilings, and floors.
   a. Conduit Installed in Concrete Floor Slabs
      (1.) PVC, Type EPC-40, unless indicated otherwise. Locate so as not to adversely affect structural strength of slabs. Install conduit within middle one-third of concrete slab.

2. Telecommunications and Signal System Pathway
   a. Install telecommunications pathway in accordance with EIA TIA/EIA-569-A.
      (1.) Horizontal Pathway:
(a.) Telecommunications pathways from the work area to the telecommunications room shall be installed and cabling length requirements in accordance with EIA TIA/EIA-568-B.1.

(b.) Size conduits, wireways, and cable trays in accordance with EIA TIA/EIA-569-A and as indicated.

E. Boxes, Outlets, and Supports

1. General:
   a. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
   b. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.

2. Boxes:
   a. Boxes for use with raceway systems shall be minimum 40 mm (1 1/2 inches) deep, except where shallower boxes required by structural conditions are approved.
   b. Boxes for other than lighting fixture outlets shall be minimum 100 mm (4 inches) square, except that 100 by 50 mm (4 by 2 inch) boxes may be used where only one raceway enters outlet.
   c. Telecommunications outlets shall be a minimum of 100 mm square by 54 mm deep (4 inches square by 2 1/8 inches deep), except for wall mounted telephones.
   d. Mount outlet boxes flush in finished walls.

F. Mounting Heights:

1. Mount panelboards, enclosed circuit breakers, motor controller and disconnecting switches so height of operating handle at its highest position is maximum 1980 mm (78 inches) above floor or as mentioned in design drawings.

2. Mount lighting switches 1200 mm (48 inches) above finished floor.

3. Mount receptacles and telecommunications outlets 450 mm (18 inches) above finished floor, unless otherwise indicated.

4. Wall-mounted telecommunications outlets shall be mounted at height indicated.

G. Nonmetallic Sheathed Cable Installation:

1. Where possible, install cables concealed behind ceiling or wall finish, inside conduit or tubing.

H. Covers and Device Plates:

1. Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices.

I. Grounding and Bonding:

1. Provide In accordance with NFPA 70.

2. Ground exposed, non-current-carrying metallic parts of electrical equipment, access flooring support system, metallic raceway systems, grounding conductor in metallic and
nonmetallic raceways, telecommunications system grounds, and neutral conductor of wiring systems.

3. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service.

4. Grounding means:
   a. Provide the grounding system described and reported on construction drawings.
   b. The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. Or the method accepted by Contractor.
   c. The maximum resistance of ground system shall not exceed 25 ohms under normally dry conditions.
   d. If the resultant resistance exceeds 25 ohms measured not less than 48 hours after rainfall, notify Contractor who will decide on the number of rods to add.

5. Grounding Connections
   a. Make grounding connections which are buried or otherwise normally inaccessible, excepting specifically those connections for which access for periodic testing is required, by exothermic weld or compression connector.
   b. Make exothermic welds strictly in accordance with the weld manufacturer’s written recommendations. Welds which are "puffed up" or which show convex surfaces indicating improper cleaning are not acceptable. Mechanical connectors are not required at exothermic welds.

6. Ground Bus
   a. A copper ground bus shall be provided in the electrical equipment rooms as indicated.
   b. Noncurrent-carrying metal parts of transformer neutrals and other electrical equipment shall be effectively grounded by bonding to the ground bus.

7. Telecommunications System
   a. Provide telecommunications grounding in accordance with the following:
      (1.) Telecommunications Grounding Busbars:
         (a.) Provide a telecommunications main grounding busbar (TMGB) in the telecommunications entrance facility.
         (b.) The TMGB shall be as close to the electrical service entrance grounding connection as practicable.
         (c.) Provide a telecommunications grounding busbar (TGB) in all other telecommunications rooms and telecommunications equipment rooms.
         (d.) The TGB shall be as close to the telecommunications room panelboard as practicable, when equipped.
         (e.) Where a panelboard for telecommunications equipment is not installed in the telecommunications room, the TGB shall be located near the backbone cabling and associated terminations.
         (f.) In addition, the TGB shall be placed to provide for the shortest and straightest routing of the grounding conductors.
(g.) Where a panelboard for telecommunications equipment is located within the same room or space as a TGB, that panelboard’s alternating current equipment ground (ACEG) bus (when equipped) or the panelboard enclosure shall be bonded to the TGB.

