

Embassy of the United States of America
February 23, 2021

To: Prospective Offerors
SUBJECT: **Solicitation 19EG3021Q0003 Apartment Renovation @ US Gov Owned Maadi Bldgs.**

Dear Prospective Offerors,

The Embassy of the United States of America invites you to submit a price quotation for **Apartment Renovation at US Gov Owned Maadi Bldgs, Cairo – Egypt.**

If you would like to submit a quotation, you should thoroughly examine all documents contained in the Request for Quotation package, and submit your quotation according to section J.

Your offer must be submitted by e-mail to CairoContracts@state.gov on or before **March 30, 2021 at 02:00 PM.**

The Site visit will be on **March 10, 2021 at 10:30 AM** at **55 Rd 17 Maadi, Cairo Egypt.**

In order to attend the site visit, you are kindly requested to provide the name and Egyptian ID number / Passport # of each of your representatives that will attend maximum by COB **March 04, 2021.** Please e-mail this information to ShoukryNF@state.gov to prepare for your access to the Site Visit premises.

The order price will be fixed, with no adjustment for any escalation in costs or prices of labor or materials. Each offeror will be responsible for determining the amount of labor and materials that will be required to complete the project, and for pricing his proposal accordingly.

The Contracting Officer reserves the right to reject any and all offers and to waive any informality in offers received. In addition, the Embassy reserves the right to establish a competitive range of one or more offerors, and to conduct further negotiations concerning price and other terms before awarding the order, or to award without discussions.

The U.S. Government intends to award an order to the lowest priced, technically acceptable offeror who is a responsible contractor.

In order for your company to do business with the US Federal Government, you need to register it in the below web site and provide us with the registration number.

<https://www.sam.gov>

The Completion of the entire work will be within 60 days from the Notice To Proceed (NTP) starting date (for base bid). In the event of an unauthorized or unexcused delay in completing the project, liquidated damages in the amount of **EGP 875.00** per calendar day will be assessed until substantial completion of the project is achieved.

Any questions regarding this Request for quotation may be directed by letter, Email MohamedSH@state.gov or by telephone to Sherif Mohamed at Tel +20(122) 218-6445 during business hours. For any technical matters kindly contact Eng. Mira Mesdary.

Sincerely,

Nathan Voelker
Contracting Officer

Enclosure

REQUEST FOR QUOTATION
(THIS IS NOT AN ORDER)

THIS RFQ IS IS NOT A SMALL BUSINESS SET-ASIDE

PAGE 1 OF 242 PAGES

| | | | | |
|---------------------------------|------------------------------|--|---|--------|
| 1. REQUEST NO. 19EG3021Q0003 | 2. DATE ISSUED 02/11/2021 | 3. REQUISITION/PURCHASE REQUEST NO. PR9650377 | 4. CERT. FOR NAT. DEF. UNDER BDSA REG. 2 AND/OR DMS REG. 1 <input checked="" type="checkbox"/> | RATING |
|---------------------------------|------------------------------|--|---|--------|

5a. ISSUED BY
AMERICAN EMBASSY CAIRO
US EMBASSY CAIRO 8 KAMAL EL DIN SALAH, ATTN: PROCUREMENT/CONTRACTING OFFICE
CAIRO 11519
EGYPT

6. DELIVER BY (Date)

5b. FOR INFORMATION CALL (NO COLLECT CALLS)

7. DELIVERY
 FOB DESTINATION OTHER (See Schedule)

| | | |
|------------------------|---------------------------------|--|
| NAME Sherif Mohamed | TELEPHONE NUMBER | 9. DESTINATION |
| | AREA CODE NUMBER 01222186445 | a. NAME OF CONSIGNEE AMERICAN EMBASSY CAIRO |

8. TO:

| | | |
|---------|------------|--|
| a. NAME | b. COMPANY | b. STREET ADDRESS US EMBASSY CAIRO 8 KAMAL EL DIN SALAH, ATTN: SPM RECEIVING OFFICE |
|---------|------------|--|

| | |
|-------------------|------------------|
| c. STREET ADDRESS | c. CITY CAIRO |
|-------------------|------------------|

| | | | | |
|---------|----------|-------------|----------|----------------------|
| d. CITY | e. STATE | f. ZIP CODE | d. STATE | e. ZIP CODE 11519 |
|---------|----------|-------------|----------|----------------------|

10. PLEASE FURNISH QUOTATIONS TO THE ISSUING OFFICE IN BLOCK 5a ON OR BEFORE CLOSE OF BUSINESS (Date)
03/14/2021

IMPORTANT: This is a request for information and quotations furnished are not offers. If you are unable to quote, please so indicate on this form and return it to the address in Block 5a. This request does not commit the Government to pay any costs incurred in the preparation of the submission of this quotation or to contract for supplies or service. Supplies are of domestic origin unless otherwise indicated by quoter. Any representations and/or certifications attached to this Request for Quotation must be completed by the quoter.

11. SCHEDULE (Include applicable Federal, State and local taxes)

| ITEM NO. (a) | SUPPLIES/ SERVICES (b) | QUANTITY (c) | UNIT (d) | UNIT PRICE (e) | AMOUNT (f) |
|-----------------|---|-----------------|-------------|-------------------|---------------|
| | Perform complete renovation of one (1) three bedrooms apartment Type B at US government owned apartment #13 at 55 RD 17, Maadi as the base bid with an Add Alternate #2 of one Three (3) bedrooms apartment Type B #41 at 11 road 11, Maadi as per attached specifications, BOQ and drawings. | 1 | | | |

| | | | | |
|---|-------------------------|-------------------------|-------------------------|---------------------------------------|
| 12. DISCOUNT FOR PROMPT PAYMENT <input checked="" type="checkbox"/> | a. 10 CALENDAR DAYS (%) | b. 20 CALENDAR DAYS (%) | c. 30 CALENDAR DAYS (%) | d. CALENDAR DAYS NUMBER PERCENTAGE |
|---|-------------------------|-------------------------|-------------------------|---------------------------------------|

NOTE: Additional provisions and representations are are not attached.

| | | | | |
|--------------------------------|----------|-------------|--|---------------------------|
| 13. NAME AND ADDRESS OF QUOTER | | | 14. SIGNATURE OF PERSON AUTHORIZED TO SIGN QUOTATION | 15. DATE OF QUOTATION |
| a. NAME OF QUOTER | | | 16. SIGNER | |
| b. STREET ADDRESS | | | | |
| c. COUNTY | | | a. NAME (Type or print) | b. TELEPHONE AREA CODE |
| d. CITY | e. STATE | f. ZIP CODE | c. TITLE (Type or print) | NUMBER |

TABLE OF CONTENTS

SF-18 COVER SHEET

A. PRICE

B. SCOPE OF WORK

C. PACKAGING AND MARKING

D. INSPECTION AND ACCEPTANCE

E. DELIVERIES OR PERFORMANCE

F. ADMINISTRATIVE DATA

G. SPECIAL REQUIREMENTS

H. CLAUSES

I. LIST OF ATTACHMENTS

J. QUOTATION INFORMATION

K. EVALUATION CRITERIA

L. REPRESENTATIONS, CERTIFICATIONS, AND OTHER STATEMENTS OF OFFERORS
OR QUOTERS

ATTACHMENTS:

Attachment 1: Standard Form 25, "Performance and Guaranty Bond"

Attachment 2: Standard Form 25A, "Payment Bond"

Attachment 3: Sample Letter of Bank Guaranty

Attachment 4: Breakdown of Price by Divisions of Specifications

Attachment 5: Drawings & Specifications

REQUEST FOR QUOTATIONS - CONSTRUCTION

A. PRICE

The Contractor shall complete all work, including furnishing all labor, material, equipment and services required under this purchase order for the following firm fixed price and within the time specified. This price shall include all labor, materials, all insurances, overhead and profit.

| | |
|---|------------|
| Total Price (including all labor, materials, overhead and profit) | EGP |
|---|------------|

A.1 VALUE ADDED TAX

VALUE ADDED TAX (VAT). The Government will not reimburse the Contractor for VAT under this contract. The Contractor shall not include a line for VAT on Invoices as the U.S. Embassy has a tax exemption certificate with the host government.