(h.) Telecommunications grounding busbars shall be installed to maintain clearances as required by NFPA 70 and shall be insulated from its support.

(i.) A minimum of 50 mm (2 inches) separation from the wall is recommended to allow access to the rear of the busbar and the mounting height shall be adjusted to accommodate overhead or underfloor cable routing.

(2.) Telecommunications Bonding Conductors:

(a.) Provide main telecommunications service equipment ground consisting of separate bonding conductor for telecommunications, between the TMGB and readily accessible grounding connection of the electrical service.

(b.) Grounding and bonding conductors should not be placed in ferrous metallic conduit. If it is necessary to place grounding and bonding conductors in ferrous metallic conduit that exceeds 1 m (3 feet)3 feet in length, the conductors shall be bonded to each end of the conduit using a grounding bushing or a No. 6 AWG (16 sq mm) conductor, minimum.

(c.) Provide a telecommunications bonding backbone (TBB) that originates at the TMGB extends throughout the building using the telecommunications backbone pathways, and connects to the TGBs in all telecommunications rooms and equipment rooms.

(d.) The TBB conductors shall be installed and protected from physical and mechanical damage.

(e.) The TBB conductors should be installed without splices and routed in the shortest possible straight-line path.

(f.) The bonding conductor between a TBB and a TGB shall be continuous.

(g.) Where splices are necessary, the number of splices should be a minimum and they shall be accessible and located in telecommunications spaces.

(h.) Joined segments of a TBB shall be connected using exothermic welding, irreversible compression-type connectors, or equivalent.

(i.) All joints shall be adequately supported and protected from damage.

(j.) Whenever two or more TBBs are used within a multistory building, the TBBs shall be bonded together with a grounding equalizer (GE) at the top floor and at a minimum of every third floor in between.

(k.) The TBB and GE shall not be connected to the pathway ground, except at the TMGB or the TGB.

(3.) Telecommunications Grounding Connections:

(a.) Telecommunications grounding connections to the TMGB or TGB shall utilize listed compression two-hole lugs, exothermic welding, suitable and equivalent one hole non-twisting lugs, or other irreversible compression type connections.
(b.) All metallic pathways, cabinets, and racks for telecommunications cabling and interconnecting hardware located within the same room or space as the TMGB shall be bonded to the TMGB or TGB respectively.

(c.) In a metal frame (structural steel) building, where the steel framework is readily accessible within the room; each TMGB and TGB shall be bonded to the vertical steel metal frame using a minimum No. 6 AWG conductor.

(d.) Where the metal frame is external to the room and readily accessible, the metal frame shall be bonded to the TGB or TMGB with a minimum No. 6 AWG (16 sq mm) conductor.

(e.) When practicable because of shorter distances and, where horizontal steel members are permanently electrically bonded to vertical column members, the TGB may be bonded to these horizontal members in lieu of the vertical column members.

(f.) All connectors used for bonding to the metal frame of a building shall be listed for the intended purpose.

8. Workmanship:

   a. Lay out work in advance.

   b. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work.

   c. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

9. Continuation of Service:

   a. Maintain continuity of existing circuits of equipment to remain.

   b. Existing circuits of equipment shall remain energized.

   c. Circuits which are to remain but were disturbed during demolition shall have circuits wiring and power restored back to original condition.

J. Grounding System Test:

1. Test grounding system to ensure continuity, and that resistance to ground is not excessive.

2. Test each ground "well" for resistance to ground before making connections to system; tie grounding system together and test for resistance to ground.

3. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall.

4. Submit written results of each test to Contracting Officer, and indicate location of well as well as resistance and soil conditions at time measurements were made.

---End of Section---
SECTION 26 50 00
BUILDING LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION
A. Work to be performed under this section consists of providing all labor, material, tools, equipment and related items necessary to furnish, install and place into operation interior lighting fixtures, supports and accessories as well as exterior lighting fixtures and accessories mounted on outside surfaces of buildings.

B. Related work specified elsewhere:
   1. Coordinate the work of this Section with that of other Sections in this Project Manual.

1.2 QUALITY ASSURANCE
A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Codes and standards:
   1. The Manufacturer is responsible for complying with all applicable codes.
   2. All products submitted for review under this section shall meet the requirements of the project scope of work as well as accepted local Afghanistan standards for products and installations of the type covered by this section.

1.3 SUBMITTALS
A. Within thirty (30) calendar days after the effective date of Contracting Officer’s “Notice to Proceed” submit the following:
   1. Product data:
      a. Materials list of items proposed to be provided under this Section;
         (1.) Fluorescent lighting fixtures;
         (2.) High Pressure Sodium lighting fixtures
         (3.) Emergency and exit lighting fixtures
         (4.) Incandescent lighting fixtures
      b. Manufacturer’s specifications and other data needed to prove compliance with specified requirements;
      c. Manufacturer’s recommended installation procedures. Once approved by Contracting Officer, these will become the basis for acceptance or rejection of the actual installation procedures used in the work.
   2. Samples:
      a. Lighting Fixtures shall be factory finished, complete with lamps and magnetic ballasts
         (1.) Submit one sample of each fixture type for inspection, review, and approval.
(2.) The sample shall be retained for comparison against the remainder of the fixtures.

(3.) The sample may be used in the final fixture installation. Provide samples for all the lighting fixture types indicated on the drawings.

PART 2 - PRODUCTS

2.1 GENERAL

A. All products specified within this Section are subject to local availability in markets accessible to Afghanistan.

B. In the absence of local Afghanistan product standards or laboratory certifications against which to review sample products, the Contractor and the manufacturer shall provide a letter certifying that the submitted product and installation will conform to the requirements of the project scope of work and will meet or exceed accepted local standards for products and installations of the type covered by this Section.

C. Furnish all materials, tools, equipment, services and incidentals necessary to complete the work of this Section as described in the Contract Documents and required by the scope of work whether or not these are specifically described herein.

2.2 FLUORESCENT LIGHTING FIXTURES

A. Fluorescent lighting fixtures shall be water proof or ordinary surface mounted as indicated in design drawings and shall have magnetic ballasts unless specifically indicated otherwise.

B. Fluorescent Magnetic Ballasts

1. Ballasts shall be high power factor type (0.9 minimum), unless indicated otherwise and shall be designed to operate on the voltage system to which they are connected.

2. Ballasts shall be Class P and shall have sound rating "A" unless otherwise noted.

3. Fixtures and ballasts shall be designed and constructed to limit the ballast case temperature to 90 °C when installed in an ambient temperature of 40 °C.

C. Fluorescent Lamps:

1. T-8 rapid start lamps shall be rated 36 watts, nominal length of 1200 mm (48 inches), 2800 initial lumens, minimum CRI, color temperature Tc and light color K as described at point 2.1.6.1 of this specification, and an average rated life of 20,000 hours.

2. T-8 rapid start lamp, 18 watt (maximum), nominal length of 610 mm (24 inches), 1150 initial lumens, CRI, color temperature Tc and light color K as described at point 2.1.6.1 of this specification, and an average rated life of 20,000 hours.

2.3 HIGH PRESSURE SODIUM LIGHTING FIXTURES

A. Exterior flood lighting fixtures shall be 220 V, 50 Hz, 400 W photocell controlled.

B. Roadway lighting fixtures shall be 220 V, 50 Hz, 100 W mounted on a pole with photocell control.

C. Interior HPS lighting fixtures shall be 220 V, 50 Hz, 400 W.

2.4 Halogen lights for spot lights

A. Shall be 1000W, 230V.
2.5 EMERGENCY AND EXIT LIGHTS
   A. Emergency and exit lights shall be with self contained nickel-cadmium battery pack to operate on stand-by circuit for 90 minutes and have 1x8 W lights.

2.6 INCANDESCENT LAMPS
   A. Incandescent lighting fixtures shall be 220V, 40, 60 W or as indicated in design drawings.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Electrical installations shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.
   
   B. Lamps:
      1. Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion.
      2. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer.
   
   C. Lighting Fixtures:
      1. Set lighting fixtures plumb, square, and level with ceiling and walls, in alignment with adjacent lighting fixtures, and secure in accordance with manufacturers' directions and approved drawings.
      2. Installation shall meet requirements of NFPA 70.
      3. Mounting heights specified or indicated shall be to the bottom of fixture for ceiling-mounted fixtures and to center of fixture for wall-mounted fixtures.