B. SCOPE OF WORK

The character and scope of the work are set forth in the contract. The Contractor shall furnish and install all materials required by this contract to include complete renovation of one (1) three bedrooms apartment Type B at US government owned apartment #13 at 55 RD 17, Maadi as the base bid with an alternate # 1 of one Three (3) bedrooms apartment Type B #41 at 11 road 11, Maadi as per attached specifications, BOQ and drawings.

In case of differences between small and large-scale drawings, the latter will govern. Where a portion of the work is drawn in detail and the remainder of the work is indicated in outline, the parts drawn in detail shall apply also to all other portions of the work.

C. PACKAGING AND MARKING

Mark materials delivered to the site as follows:

None

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D. INSPECTION AND ACCEPTANCE

The COR, or his/her authorized representatives, will inspect from time to time the services being performed and the supplies furnished to determine whether work is being performed in a satisfactory manner, and that all supplies are of acceptable quality and standards.

The Contractor shall be responsible for any countermeasures or corrective action, within the scope of this contract, which may be required by the Contracting Officer as a result of such inspection.

D.1 SUBSTANTIAL COMPLETION

(a) "*Substantial Completion*" means the stage in the progress of the work as determined and certified by the Contracting Officer in writing to the Contractor, on which the work (or a portion designated by the Government) is sufficiently complete and satisfactory. Substantial completion means that the property may be occupied or used for the purpose for which it is intended, and only minor items such as touch-up, adjustments, and minor replacements or installations remain to be completed or corrected which:

- (1) do not interfere with the intended occupancy or utilization of the work, and
- (2) can be completed or corrected within the time period required for final completion.

(b) The "date of substantial completion" means the date determined by the Contracting Officer or authorized Government representative as of which substantial completion of the work has been achieved.

Use and Possession upon Substantial Completion - The Government shall have the right to take possession of and use the work upon substantial completion. Upon notice by the Contractor that the work is substantially complete (a Request for Substantial Completion) and an inspection by the Contracting Officer or an authorized Government representative (including any required tests), the Contracting Officer shall furnish the Contractor a Certificate of Substantial Completion. The certificate will be accompanied by a Schedule of Defects listing items of work remaining to be performed, completed or corrected before final completion and acceptance. Failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use upon substantial completion shall not be deemed an acceptance of any work under the contract.

D.2 FINAL COMPLETION AND ACCEPTANCE

D.2.1 "Final completion and acceptance" means the stage in the progress of the work as determined by the Contracting Officer and confirmed in writing to the Contractor, at which all work required under the contract has been completed in a satisfactory manner, subject to

the discovery of defects after final completion, and except for items specifically excluded in the notice of final acceptance.

D.2.2 The "*date of final completion and acceptance*" means the date determined by the Contracting Officer when final completion of the work has been achieved, as indicated by written notice to the Contractor.

D.2.3 FINAL INSPECTION AND TESTS. The Contractor shall give the Contracting Officer at least five (5) days advance written notice of the date when the work will be fully completed and ready for final inspection and tests. Final inspection and tests will be started not later than the date specified in the notice unless the Contracting Officer determines that the work is not ready for final inspection and so informs the Contractor.

D.2.4 FINAL ACCEPTANCE. If the Contracting Officer is satisfied that the work under the contract is complete (with the exception of continuing obligations), the Contracting Officer shall issue to the Contractor a notice of final acceptance and make final payment upon:

- Satisfactory completion of all required tests,
- A final inspection that all items by the Contracting Officer listed in the Schedule of Defects have been completed or corrected and that the work is finally complete (subject to the discovery of defects after final completion), and
- Submittal by the Contractor of all documents and other items required upon completion of the work, including a final request for payment (Request for Final Acceptance).

E. DELIVERIES OR PERFORMANCE

52.211-10 COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984)

The Contractor shall be required to:

- (a) commence work under this contract within **7 calendar days** after the date the Contractor receives the notice to proceed,
- (b) prosecute the work diligently, and,
- (c) complete the entire work ready for use not later than **55 days from the Notice To Proceed (NTP) starting date (for base bid)**.

The time stated for completion shall include final cleanup of the premises.

52.211-12 LIQUIDATED DAMAGES - CONSTRUCTION (SEPT 2000)

(a) If the Contractor fails to complete the work within the time specified in the contract, or any extension, the Contractor shall pay liquidated damages to the Government in the amount of **EGP 875.00** for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Default clause.

CONTRACTOR'S SUBMISSION OF CONSTRUCTION SCHEDULES

(a) The time for submission of the schedules referenced in FAR 52.236-15, "Schedules for Construction Contracts", paragraph (a), is hereby modified to reflect the due date for submission as "7" calendar days after receipt of an executed contract".

(b) These schedules shall include the time by which shop drawings, product data, samples and other submittals required by the contract will be submitted for approval.

(c) The Contractor shall revise such schedules (1) to account for the actual progress of the work, (2) to reflect approved adjustments in the performance schedule, and (3) as required by the Contracting Officer to achieve coordination with work by the Government and any separate contractors used by the Government. The Contractor shall submit a schedule, which sequences work so as to minimize disruption at the job site.

(d) All deliverables shall be in the English language and any system of dimensions (English or metric) shown shall be consistent with that used in the contract. No extension of time shall be allowed due to delay by the Government in approving such deliverables if the Contractor has failed to act promptly and responsively in submitting its deliverables. The Contractor shall identify each deliverable as required by the contract.

(e) Acceptance of Schedule: When the Government has accepted any time schedule; it shall be binding upon the Contractor. The completion date is fixed and may be extended only by a written contract modification signed by the Contracting Officer. Acceptance or approval of any schedule or revision thereof by the Government shall not:

- (1) Extend the completion date or obligate the Government to do so,
- (2) Constitute acceptance or approval of any delay, or
- (3) Excuse the Contractor from or relieve the Contractor of its obligation to maintain the progress of the work and achieve final completion by the established completion date.

NOTICE OF DELAY

If the Contractor receives a notice of any change in the work, or if any other conditions arise which are likely to cause or are actually causing delays which the Contractor believes may result in late completion of the project, the Contractor shall notify the Contracting Officer. The Contractor's notice shall state the effect, if any, of such change or other conditions upon the approved schedule, and shall state in what respects, if any, the relevant schedule or the completion date should be revised. The Contractor shall give such notice promptly, not more than ten (10) days after the first event giving rise to the delay or prospective delay. Only the Contracting Officer may make revisions to the approved time schedule.

NOTICE TO PROCEED

(a) After receiving and accepting any bonds or evidence of insurance, the Contracting Officer will provide the Contractor a Notice to Proceed. The Contractor must then prosecute the work, commencing and completing performance not later than the time period established in the contract.

(b) It is possible that the Contracting Officer may elect to issue the Notice to Proceed before receipt and acceptance of any bonds or evidence of insurance. Issuance of a Notice to Proceed by the Government before receipt of the required bonds or insurance certificates or policies shall not be a waiver of the requirement to furnish these documents.

WORKING HOURS

All work shall be performed during **Sunday through Thursday from 08:00 am to 04:30 pm**. Other hours, if requested by the Contractor, may be approved by the Contracting Officer's Representative (COR). The Contractor shall give **48 hours in advance** to COR who will consider any deviation from the hours identified above. Changes in work hours, initiated by the Contractor, will not be a cause for a price increase.

(a) The Department of State observes the following days as holidays:

| | | |
|-------------------------------|----------|-----------------------------|
| New Year's Day | American | Thursday, December 31, 2020 |
| Coptic Christmas | Egyptian | Thursday, January 7 |
| Martin Luther King's Birthday | American | Sunday, January 17 |
| Revolution/Police Day* | Egyptian | Monday, January 25* |
| Washington's Birthday | American | Sunday, February 14 |
| Sinai Liberation Day | Egyptian | Sunday, April 25 |
| Labor Day* | Egyptian | Saturday, May 1* |
| Sham El Nessim | Egyptian | Monday, May 3 |
| Eid El Fitr** | Egyptian | Thurs/Fri, May 13/14** |
| Memorial Day | American | Sunday, May 30 |
| June 30 Revolution | Egyptian | Wednesday, June 30* |
| Independence Day | American | Sunday, July 4 |
| Eid Al Adha** | Egyptian | Mon/Tues/Wed, July 19-21** |
| National Day* | Egyptian | Friday, July 23* |
| Islamic New Year** | Egyptian | Monday, August 9** |
| Labor Day | American | Sunday, September 5 |
| Armed Forces Day* | Egyptian | Wednesday, October 6* |
| Columbus Day | American | Sunday, October 10 |
| Moulid El Nabi** | Egyptian | Monday, October 18** |
| Veteran's Day | American | Thursday, November 11 |
| Thanksgiving Day | American | Thursday, November 25 |
| Christmas Day | American | Sunday, December 26 |

*The Embassy will consider moving the observance date of local holidays falling on weekends or otherwise in the event that the Egyptian Government issues decisions mandating that both the public and private sector change the observance date of a local holiday.