3.2 FIELD APPLIED PAINTING
   A. Paint electrical equipment as required to match finish of adjacent surfaces or to meet the indicated or specified safety criteria. Painting shall be as specified in Section 09900: “Paints and Coatings”.

3.3 FIELD QUALITY CONTROL
   A. Upon completion of installation, conduct an operating test to show that equipment operates in accordance with requirements of this section.

---End of Section---
SECTION 27 05 13
COMMUNICATION SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Types of data/communication cable systems specified in this section include the following:

1. Fiber-optic cable systems.
2. Voice communication cable system.
3. Data communication cable system.
4. CATV communication cable system.
5. Associated conduit raceway distribution and equipment rack/cabinet system.

B. The Contractor shall furnish, install and test cable and conduit support system, fiber-optic, voice, data and CATV cables, associated connectors, patch panels, equipment racks, grounding system, patch cords, etc., as indicated on the drawings and in these specifications.

C. The Contractor shall include all work shown on the drawings and in the specifications. The drawings and specifications are intended to agree with each other. Any discrepancies shall be brought to the attention of the Engineer for correction. No omission from any drawing shall release the Contractor from furnishing equipment, materials or services required by these documents.

D. The Contractor, the cable manufacturer, the connectivity manufacturer and the distributor shall collaborate and work in partnership with one another so as to provide the Owner with UL verified cabling installation that is guaranteed to perform at levels above and beyond, as per the minimum acceptable full channel performance specification contained herein. The partnership shall make available optional UL independent testing and verification of the completed installation. The partnership shall provide full written certification of the installation to the Owner upon completion.

E. Any deviation, alteration or substitution from the drawings and specifications shall be fully documented by the Contractor and submitted as a voluntary alternate to the base bid. Approval of requests for substitution of products, processes or procedures other than those specified shall be contingent upon submission of fully acceptable documentation to the Engineer.

F. The Contractor shall also be responsible for protecting any and all equipment and materials from damage during his installation process. Any equipment, material and/or facilities damaged by the Contractor during, due to, or in the performance of his contract, shall be replaced or repaired at the expense of the Contractor, as directed by the Engineer.

1.2 QUALITY CONTROL

A. Manufacturer Qualifications: Firms regularly engaged in manufacture of communication cabling system equipment whose products have been in satisfactory use in similar service for not less than five years.

B. Installer Qualifications:
1. Installers shall be fully capable and experienced in communication cabling system specified. This Contractor and all subcontractors engaged in this communication cabling installation shall have experience in this business for not less than five years and shall have successfully completed a minimum of five projects of similar size.
2. The Contractor shall specify, in his bid, all subcontractors who shall be utilized in this project. Subcontractors’ company name, contact and responsibilities shall be listed.

1.4 ALTERNATE MATERIALS AND EQUIPMENT

A. Refer to Contract Documents for description of alternate material and equipment.
B. Refer to Contract Documents for substitution request requirements.

1.5 SHOP DRAWINGS

A. Submit all shop drawings and data in accordance with Division 1. The complete communication shop drawings shall all be bound in one hardcover, 3-ring binder indexed to this Division.

B. Manufacturers’ data and dimension sheets shall be submitted, giving all pertinent physical and engineering data including weights, cross-sections and maintenance instructions. Standard items of equipment such as receptacles, switches, plates, etc., which are cataloged items, shall be listed by manufacturer.

C. Index all submittals and reference to these specifications.

1.6 EQUIPMENT PURCHASES

A. All materials and equipment shall be ordered in ample quantities for delivery at the proper time. If items are not on the project in time to expedite completion, the Owner may purchase said equipment and materials and deduct the cost from the Contract Sum.

B. Provide all materials of similar class or service by one manufacturer.

1.7 WORK AND MATERIALS

A. All electrical materials and equipment shall be new and of the type and quality specified, and shall be listed by UL and bear their label where standards have been established, in compliance with the applicable standards of NEC (NFPA 70), NFPA, ANSI, IEEE, IPCEA and NEMA. Replace or repair any nonconforming, damaged, or defective items at no extra cost to the Owner.

B. Perform all labor in a thorough and workman like manner, to the satisfaction of the Architect. The Contractor shall staff the project with sufficient skilled workmen, including a fully qualified superintendent Project Manager, to complete the work in the time allotted. The Project Manager shall be qualified to supervise all of the work of this Division.

C. Materials provided under the contract for which the UL label is not normally available shall be mounted in separate enclosures and wired to the labeled units in an acceptable manner.