**Dates of Islamic holidays are subject to confirmation from Dar al Ifta, and may vary from the above projected dates.

Any other day designated by Federal law, Executive Order, or Presidential Proclamation.

PRECONSTRUCTION CONFERENCE

A preconstruction conference will be held 10 days after contract award at **55 Rd 17 Maadi, Cairo Egypt** to discuss the schedule, submittals, notice to proceed, mobilization and other important issues that effect construction progress. See FAR 52.236-26, Preconstruction Conference.

| DELIVERABLES - The following items shall be delivered under this contract: | | | |
|--|-----------------|---------------------------------|-------------------|
| <u>Description</u> | <u>Quantity</u> | <u>Deliver Date</u> | <u>Deliver To</u> |
| Section G. Securities/Insurance | 1 | 10 days after award | CO |
| Section E. Construction Schedule | 1 | 10 days after award | COR |
| Section E. Preconstruction Conference | 1 | 10 days after award | COR |
| Section G. Personnel Biographies | 1 | 10 days after award | COR |
| Section F. Payment Request | 1 | Last calendar day of each month | COR & FMC |
| Section D. Request for Substantial Completion | 1 | 15 days before inspection | COR |
| Section D. Request for Final Acceptance | 1 | 5 days before inspection | COR |

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F. ADMINISTRATIVE DATA

652.242-70 CONTRACTING OFFICER'S REPRESENTATIVE (COR) (AUG 1999)

(a) The Contracting Officer may designate in writing one or more Government employees, by name or position title, to take action for the Contracting Officer under this contract. Each designee shall be identified as a Contracting Officer's Representative (COR). Such designation(s) shall specify the scope and limitations of the authority so delegated; provided, that the designee shall not change the terms or conditions of the contract, unless the COR is a warranted Contracting Officer and this authority is delegated in the designation.

(b) The COR for this contract is **Eng Mira Mesdary**.

Payment: The Contractor's attention is directed to Section H, 52.232-5, "Payments Under Fixed-Price Construction Contracts". The following elaborates on the information contained in that clause.

Requests for payment, may be made no more frequently than monthly. Payment requests shall cover the value of labor and materials completed and in place, including a prorated portion of overhead and profit.

After receipt of the Contractor's request for payment, and on the basis of an inspection of the work, the Contracting Officer shall make a determination as to the amount, which is then due. If the Contracting Officer does not approve payment of the full amount applied for, less the retainage allowed by in 52.232-5, the Contracting Officer shall advise the Contractor as to the reasons.

Under the authority of 52.232-27(a), the 14 day period identified in FAR 52.232-27(a)(1)(i)(A) is hereby changed to 30 days.

U.S. Embassy Cairo
Financial Management Office – DBO
8 Kamal El Din Salah Street
Garden City, Cairo, Egypt
CairoDBO@state.gov

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G. SPECIAL REQUIREMENTS

G.1.0 PERFORMANCE/PAYMENT PROTECTION - The Contractor shall furnish some form of payment protection as described in 52.228-13 in the amount of **10% of the contract price through a company check, irrevocable letters of credit, or bank guarantee.**

G.1.1 The Contractor shall provide the information required by the paragraph above within **ten (10) calendar days after award.** Failure to timely submit the required security may result in rescinding or termination of the contract by the Government. If the contract is terminated, the Contractor will be liable for those costs as described in FAR 52.249-10, Default (Fixed-Price Construction), which is included in this purchase order.

G.1.2 The bonds or alternate performance security shall guarantee the Contractor's execution and completion of the work within the contract time. This security shall also guarantee the correction of any defects after completion, the payment of all wages and other amounts payable by the Contractor under its subcontracts or for labor and materials, and the satisfaction or removal of any liens or encumbrances placed on the work.

G.1.3 The required securities shall remain in effect in the full amount required until final acceptance of the project by the Government. Upon final acceptance, the penal sum of the performance security shall be reduced to 10% of the contract price. The security shall remain in effect for one year after the date of final completion and acceptance, and the Contractor shall pay any premium required for the entire period of coverage.

G.2.0 INSURANCE - The Contractor is required by FAR 52.228-5, "Insurance - Work on a Government Installation" to provide whatever insurance is legally necessary. The Contractor shall at its own expense provide and maintain during the entire performance period the following insurance amounts:

G.2.1 GENERAL LIABILITY (includes premises/operations, collapse hazard, products, completed operations, contractual, independent contractors, broad form property damage, personal injury) :

| | |
|---|------------------|
| (1) BODILY INJURY, ON OR OFF THE SITE, IN U.S. DOLLARS | |
| Per Occurrence | \$ 5,000 |
| Cumulative | \$ 15,000 |
| (2) PROPERTY DAMAGE, ON OR OFF THE SITE, IN U.S. DOLLARS | |
| Per Occurrence | \$ 10,000 |
| Cumulative | \$ 20,000 |

G.2.2 The foregoing types and amounts of insurance are the minimums required. The Contractor shall obtain any other types of insurance required by local law or that are ordinarily or customarily obtained in the location of the work. The limit of such insurance shall be as provided by law or sufficient to meet normal and customary claims.

G.2.3 The Contractor agrees that the Government shall not be responsible for personal injuries or for damages to any property of the Contractor, its officers, agents, servants, and employees, or any other person, arising from an incident to the Contractor's performance of this contract. The Contractor shall hold harmless and indemnify the Government from any and all claims arising therefrom, except in the instance of gross negligence on the part of the Government.

G.2.4 The Contractor shall obtain adequate insurance for damage to, or theft of, materials and equipment in insurance coverage for loose transit to the site or in storage on or off the site.

G.2.5 The general liability policy required of the Contractor shall name "the United States of America, acting by and through the Department of State", as an additional insured with respect to operations performed under this contract.

G.3.0 DOCUMENT DESCRIPTIONS

G.3.1 SUPPLEMENTAL DOCUMENTS: The Contracting Officer shall furnish from time to time such detailed drawings and other information as is considered necessary, in the opinion of the Contracting Officer, to interpret, clarify, supplement, or correct inconsistencies, errors or omissions in the Contract documents, or to describe minor changes in the work not involving an increase in the contract price or extension of the contract time. The Contractor shall comply with the requirements of the supplemental documents, and unless prompt objection is made by the Contractor within 20 days, their issuance shall not provide for any claim for an increase in the Contract price or an extension of contract time.

G.3.1.1. RECORD DOCUMENTS. The Contractor shall maintain at the project site:

- (1) a current marked set of Contract drawings and specifications indicating all interpretations and clarification, contract modifications, change orders, or any other departure from the contract requirements approved by the Contracting Officer; and,
- (2) a complete set of record shop drawings, product data, samples and other submittals as approved by the Contracting Officer.

G.3.1.2. "As-Built" Documents: After final completion of the work, but before final acceptance thereof, the Contractor shall provide:

- (1) a complete set of "as-built" drawings, based upon the record set of drawings, marked to show the details of construction as actually accomplished; and,
- (2) record shop drawings and other submittals, in the number and form as required by the specifications.

G.4.0 LAWS AND REGULATIONS - The Contractor shall, without additional expense to the Government, be responsible for complying with all laws, codes, ordinances, and regulations applicable to the performance of the work, including those of the host country, and with the lawful orders of any governmental authority having jurisdiction. Host country authorities may not enter the construction site without the permission of the Contracting Officer. Unless otherwise directed by the Contracting Officer, the Contractor shall comply with the more stringent of the requirements of such laws, regulations and orders and of the contract. In the event of a conflict between the contract and such laws, regulations and orders, the Contractor shall promptly advise the Contracting Officer of the conflict and of the Contractor's proposed course of action for resolution by the Contracting Officer.

G.4.1 The Contractor shall comply with all local labor laws, regulations, customs and practices pertaining to labor, safety, and similar matters, to the extent that such compliance is not inconsistent with the requirements of this contract.

G.4.2 The Contractor shall give written assurance to the Contracting Officer that all subcontractors and others performing work on or for the project have obtained all requisite licenses and permits.

G.4.3 The Contractor shall submit proper documentation and evidence satisfactory to the Contracting Officer of compliance with this clause.

G.5.0 CONSTRUCTION PERSONNEL - The Contractor shall maintain discipline at the site and at all times take all reasonable precautions to prevent any unlawful, riotous, or disorderly conduct by or among those employed at the site. The Contractor shall ensure the preservation of peace and protection of persons and property in the neighborhood of the project against such action. The Contracting Officer may require, in writing that the Contractor remove from the work any employee that the Contracting Officer deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the project is deemed by the Contracting Officer to be contrary to the Government's interests.

G.5.1 If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

G.5.2 After award, the Contractor has ten calendar days to submit to the Contracting Officer a list of workers and supervisors assigned to this project for the Government to conduct all necessary security checks. It is anticipated that security checks will take **30 calendar days** to

perform. For each individual the list shall include:

- Full Name**
- Place and Date of Birth**
- Current Address**
- National Identification number**
- Fingerprint Card**
- Participation in a personal interview with Embassy security staff**

Failure to provide any of the above information may be considered grounds for rejection and/or resubmittal of the application. Once the Government has completed the security screening and approved the applicants a badge will be provided to the individual for access to the site. This badge may be revoked at any time due to the falsification of data, or misconduct on site.

G.5.3 The Contractor shall provide an English speaking supervisor on site at all times. This position is considered as key personnel under this purchase order.

G.6.0 Materials and Equipment - All materials and equipment incorporated into the work shall be new and for the purpose intended, unless otherwise specified. All workmanship shall be of good quality and performed in a skillful manner that will withstand inspection by the Contracting Officer.

G.7.0 SPECIAL WARRANTIES

G.7.1 Any special warranties that may be required under the contract shall be subject to the stipulations set forth in 52.246-21, "Warranty of Construction", as long as they are not in conflict.

G.7.2 The Contractor shall obtain and furnish to the Government all information required to make any subcontractor's, manufacturer's, or supplier's guarantee or warranty legally binding and effective. The Contractor shall submit both the information and the guarantee or warranty to the Government in sufficient time to permit the Government to meet any time limit specified in the guarantee or warranty, but not later than completion and acceptance of all work under this contract.

G.8.0 EQUITABLE ADJUSTMENTS

Any circumstance for which the contract provides an equitable adjustment that causes a change within the meaning of paragraph (a) of the "Changes" clause shall be treated as a change under that clause; provided, that the Contractor gives the Contracting Officer prompt written notice (within 20 days) stating:

- (a) the date, circumstances, and applicable contract clause authorizing an equitable adjustment and

(b) that the Contractor regards the event as a changed condition for which an equitable adjustment is allowed under the contract

The Contractor shall provide written notice of a differing site condition within 10 calendar days of occurrence following FAR 52.236-2, Differing Site Conditions.

G.9.0 ZONING APPROVALS AND PERMITS

The Government shall be responsible for:

- obtaining proper zoning or other land use control approval for the project
- obtaining the approval of the Contracting Drawings and Specifications
- paying fees due for the foregoing; and,
- for obtaining and paying for the initial building permits.

The remainder of this page is intentionally blank.

H. CLAUSES

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es): <http://www.acquisition.gov/far/> or <http://farsite.hill.af.mil/vffara.htm>. Please note these addresses are subject to change.

If the Federal Acquisition Regulation (FAR) is not available at the locations indicated above, use the Department of State Acquisition website at <https://www.ecfr.gov/cgi-bin/text-idx?SID=2e978208d0d2aa44fb9502725ecac4e5&mc=true&tpl=/ecfrbrowse/Title48/48chapter6.tpl> to access links to the FAR. You may also use an internet “search engine” (for example, Google, Yahoo, Excite) to obtain the latest location of the most current FAR.

The following Federal Acquisition Regulation clause(s) is/are incorporated by reference (48 CFR CH. 1):

| <u>CLAUSE</u> | <u>TITLE AND DATE</u> |
|-------------------------|--|
| 52.202-1 | DEFINITIONS (JUN 2020) |
| 52.204-9 | PERSONAL IDENTITY VERIFICATION OF CONTRACTOR PERSONNEL (JAN 2011) |
| 52.204-10 | REPORTING EXECUTIVE COMPENSATION AND FIRST-TIER SUBCONTRACT AWARDS (OCT 2018) |
| 52.204-13 | SYSTEM FOR AWARD MANAGEMENT MAINTENANCE (OCT 2018) |
| 52.204-18 | COMMERCIAL AND GOVERNMENT ENTITY CODE MAINTENANCE (JUL 2016) |
| 52.204-19 (DEC 2014) | INCORPORATION BY REFERENCE OF REPRESENTATIONS AND CERTIFICATIONS |
| 52.209-6 | PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED OR PROPOSED FOR DEBARMENT (JUN 2020) |
| 52.209-9 | UPDATES OF PUBLICLY AVAILABLE INFORMATION REGARDING RESPONSIBILITY MATTERS (JUL 2013) |
| 52.213-4 | TERMS AND CONDITIONS-SIMPLIFIED ACQUISITIONS (OTHER THAN COMMERCIAL ITEMS) (NOV 2020) |
| 52.216-7 | ALLOWABLE COST AND PAYMENT (JUN 2013) |

- 52.222-1 NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)
- 52.222-19 CHILD LABOR – COOPERATION WITH AUTHORITIES AND REMEDIES (JAN 2018)
- 52.222-50 COMBATING TRAFFICKING IN PERSONS (OCT 2020)
- 52.223-18 ENCOURAGING CONTRACTOR POLICIES TO BAN TEXT MESSAGING WHILE DRIVING (JUN 2020)
- 52.225-13 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUNE 2008)
- 52.225-14 INCONSISTENCY BETWEEN ENGLISH VERSION AND TRANSLATION OF CONTRACT (FEB 2000)
- 52.225-19 CONTRACTOR PERSONNEL IN A DESIGNATED OPERATIONAL AREA OR SUPPORTING A DIPLOMATIC MISSION OUTSIDE THE UNITED STATES (MAR 2008)
- 52.228-4 WORKERS’ COMPENSATION AND WAR-HAZARD INSURANCE OVERSEAS (APR 1984)
- 52.228-5 INSURANCE - WORK ON A GOVERNMENT INSTALLATION (JAN 1997)
- 52.228-11 PLEDGES OF ASSETS (JAN 2012)
- 52.228-13 ALTERNATIVE PAYMENT PROTECTION (JULY 2000)
- 52.228-14 IRREVOCABLE LETTER OF CREDIT (NOV 2014)
- 52.228-15 PERFORMANCE AND PAYMENT BONDS-CONSTRUCTION (JUN 2020)
- 52.229-6 TAXES - FOREIGN FIXED-PRICE CONTRACTS (FEB 2013)
- 52.229-7 TAXES- FIXED PRICE CONTRACTS WITH FOREIGN GOVERNMENTS (FEB 2013)
- 52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 2014)
- 52.232-8 DISCOUNTS FOR PROMPT PAYMENT (FEB 2002)
- 52.232-11 EXTRAS (APR 1984)
- 52.232-18 AVAILABILITY OF FUNDS (APR 1984)
- 52.232-22 LIMITATION OF FUNDS (APR 1984)