1.8 COOPERATIVE WORK

A. Cooperative work includes:

1. General supervision and responsibility for proper location and size of work related to this Division, but provided under other sections of these specifications.
2. Installation of sleeves, inserts, and anchor bolts for work under each section in this Division.

B. Correct without charge any work requiring alteration due to lack of proper supervision or failure to make proper provision in time. Correct without charge any damage to adjacent work caused by the alteration.

--- End of Section ---
SECTION 28 31 00
FIRE ALARM AND DETECTION SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Providing and installing an intelligent, fully-addressable fire alarm and detection system.

B. Documentation and maintenance of equipment.

C. Testing system.

1.2 DRAWINGS

The locations and spacing of alarm initiating devices indicated on the Drawings are approximate. The equipment supplier shall verify device requirements and spacing, and shall add devices as required to satisfy governing authorities.

1.3. REFERENCES

Industry standards

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in alarm and detection systems with five years’ experience in security alarms.

B. Installer: Company specializing in alarm and detection systems with five years’ documented experience in the installation and maintenance of security alarm systems.

C. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative and the Commissioning Agent. Project closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.

1.5 SUBMITTALS

A. Shop Drawings: Shall consist of the following:
Floor plans indicating the location of all fire alarm equipment and interconnection between devices. Fire alarm zone and device addresses shall be clearly labeled on the drawings. Quantities, types and locations of all devices shown on the drawings shall be verified by the supplier and adjusted accordingly to meet NFPA, ADA and manufacturer's requirements.

B. Manufacturer's Installation Instructions: Indicate installation instructions.

C. Manufacturer's Certificate: Certify that system meets or exceeds specified requirements.

F. Submittals shall also include quantities of equipment, catalog cuts indicating technical data necessary to fully describe the equipment proposed.

1.6 OPERATION AND MAINTENANCE DATA

A. Operation and Maintenance Data.

B. Maintenance Data: Include maintenance and repair procedures, instructions and data from installation.
PART 2 - PRODUCTS

All fire alarm system equipment, support materials, cabling and wiring shall be manufactured in the United States, Turkey or UAE.

Following minimum features are to be included in the system:
- Fire Alarm Control Panel
- Photo-Electric Smoke Detectors
- Heat Detectors
- Magnetic Door Holders
- Emergency Response Repeater System – In Building
- Pull Stations
- Sprinkler Horn/Strobe
- Audio System
- Visual Indicators
- Back Boxes
- Emergency Power Supply
- Addressable Interface Devices

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor shall verify that Coordination Drawings have been approved and signed by all participating contractors.

B. Install the fire alarm system in accordance with approved manufacturer’s wiring diagrams. Furnish all conduit, wiring, outlet boxes, junction boxes, cabinets, and similar devices necessary for a complete installation. Boxes shall be installed in accessible spaces without requiring the removal of light fixtures or any other equipment.

C. Coordinate the installation of equipment and devices that pertain to the work of other trades with the appropriate contractors.

3.2 MANDATORY CONTRACTOR TRAINING

Prior to fire alarm installation, all contractor personnel directly involved with supervision and/or installation of the fire alarm system shall attend a one (1) hour training provided by FM-Fire Safety maintenance personnel.

3.3 LABELING OF EQUIPMENT AND CABLES

A. All cables in the fire alarm control panel, and in all junction boxes and pull boxes, shall be clearly marked with a written description (e.g., SLC #1, 3rd Flr. Spk Sig. #18, 3rd East Strobe Sig. #22, etc.) (Tape type I.E. TZ).

B. All control and monitor modules shall be labeled on the cover, identifying address and function and equipment controlled. (e.g.: L1M16 Supply Fan #1 Shutdown)

C. All components within the fire alarm control panel shall be labeled and a drawing shall be provided showing each component’s purpose.

D. Junction and pull boxes shall be clearly marked by painting the covers "red."

3.4 CLEANING

The fire alarm panel and devices shall be accepted only in the new and clean condition.
3.5 FIRE ALARM AND DETECTION SYSTEM TESTING AND ACCEPTANCE

A. Fire Alarm Contractor Pre-Test:

B. The system must be capable of passing a voice intelligibility test.

C. Contractor’s tests shall be scheduled and documented in accordance with the commissioning requirements.

D. The contractor shall provide sufficient personnel to conduct the fire alarm acceptance test.

E. The manufacturer’s authorized representative shall perform a 100% quality inspection of the final installation and a complete test of all aspects of the system in the presence of the Contractor, Contracting Officer.