- 52.232-25 PROMPT PAYMENT (JULY 2013)
- 52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (MAY 2014)
- 52.232-33 PAYMENT BY ELECTRONIC FUNDS TRANSFER - SYSTEM FOR AWARD
MANAGEMENT (OCT 2018)
- 52.232-34 PAYMENT BY ELECTRONIC FUNDS TRANSFER – OTHER THAN
SYSTEM FOR AWARD MANAGEMENT (JULY 2013)
- 52.233-1 DISPUTES (MAY 2014) *Alternate I (DEC 1991)*
- 52.233-3 PROTEST AFTER AWARD (AUG 1996)
- 52.236-2 DIFFERING SITE CONDITIONS (APR 1984)
- 52.236-3 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)
- 52.236-5 MATERIAL AND WORKMANSHIP (APR 1984)
- 52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)
- 52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)
- 52.236-8 OTHER CONTRACTS (APR 1984)
- 52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES,
AND IMPROVEMENTS (APR 1984)
- 52.236-10 OPERATIONS AND STORAGE AREAS (APR 1984)
- 52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)
- 52.236-12 CLEANING UP (APR 1984)
- 52.236-13 ACCIDENT PREVENTION (NOV 1991)
- 52.236-14 AVAILABILITY AND USE OF UTILITY SERVICES (APR 1984)
- 52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)
- 52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)

- 52.236-26 PRECONSTRUCTION CONFERENCE (FEB 1995)
- 52.242-14 SUSPENSION OF WORK (APR 1984)
- 52.243-4 CHANGES (JUN 2007)
- 52.243-5 CHANGES AND CHANGED CONDITIONS (APR 1984)
- 52.244-6 SUBCONTRACTS FOR COMMERCIAL ITEMS (NOV 2020)
- 52.245-2 GOVERNMENT PROPERTY INSTALLATION OPERATION SERVICES (APR 2012)
- 52.245-9 USE AND CHARGES (APR 2012)
- 52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)
- 52.246-17 WARRANTY OF SUPPLIES OF A NONCOMPLEX NATURE (JUN 2003)
- 52.246-21 WARRANTY OF CONSTRUCTION (MAR 1994)
- 52.246-26 REPORTING NONCONFORMING ITEMS (DEC 2019)
- 52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (APR 2012) *Alternate I (SEPT 1996)*
- 52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)
- 52.249-14 EXCUSABLE DELAYS (APR 1984)

I. FAR CLAUSES INCORPORATED IN FULL TEXT

- 52.204-25 PROHIBITION ON CONTRACTING FOR CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT (AUG 2020)

(a) Definitions. As used in this clause—

Covered foreign country means The People’s Republic of China.

Covered telecommunications equipment or services means—

(1) Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);

(2) For the purpose of public safety, security of Government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation,

Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);

(3) Telecommunications or video surveillance services provided by such entities or using such equipment; or

(4) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Critical technology means—

(1) Defense articles or defense services included on the United States Munitions List set forth in the International Traffic in Arms Regulations under subchapter M of chapter I of title 22, Code of Federal Regulations;

(2) Items included on the Commerce Control List set forth in Supplement No. 1 to part 774 of the Export Administration Regulations under subchapter C of chapter VII of title 15, Code of Federal Regulations, and controlled-

(i) Pursuant to multilateral regimes, including for reasons relating to national security, chemical and biological weapons proliferation, nuclear nonproliferation, or missile technology; or

(ii) For reasons relating to regional stability or surreptitious listening;

(3) Specially designed and prepared nuclear equipment, parts and components, materials, software, and technology covered by part 810 of title 10, Code of Federal Regulations (relating to assistance to foreign atomic energy activities);

(4) Nuclear facilities, equipment, and material covered by part 110 of title 10, Code of Federal Regulations (relating to export and import of nuclear equipment and material);

(5) Select agents and toxins covered by part 331 of title 7, Code of Federal Regulations, part 121 of title 9 of such Code, or part 73 of title 42 of such Code; or

(6) Emerging and foundational technologies controlled pursuant to section 1758 of the Export Control Reform Act of 2018 (50 U.S.C. 4817).

Substantial or essential component means any component necessary for the proper function or performance of a piece of equipment, system, or service.

(b) Prohibition. Section 889(a)(1)(A) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2019, from procuring or obtaining, or extending or renewing a contract to procure or obtain, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. The Contractor is prohibited from providing to the Government any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless an exception at paragraph (c) of this clause applies or the covered telecommunication equipment or services are covered by a waiver described in Federal Acquisition Regulation 4.2104.

(c) Exceptions. This clause does not prohibit contractors from providing—

(1) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(2) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(d) Reporting requirement.

(1) In the event the Contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the Contractor is notified of such by a subcontractor at any tier or by any other source, the Contractor shall report the information in paragraph (d)(2) of this clause to the Contracting Officer, unless elsewhere in this contract are established procedures for reporting the information; in the case of the Department of Defense, the Contractor shall report to the website at <https://dibnet.dod.mil>. For indefinite delivery contracts, the Contractor shall report to the Contracting Officer for the indefinite delivery contract and the Contracting Officer(s) for any affected order or, in the case of the Department of Defense, identify both the indefinite delivery contract and any affected orders in the report provided at <https://dibnet.dod.mil>.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause

(i) Within one business day from the date of such identification or notification: the contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.

(ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: any further available information about mitigation actions undertaken or recommended. In addition, the Contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e) Subcontracts. The Contractor shall insert the substance of this clause, including this paragraph (e), in all subcontracts and other contractual instruments, including subcontracts for the acquisition of commercial items.

(End of clause)

II. The following Department of State Acquisition Regulation (DOSAR) clause(s) is/are set forth in full text:

652.204-70 DEPARTMENT OF STATE PERSONAL IDENTIFICATION CARD ISSUANCE PROCEDURES (MAY 2011)

(a) The Contractor shall comply with the Department of State (DOS) Personal Identification Card Issuance Procedures for all employees performing under this contract who require frequent and continuing access to DOS facilities, or information systems. The Contractor shall insert this clause in all subcontracts when the subcontractor's employees will require frequent and continuing access to DOS facilities, or information systems.

(b) The DOS Personal Identification Card Issuance Procedures may be accessed at <http://www.state.gov/m/ds/rls/rpt/c21664.htm> .

(End of clause)

652.229-71 PERSONAL PROPERTY DISPOSITION AT POSTS ABROAD (AUG 1999)

Regulations at 22 CFR Part 136 require that U.S. Government employees and their families do not profit personally from sales or other transactions with persons who are not themselves entitled to exemption from import restrictions, duties, or taxes. Should the Contractor experience importation or tax privileges in a foreign country because of its contractual relationship to the United States Government, the Contractor shall observe the requirements of 22 CFR Part 136 and all policies, rules, and procedures issued by the chief of mission in that foreign country.

(End of clause)

CONTRACTOR IDENTIFICATION (JULY 2008)

Contract performance may require contractor personnel to attend meetings with government personnel and the public, work within government offices, and/or utilize government email.

Contractor personnel must take the following actions to identify themselves as non-federal employees:

- 1) Use an e-mail signature block that shows name, the office being supported and company affiliation (e.g. "John Smith, Office of Human Resources, ACME Corporation Support Contractor");
- 2) Clearly identify themselves and their contractor affiliation in meetings;
- 3) Identify their contractor affiliation in Departmental e-mail and phone listings whenever contractor personnel are included in those listings; and
- 4) Contractor personnel may not utilize Department of State logos or indicia on business cards.

(End of clause)

652.236-70 ADDITIONAL SAFETY MEASURES (OCT 2017)

In addition to the safety/accident prevention requirements of FAR 52.236-13, Accident Prevention Alternate I, the contractor shall comply with the following additional safety measures.

(a) *High Risk Activities*. If the project contains any of the following high risk activities, the contractor shall follow the section in the latest edition, as of the date of the solicitation, of the

U.S. Army Corps of Engineers Safety and Health manual, EM 385-1-1, that corresponds to the high risk activity. Before work may proceed, the contractor must obtain approval from the COR of the written safety plan required by FAR 52.236-13, Accident Prevention Alternate I (see paragraph (f) below), containing specific hazard mitigation and control techniques.

(1) Scaffolding;

(2) Work at heights above 1.8 meters;

(3) Trenching or other excavation greater than one (1) meter in depth;

(4) Earth-moving equipment and other large vehicles;

(5) Cranes and rigging;

(6) Welding or cutting and other hot work;

(7) Partial or total demolition of a structure;

(8) Temporary wiring, use of portable electric tools, or other recognized electrical hazards. Temporary wiring and portable electric tools require the use of a ground fault circuit interrupter (GFCI) in the affected circuits; other electrical hazards may also require the use of a GFCI;

(9) Work in confined spaces (limited exits, potential for oxygen less than 19.5 percent or combustible atmosphere, potential for solid or liquid engulfment, or other hazards considered to be immediately dangerous to life or health such as water tanks, transformer vaults, sewers, cisterns, etc.);

(10) Hazardous materials - a material with a physical or health hazard including but not limited to, flammable, explosive, corrosive, toxic, reactive or unstable, or any operations, which creates any kind of contamination inside an occupied building such as dust from demolition activities, paints, solvents, etc.; or

(11) Hazardous noise levels as required in EM 385-1 Section 5B or local standards if more restrictive.