F. The system must be completed and accepted by the Contracting Officer or off-site monitoring shall be provided by the Contractor at no additional cost to the Owner upon project Substantial Completion.

--- End of Section ---
PART 1 - GENERAL

1.1 INSPECTION

Notice: Give sufficient notice so that inspection may be made at the following stages:

- Service trenches excavated before laying the service.
- Services laid in trenches and ready for backfilling.

PART 2 - EXECUTION

2.1 EXCAVATING

A. Excavation
Excavate for underground services, to required levels and grades. Generally make the
trenches straight between inspection points and junctions, with vertical sides and uniform
grades.

B. Trench Widths
General: Keep trench widths to the minimum required for laying and bedding of the relevant
service and construction of pits.

C. Trench Depths
If excavation is necessary below the zone of influence of the underside of adjacent footings,
give notice, and provide support for the footings as instructed.

D. Obstructions
Clear trenches of sharp projections. Cut back roots encountered in trenches to at least 600 mm
clear of services. Remove other obstructions including stumps and boulders which may interfere
with services or bedding.

E. Dewatering
Keep trenches free of water. Place bedding material, services and backfilling on firm ground free
of surface water.

F. Excess Excavation
If trench excavation exceeds the correct depth, reinstate to the correct depth and bearing value
using compacted bedding material or sand stabilized with 1 part of cement to 20 parts of sand by
weight.

2.2 BACKFILLING

A. General
Do not install backfill until required inspections and testing are completed.

Backfill service trenches as soon as possible after the service has been laid and bedded, if
possible on the same working day.

B. Backfill Material
Install backfill materials in layers not exceeding 15 centimeters in thickness and compact to 95
percent of the maximum density. Install and compact sand bedding to provide a uniform full
length bearing under piping and conduits.

Where portions of existing structures, walks, paving, or other improvements are removed or cut
for piping or conduit installation, replace the material with equal quality, finished to match
adjoining existing improvements.
General fill with no stones greater than 25 mm occurring within 150 mm of the service, or other materials as required for particular services or locations.

Under roads and paved areas and within 4 m of building: Coarse sand, controlled low strength material or fine crushed rock.

In topsoil areas: Complete the backfilling with topsoil for at least the top 100 mm. Use appropriate marking tape to identify services.

2.3 REINSTATEMENT OF SURFACES

General
Reinstate existing surfaces removed or disturbed by trench excavations to match existing and adjacent work.
PART 1 - GENERAL

1.1 SUMMARY

A. Excavate, backfill, compact, and grade the site to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.

B. Related work:

1. Coordinate the work of this Section with that of other Sections in this Project Manual.

2. Testing Laboratory Services

3. Subsurface Investigation

4. Section 03300: Cast-In-Place Concrete

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.

C. When appropriate to the Scope of Work for the Project as determined by CONTRACTOR, coordinate the work of this Section with the recommendations and requirements of Contractor' Soils Engineer Consultant, found in the soils survey or soils analysis report approved by CONTRACTING OFFICER for this Project.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640: “Storage and Protection”.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide soil materials free from organic matter and deleterious substances, containing no rocks or lumps over 153mm (6") in greatest dimension, and with not more than 15% of the rocks or lumps larger than 61mm (2-3/8") in their greatest dimension.

2. Fill material is subject to the approval of CONTRACTING OFFICER’ Soil Engineer Consultant working with the Contractor approved Soil Testing Laboratory, and is that material removed from excavations or imported from off-site borrow areas, predominantly granular, non-expansive soils free from roots and other deleterious matter.

3. Do not permit rocks having a dimension greater than 75mm (3") in the upper 305mm (12") of fill or embankment.

4. Cohesionless material used for structural backfill:
a. Provide sand free from organic material and other foreign matter, and as approved by CONTRACTING OFFICER’s Soil Engineer Consultant working with the Contractor approved Soil Testing Laboratory.

5. Where granular base is called for under building slabs, provide aggregate complying with requirements of Section 03300: “Cast-In-Place Concrete” of this Project Manual.