(b) *Safety and Health Requirements.* The contractor and all subcontractors shall comply with the latest edition of the U.S. Army Corps of Engineers Safety and Health manual EM 385-1-1, or OSHA 29 CFR parts 1910 or 1926 if no EM 385-1-1 requirements are applicable, and the accepted contractor's written safety program.

(c) *Mishap Reporting.* The contractor is required to report **immediately** all mishaps to the COR and the contracting officer. A "mishap" is any event causing injury, disease or illness,

death, material loss or property damage, or incident causing environmental contamination. The mishap reporting requirement shall include fires, explosions, hazardous materials contamination, and other similar incidents that may threaten people, property, and equipment.

(d) *Records.* The contractor shall maintain an accurate record on all mishaps incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to or theft of property, materials, supplies, or equipment. The contractor shall report this data in the manner prescribed by the contracting officer.

(e) *Subcontracts.* The contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

(f) *Written program.* The plan required by paragraph (f)(1) of the clause entitled "Accident Prevention Alternate I" shall be known as the Site Safety and Health Plan (SSHP) and shall address any activities listed in paragraph (a) of this clause, or as otherwise required by the contracting officer/COR.

(1) The SSHP shall be submitted at least 10 working days prior to commencing any activity at the site.

(2) The plan must address developing activity hazard analyses (AHAs) for specific tasks. The AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk. Work shall not begin until the AHA for the work activity has been accepted by the COR and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives.

(3) The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by EM 385-1-1) shall be identified and included in the AHA. Proof of their competency/qualification shall be submitted to the contracting officer or COR for acceptance prior to the start of that work activity. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).

(End of clause)

652.242-73 AUTHORIZATION AND PERFORMANCE (AUG 1999)

(a) The Contractor warrants the following:

(1) That is has obtained authorization to operate and do business in the country or countries in which this contract will be performed;

(2) That is has obtained all necessary licenses and permits required to perform this contract; and,

(3) That it shall comply fully with all laws, decrees, labor standards, and regulations of said country or countries during the performance of this contract.

(b) If the party actually performing the work will be a subcontractor or joint venture partner, then such subcontractor or joint venture partner agrees to the requirements of paragraph (a) of this clause.

(End of clause)

652.243-70 NOTICES (AUG 1999)

Any notice or request relating to this contract given by either party to the other shall be in writing. Said notice or request shall be mailed or delivered by hand to the other party at the address provided in the schedule of the contract. All modifications to the contract must be made in writing by the Contracting Officer.

(End of clause)

The remainder of this page is intentionally blank.

I. LIST OF ATTACHMENTS

| ATTACHMENT NUMBER | DESCRIPTION OF ATTACHMENT | NUMBER OF PAGES |
|-------------------|---|-----------------|
| Attachment 1 | Standard Form 25, "Performance and Guaranty Bond" | 2 |
| Attachment 2 | Standard Form 25A, "Payment Bond" | 2 |
| Attachment 3 | Sample Bank Letter of Guaranty | 1 |
| Attachment 4 | Breakdown of Price by Divisions of Specifications | 8 |
| Attachment 5 | Drawings & Specifications | 186 |

The remainder of this page is intentionally blank.

J. QUOTATION INFORMATION

The Offeror shall include Defense Base Act (DBA) insurance premium costs covering employees. The offeror may obtain DBA insurance directly from any Department of Labor approved providers at the DOL website at <http://www.dol.gov/owcp/dlhwc/lscarrier.htm>

A. QUALIFICATIONS OF OFFERORS

Offerors/quoters must be technically qualified and financially responsible to perform the work described in this solicitation. At a minimum, each Offeror/Quoter must meet the following requirements:

- (1) Be able to understand written and spoken English;
- (2) Have an established business with a permanent address and telephone listing;
- (3) Be able to demonstrate prior construction experience with suitable references;
- (4) Have the necessary personnel, equipment and financial resources available to perform the work;
- (5) Have all licenses and permits required by local law;
- (6) Meet all local insurance requirements;
- (7) Have the ability to obtain or to post adequate performance security, such as bonds, irrevocable letters of credit or guarantees issued by a reputable financial institution;
- (8) Have no adverse criminal record; and
- (9) Have no political or business affiliation which could be considered contrary to the interests of the United States.

B. SUBMISSION OF QUOTATIONS

This solicitation is for the performance of the construction services described in SCOPE OF WORK, and the Attachments which are a part of this request for quotation.

| Each quotation must consist of the following: | | |
|---|--|-------------------|
| VOLUME | TITLE | NUMBER OF COPIES* |
| I | Standard Form 18 including a completed Attachment 4, "BREAKDOWN OF PROPOSAL PRICE BY DIVISIONS OF SPECIFICATIONS | 1 |
| II | Performance schedule in the form of a "bar chart" and Business Management/Technical Proposal | 1 |

Submit the complete quotation to the address indicated. If mailed, on Standard Form 18, or if hand-delivered, use the address set forth below:

CairoContracts@state.gov (preferred)

U.S. Embassy Cairo

ATTN: GSO/Contracting Office

8 Kamal El Din Salah Street

Garden City, Cairo, Egypt

The Offeror/Quoter shall identify and explain/justify any deviations, exceptions, or conditional assumptions taken with respect to any of the instructions or requirements of this request for quotation in the appropriate volume of the offer.

Volume II: Performance schedule and Business Management/Technical Proposal.

(a) Present the performance schedule in the form of a "bar chart" indicating when the various portions of the work will be commenced and completed within the required schedule. This bar chart shall be in sufficient detail to clearly show each segregable portion of work and its planned commencement and completion date.

(b) The Business Management/Technical Proposal shall be in two parts, including the following information:

Proposed Work Information - Provide the following:

- (1) A list of the names, addresses and telephone numbers of the owners, partners, and principal officers of the Offeror;
- (2) The name and address of the Offeror's field superintendent for this project;
- (3) A list of the names, addresses, and telephone numbers of subcontractors and principal materials suppliers to be used on the project, indicating what portions of the work will be performed by them; and,

Experience and Past Performance - List all contracts and subcontracts your company has held over the past three years for the same or similar work. Provide the following information for each contract and subcontract:

- (1) Customer's name, address, and telephone numbers of customer's lead contract and technical personnel;
- (2) Contract number and type;
- (3) Date of the contract award place(s) of performance, and completion dates;
Contract dollar value;
- (4) Brief description of the work, including responsibilities; and
- (5) Any litigation currently in process or occurring within last 5 years.

C. 52.236-27 SITE VISIT (CONSTRUCTION) (FEB 1995)

(a) The clauses at 52.236-2, Differing Site Conditions, and 52.236-3, Site Investigations and Conditions Affecting the Work, will be included in any contract awarded as a result of this solicitation. Accordingly, offerors or quoters are urged and expected to inspect the site where the work will be performed.

(b) A site visit has been scheduled for **March 10, 2021 at 10:30 AM** (**Please make sure to be at site at least 30 mins prior to allow time for security check**)

(c) Participants will meet at **55 Rd 17 Maadi, Cairo Egypt.**

D. MAGNITUDE OF CONSTRUCTION PROJECT

It is anticipated that the range in price of this contract will be:

Between \$100,000.00 and \$250,000.00

E. LATE QUOTATIONS. Late quotations shall be handled in accordance with FAR.

F. 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates the following provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer.

Also, the full text of a solicitation provision may be accessed electronically at: <http://acquisition.gov/far/index.html/> or <http://farsite.hill.af.mil/vffara.htm>. Please note these addresses are subject to change.

If the Federal Acquisition Regulation (FAR) is not available at the locations indicated above, use the Department of State Acquisition website at <http://www.statebuy.state.gov> to access the link to the FAR, or use of an Internet "search engine" (for example, Google, Yahoo or Excite) is suggested to obtain the latest location of the most current FAR.