2.2 WEED KILLER

A. Provide a dry, free-flowing, dust-free chemical compound, soluble in water, capable of inhibiting growth of vegetation, and approved for use on this Work by CONTRACTING OFFICER.

2.3 TOPSOIL

A. Where and if shown on the Drawings or otherwise required, provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic matter normal to the region, capable of sustaining healthy plant life, and reasonably free from subsoil, roots, heavy or stiff clay, stones larger than 51mm (2”) in greatest dimension, noxious weeds, sticks, brush, litter, and other deleterious matter.

B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, subject to the approval of CONTRACTING OFFICER.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed.

1. Correct conditions within the Scope of Work detrimental to timely and proper completion of the Work.

2. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Comply with appropriate field engineering standards as approved by CONTRACTING OFFICER.

3.3 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contracting Officer prior to excavating. If damaged, repair or replace at no additional cost.

2. If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify Contracting Officer and secure instructions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from Contracting Officer.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.

C. Dewatering:

1. Remove all water, including rain water, encountered during trench and sub-structure work to an approved location by pumps, drains, and other approved methods.

2. Keep excavations and site construction area free from water.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to adjacent areas at all times.

3.4 EXCAVATING

A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades, and elevations indicated and specified herein.

B. Satisfactory excavated materials:

1. Transport to, and place in, fill or embankment areas within the limits of the Work.

C. Unsatisfactory excavated materials:

1. Excavate to a distance below grade as directed by Contracting Officer, and replace with satisfactory materials.

2. Include excavation of unsatisfactory materials, and replacement by satisfactory materials, as parts of the work of this Section.

D. Surplus materials:

1. Dispose of unsatisfactory excavated material, and surplus satisfactory excavated material, away from the site at disposal areas arranged and paid for by the Contractor.

E. Excavation of rock:

1. Where rocks, boulders, granite, or similar material is encountered, and where such material cannot be removed or excavated by conventional earth moving or ripping equipment, take required steps to proceed with the general grading operations of the Work, and remove or excavate such material by means which will neither cause additional cost to Contractor nor endanger buildings or structures whether on or off the site.

2. Do not use explosives without written permission from Contracting Officer.
F. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

G. Borrow:

1. Obtain material required for fill or embankment in excess of that produced within the grading limits of the Work from borrow areas selected and paid for by the Contractor and approved by CONTRACTING OFFICER.

H. Ditches and gutters:

1. Cut accurately to the cross sections, grades, and elevations shown.

2. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the Work.

3. Dispose of excavated materials as shown on the Drawings or directed by Contracting Officer; except do not, in any case, deposit materials less than 1m (3'-0") from the edge of a ditch.

I. Unauthorized excavation:

1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific instruction from Contracting Officer.

2. Under footings, foundations, or retaining walls:
   a. Fill unauthorized excavations by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering the required top elevation.
   b. When acceptable to CONTRACTING OFFICER, lean concrete fill may be used to bring the bottom elevation to proper position.

3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations, unless otherwise directed by Contracting Officer.

J. Stability of excavations:

1. Slope sides of excavations to 1:1 or flatter, unless otherwise directed by Contracting Officer.

2. Shore and brace where sloping is not possible because of space restrictions or stability of the materials being excavated.

3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

K. Shoring and bracing:

1. Provide materials for shoring and bracing as may be necessary for safety of personnel, protection of work, and compliance with the CONTRACTING OFFICER publication EM 385-1-1 “Safety – Safety and Health Requirements”.

2. Maintain shoring and bracing in excavations regardless of the time period excavations will be open.

3. Carry shoring and bracing down as excavation progresses.

L. Excavating for structures:

1. Conform to elevations and dimensions shown within a tolerance of 0.10 ft, and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services, other construction required, and for inspection.
2. In excavating for footings and foundations, take care not to disturb bottom of excavation:
   a. Trim bottoms to required lines and grades to leave solid base to receive concrete.

M. Excavating for pavements:

1. Cut surface under pavements to comply with cross sections, elevations, and grades.

N. Cold weather protection:

1. Protect excavation bottoms against freezing when atmospheric temperature is less than 2 degrees C (35 degrees F).

3.5 FILLING AND BACKFILLING

A. General:

1. For each classification listed below, place acceptable soil material in layers to required subgrade elevations.

2. In excavations:
   a. Use satisfactory excavated or borrow material.

3. Under asphalt pavements:
   a. Use subbase materials.

4. Under building slabs:
   a. Use granular fill, if so called for on the Drawings, complying with aggregate acceptable under Section 03300 “Cast-in-Place Concrete” of this Project Manual.

B. Backfill excavations as promptly as progress of the Work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, damp proofing and waterproofing.

2. Inspecting, testing, approving, and recording locations of underground utilities.

3. Removing concrete formwork.

4. Removing shoring and bracing, and backfilling of voids with satisfactory materials.

5. Removing trash and debris.

6. Placement of horizontal bracing on horizontally supported walls.

C. Ground surface preparation:

1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious matter from ground surface prior to placement of fills.

2. Plow, strip, or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.

3. When existing ground surface has a density less than that specified under "compacting" for the particular area, break up the ground surface, pulverize, moisture condition to the optimum moisture content, andcompact to required depth and percentage of maximum density.
D. Placing and compacting:

1. Place backfill and fill materials in layers not more than 203mm (8") in loose depth.

2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.

3. Compact each layer to required percentage of maximum density for area.

4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.

5. Place backfill and fill materials evenly adjacent to structures, to required elevations.

6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.

7. Where the construction includes basement or other underground walls having structural floors over them, do not backfill such walls until the structural floors are in place and have attained sufficient strength to support the walls.

3.6 GRADING

A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.

2. Smooth the finished surfaces within specified tolerance.

3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.

4. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 2.4m (8'-0"), unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

B. Grading outside building lines:

1. Grade areas adjacent to buildings to achieve drainage away from the structures, and to prevent ponding.

2. Finish the surfaces to be free from irregular surface changes, and:

   a. Shape the surface of areas scheduled to be under walks to line, grade, and cross-section, with finished surface not more than 30.5mm (0.10 ft) above or below the required subgrade elevation.

   b. Shape the surface of areas scheduled to be under pavement to line, grade, and cross-section, with finished surface not more than 15mm (0.05 ft) above or below the required subgrade elevation.

3.7 COMPACTING

A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to ASTM D1557.

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place, and as approved by CONTRACTING OFFICER.
1. Structures:
   a. Compact the top 203mm (8") of subgrade and each layer of fill material or backfill material at 90% of maximum density.

2. Lawn and unpaved areas:
   a. Compact the top 203mm (8") of subgrade and each layer of fill material or backfill material at 85% of maximum density.
   b. Compact the upper 305mm (12") of filled areas, or natural soils exposed by excavating, at 85% of maximum density.

3. Walks:
   a. Compact the top 203mm (8") of subgrade and each layer of fill material or backfill material at 90% of maximum density.

4. Pavements:
   a. Compact the top 203mm (8") of subgrade and each layer of fill material or backfill material at 90% of maximum density.

C. Moisture control:
   1. Where subgrade or layer of soil material must be moisture-conditioned before compacting, uniformly apply water to surface of subgrade or layer of soil material to prevent free water appearing on surface during or subsequent to compacting operations.
   2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
   3. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by CONTRACTING OFFICER.

3.8 FIELD QUALITY CONTROL

A. Secure CONTRACTING OFFICER’ inspection and approval of subgrades and fill layers before subsequent construction is permitted thereon.

B. Provide Density Tests to the approval of CONTRACTING OFFICER:
   1. In undisturbed native soil for structures two random tests in building footings and two tests on sub-grade within building line.
   2. In fills and backfills for structures one test per structure per 200 sq.m taken 300 mm below finished grade.
   3. In sub-grades for site one test per lift per 400 sq.m.
   4. In embankments or borrow for any one test per lift per 400 cubic m placed.
   5. In native soil sub-grade other than structures and parking for any one test for 900 sq.m.

C. If, in Contractor’ opinion, based on reports from Contractor’ consulting testing laboratory, sub-grade or fills which have been placed are below specified density, provide additional compacting and testing as required by Contracting Officer.
3.9 MAINTENANCE

A. Protection of newly graded areas:
   1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;
   2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.10 CERTIFICATION

A. Upon completion of this portion of the Work, and as a condition of its acceptance, deliver to Contractor certification from Contractor’s consulting soil testing laboratory that the compaction requirements have been obtained.

B. At a minimum, include in the certification the area of fill or embankment, the compaction density obtained, and the type or classification of fill material placed.

---End of Section---