The following Federal Acquisition Regulation provisions are incorporated by reference (48 CFR CH. 1):

| <u>PROVISION</u> | <u>TITLE AND DATE</u> |
|------------------|--|
| 52.204-7 | SYSTEM FOR AWARD MANAGEMENT (OCT 2018) |
| 52.204-7 ALT-I | SYSTEM FOR AWARD MANAGEMENT (OCT 2018) |
| 52.204-16 | COMMERCIAL AND GOVERNMENT ENTITY CODE REPORTING (JUL 2016) |
| 52.214-34 | SUBMISSION OF OFFERS IN THE ENGLISH LANGUAGE (APR 1991) |
| 52.215-1 | INSTRUCTIONS TO OFFERORS--COMPETITIVE ACQUISITION (JAN 2004) |

K. EVALUATION CRITERIA

Award will be made to the lowest priced, acceptable, responsible quoter. The Government reserves the right to reject quotations that are unreasonably low or high in price.

The Government will determine acceptability by assessing the offeror's compliance with the terms of the RFQ. The Government will determine responsibility by analyzing whether the apparent successful quoter complies with the requirements of FAR 9.1, including:

- ability to comply with the required performance period, taking into consideration all existing commercial and governmental business commitments;
- satisfactory record of integrity and business ethics;
- necessary organization, experience, and skills or the ability to obtain them;
- necessary equipment and facilities or the ability to obtain them; and
- otherwise, qualified and eligible to receive an award under applicable laws and regulations.

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SECTION L - REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS OR QUOTERS

L.1 52.204-3 TAXPAYER IDENTIFICATION (OCT 1998)

(a) Definitions.

"Common parent", as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

"Taxpayer Identification Number (TIN)", as used in this provision, means the number required by the IRS to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

- (b) All offerors must submit the information required in paragraphs (d) through (f) of this provision in order to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325 (d), reporting requirements of 26 USC 6041, 6041A, and 6050M and implementing regulations issued by the Internal Revenue Service (IRS). If the resulting contract is subject to the reporting requirements described in FAR 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments
- (c) otherwise due under the contract.

- (d) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 USC 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(e) Taxpayer Identification Number (TIN).

TIN: _____

- TIN has been applied for.
- TIN is not required because:
 - Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the U.S. and does not have an office or place of business or a fiscal paying agent in the U.S.;
 - Offeror is an agency or instrumentality of a foreign government;
 - Offeror is an agency or instrumentality of the Federal Government.

(e) Type of Organization.

- Sole Proprietorship;
- Partnership;
- Corporate Entity (not tax exempt);

- Corporate Entity (tax exempt);
- Government Entity (Federal, State or local);
- Foreign Government;
- International organization per 26 CFR 1.6049-4;
- Other _____.

(f) Common Parent.

- Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this clause.
- Name and TIN of common parent:
Name _____
TIN _____

(End of provision)

L.2 FAR 52.204-8 ANNUAL REPRESENTATIONS AND CERTIFICATIONS (MAR 2020)

(a) (1) The North American Industry Classification System (NAICS) code for this acquisition is **236118, 236220, 237110, 237310, 237990.**

236118 - Construction Management, residential remodeling

236220 - Construction Management, commercial and institutional building or Warehouse construction

237110 - Construction Management, water and sewage line and related structures

237310 - Construction Management, highway road, street or bridge

237990 - Construction Management, outdoor recreation facility

(2) The small business size standard is **\$36.5 Million USD.**

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) (1) If the provision at [52.204-7](#), System for Award Management, is included in this solicitation, paragraph (d) of this provision applies.

(2) If the provision at [52.204-7](#), System for Award Management, is not included in this solicitation, and the Offeror has an active registration in the System for Award Management (SAM), the Offeror may choose to use paragraph (d) of this provision instead of completing the corresponding individual representations and certifications in the solicitation. The Offeror shall indicate which option applies by checking one of the following boxes:

(i) Paragraph (d) applies.

(ii) Paragraph (d) does not apply and the offeror has completed the individual representations and certifications in the solicitation.

(c)

(1) The following representations or certifications in SAM are applicable to this solicitation as indicated:

(i) [52.203-2](#), Certificate of Independent Price Determination. This provision applies to solicitations when a firm-fixed-price contract or fixed-price contract with economic price adjustment is contemplated, unless–

(A) The acquisition is to be made under the simplified acquisition procedures in [part 13](#);

(B) The solicitation is a request for technical proposals under two-step sealed bidding procedures; or

(C) The solicitation is for utility services for which rates are set by law or regulation.

(ii) [52.203-11](#), Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions. This provision applies to solicitations expected to exceed \$150,000.

(iii) [52.203-18](#), Prohibition on Contracting with Entities that Require Certain Internal Confidentiality Agreements or Statements-Representation. This provision applies to all solicitations.

(iv) [52.204-3](#), Taxpayer Identification. This provision applies to solicitations that do not include the provision at [52.204-7](#), System for Award Management.

(v) [52.204-5](#), Women-Owned Business (Other Than Small Business). This provision applies to solicitations that–

(A) Are not set aside for small business concerns;

(B) Exceed the simplified acquisition threshold; and

(C) Are for contracts that will be performed in the United States or its outlying areas.

(vi) [52.204-26](#), Covered Telecommunications Equipment or Services-Representation. This provision applies to all solicitations.

(vii) [52.209-2](#), Prohibition on Contracting with Inverted Domestic Corporations-Representation.

(viii) [52.209-5](#), Certification Regarding Responsibility Matters. This provision applies to solicitations where the contract value is expected to exceed the simplified acquisition threshold.

(ix) [52.209-11](#), Representation by Corporations Regarding Delinquent Tax Liability or a Felony Conviction under any Federal Law. This provision applies to all solicitations.

(x) [52.214-14](#), Place of Performance-Sealed Bidding. This provision applies to invitations for bids except those in which the place of performance is specified by the Government.

(xi) [52.215-6](#), Place of Performance. This provision applies to solicitations unless the place of performance is specified by the Government.

(xii) [52.219-1](#), Small Business Program Representations (Basic, Alternates I, and II). This provision applies to solicitations when the contract will be performed in the United States or its outlying areas.

(A) The basic provision applies when the solicitations are issued by other than DoD, NASA, and the Coast Guard.

(B) The provision with its Alternate I applies to solicitations issued by DoD, NASA, or the Coast Guard.

(C) The provision with its Alternate II applies to solicitations that will result in a multiple-award contract with more than one NAICS code assigned.

(xiii) [52.219-2](#), Equal Low Bids. This provision applies to solicitations when contracting by sealed bidding and the contract will be performed in the United States or its outlying areas.

(xiv) [52.222-22](#), Previous Contracts and Compliance Reports. This provision applies to solicitations that include the clause at [52.222-26](#), Equal Opportunity.

(xv) [52.222-25](#), Affirmative Action Compliance. This provision applies to solicitations, other than those for construction, when the solicitation includes the clause at [52.222-26](#), Equal Opportunity.

(xvi) [52.222-38](#), Compliance with Veterans' Employment Reporting Requirements. This provision applies to solicitations when it is anticipated the contract award will exceed the simplified acquisition threshold and the contract is not for acquisition of commercial items.

(xvii) [52.223-1](#), Biobased Product Certification. This provision applies to solicitations that require the delivery or specify the use of USDA–designated items; or include the clause at [52.223-2](#), Affirmative Procurement of Biobased Products Under Service and Construction Contracts.

(xviii) [52.223-4](#), Recovered Material Certification. This provision applies to solicitations that are for, or specify the use of, EPA–designated items.

(xix) [52.223-22](#), Public Disclosure of Greenhouse Gas Emissions and Reduction Goals-Representation. This provision applies to solicitations that include the clause at [52.204-7](#).)

(xx) [52.225-2](#), Buy American Certificate. This provision applies to solicitations containing the clause at [52.225-1](#).

(xxi) [52.225-4](#), Buy American-Free Trade Agreements-Israeli Trade Act Certificate. (Basic, Alternates I, II, and III.) This provision applies to solicitations containing the clause at [52.225-3](#).

(A) If the acquisition value is less than \$25,000, the basic provision applies.

(B) If the acquisition value is \$25,000 or more but is less than \$50,000, the provision with its Alternate I applies.

(C) If the acquisition value is \$50,000 or more but is less than \$83,099, the provision with its Alternate II applies.

(D) If the acquisition value is \$83,099 or more but is less than \$100,000, the provision with its Alternate III applies.

(xxii) [52.225-6](#), Trade Agreements Certificate. This provision applies to solicitations containing the clause at [52.225-5](#).

(xxiii) [52.225-20](#), Prohibition on Conducting Restricted Business Operations in Sudan-Certification. This provision applies to all solicitations.

(xxiv) [52.225-25](#), Prohibition on Contracting with Entities Engaging in Certain Activities or Transactions Relating to Iran-Representation and Certifications. This provision applies to all solicitations.

(xxv) [52.226-2](#), Historically Black College or University and Minority Institution Representation. This provision applies to solicitations for research, studies, supplies, or services of the type normally acquired from higher educational institutions.

(2) The following representations or certifications are applicable as indicated by the Contracting Officer:

[Contracting Officer check as appropriate.]

(i) [52.204-17](#), Ownership or Control of Offeror.

(ii) [52.204-20](#), Predecessor of Offeror.

(iii) [52.222-18](#), Certification Regarding Knowledge of Child Labor for Listed End Products.

(iv) [52.222-48](#), Exemption from Application of the Service Contract Labor Standards to Contracts for Maintenance, Calibration, or Repair of Certain Equipment-Certification.

(v) [52.222-52](#), Exemption from Application of the Service Contract Labor Standards to Contracts for Certain Services-Certification.

(vi) [52.223-9](#), with its Alternate I, Estimate of Percentage of Recovered Material Content for EPA–Designated Products (Alternate I only).

(vii) [52.227-6](#), Royalty Information.

(A) Basic.

(B) Alternate I.

(viii) [52.227-15](#), Representation of Limited Rights Data and Restricted Computer Software.

(d) The offeror has completed the annual representations and certifications electronically in SAM website accessed through <https://www.sam.gov>. After reviewing the SAM information, the offeror verifies by submission of the offer that the representations and certifications currently posted electronically that apply to this solicitation as indicated in paragraph (c) of this

provision have been entered or updated within the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR [4.1201](#)); except for the changes identified below [*offeror to insert changes, identifying change by clause number, title, date*]. These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer.

| FAR Clause # | Title | Date | Change |
|--------------|-------|------|--------|
| _____ | | | |

Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on SAM

(End of provision)

L.3 52.204–24 Representation Regarding Certain Telecommunications and Video Surveillance Services or Equipment (OCT 2020).

The Offeror shall not complete the representation at paragraph (d)(1) of this provision if the offeror has represented that it “does not provide covered telecommunications equipment or services as a part of its offered products or services to the Government in the performance of any contract, subcontract, or other contractual instrument” in paragraph (c)(1) in the provision at 52.204–26, Covered Telecommunications Equipment or Services—Representation, or in paragraph (v)(2)(i) of the provision at 52.212–3, Offeror Representations and Certifications—Commercial Items. The Offeror shall not complete the representation in paragraph (d)(2) of this provision if the Offeror has represented that it “does not use covered telecommunications equipment or services, or any equipment, system, or service that uses covered telecommunications equipment or services” in paragraph (c)(2) of the provision at 52.204–26, or in paragraph (v)(2)(ii) of the provision at 52.212–3.

(a) *Definitions.* As used in this provision—

Backhaul, covered telecommunications equipment or services, critical technology, interconnection arrangements, reasonable inquiry, roaming, and substantial or essential component have the meanings provided in the clause [52.204-25](#), Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment.

(b) *Prohibition.*

(1) Section 889(a)(1)(A) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2019, from procuring or obtaining, or extending or renewing a contract to procure or obtain, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. Nothing in the prohibition shall be construed to—

(i) Prohibit the head of an executive agency from procuring with an entity to provide a service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(ii) Cover telecommunications equipment that cannot route or redirect user data traffic or cannot permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(2) Section 889(a)(1)(B) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2020, from entering into a contract or extending or renewing a contract with an entity that uses any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. This prohibition applies to the use of covered telecommunications equipment or services, regardless of whether that use is in performance of work under a Federal contract. Nothing in the prohibition shall be construed to—

(i) Prohibit the head of an executive agency from procuring with an entity to provide a service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(ii) Cover telecommunications equipment that cannot route or redirect user data traffic or cannot permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(c) *Procedures.* The Offeror shall review the list of excluded parties in the System for Award Management (SAM) (<https://www.sam.gov>) for entities excluded from receiving federal awards for “covered telecommunications equipment or services”.

(d) *Representation.* The Offeror represents that—

(1) It will, will not provide covered telecommunications equipment or services to the Government in the performance of any contract, subcontract or other contractual instrument resulting from this solicitation. The Offeror shall provide the additional disclosure

information required at paragraph (e)(1) of this section if the Offeror responds “will” in paragraph (d)(1) of this section; and

(2)After conducting a reasonable inquiry, for purposes of this representation, the Offeror represents that—

It does, does not use covered telecommunications equipment or services, or use any equipment, system, or service that uses covered telecommunications equipment or services. The Offeror shall provide the additional disclosure information required at paragraph (e)(2) of this section if the Offeror responds “does” in paragraph (d)(2) of this section.

(e) *Disclosures.*

(1) Disclosure for the representation in paragraph (d)(1) of this provision. If the Offeror has responded “will” in the representation in paragraph (d)(1) of this provision, the Offeror shall provide the following information as part of the offer:

(i)For covered equipment—

(A)The entity that produced the covered telecommunications equipment (include entity name, unique entity identifier, CAGE code, and whether the entity was the original equipment manufacturer (OEM) or a distributor, if known);

(B)A description of all covered telecommunications equipment offered (include brand; model number, such as OEM number, manufacturer part number, or wholesaler number; and item description, as applicable); and

(C)Explanation of the proposed use of covered telecommunications equipment and any factors relevant to determining if such use would be permissible under the prohibition in paragraph (b)(1) of this provision.

(ii)For covered services—

(A)If the service is related to item maintenance: A description of all covered telecommunications services offered (include on the item being maintained: Brand; model number, such as OEM number, manufacturer part number, or wholesaler number; and item description, as applicable); or

(B)If not associated with maintenance, the Product Service Code (PSC) of the service being provided; and explanation of the proposed use of covered telecommunications services and any factors relevant to determining if such use would be permissible under the prohibition in paragraph (b)(1) of this provision.

(2) Disclosure for the representation in paragraph (d)(2) of this provision. If the Offeror has responded “does” in the representation in paragraph (d)(2) of this provision, the Offeror shall provide the following information as part of the offer:

(i) For covered equipment—

(A) The entity that produced the covered telecommunications equipment (include entity name, unique entity identifier, CAGE code, and whether the entity was the OEM or a distributor, if known);

(B) A description of all covered telecommunications equipment offered (include brand; model number, such as OEM number, manufacturer part number, or wholesaler number; and item description, as applicable); and

(C) Explanation of the proposed use of covered telecommunications equipment and any factors relevant to determining if such use would be permissible under the prohibition in paragraph (b)(2) of this provision.

(ii) For covered services—

(A) If the service is related to item maintenance: A description of all covered telecommunications services offered (include on the item being maintained: Brand; model number, such as OEM number, manufacturer part number, or wholesaler number; and item description, as applicable); or

(B) If not associated with maintenance, the PSC of the service being provided; and explanation of the proposed use of covered telecommunications services and any factors relevant to determining if such use would be permissible under the prohibition in paragraph (b)(2) of this provision.

(End of provision)

L.4. 52.209-2 PROHIBITION ON CONTRACTING WITH INVERTED DOMESTIC CORPORATIONS REPRESENTATION (Nov 2015)

(a) Definitions. “Inverted domestic corporation” and “subsidiary” have the meaning given in the clause of this contract entitled Prohibition on Contracting with Inverted Domestic Corporations ([52.209-10](#)).

(b) Government agencies are not permitted to use appropriated (or otherwise made available) funds for contracts with either an inverted domestic corporation, or a subsidiary of

an inverted domestic corporation, unless the exception at [9.108-2\(b\)](#) applies or the requirement is waived in accordance with the procedures at [9.108-4](#).

(c) Representation. The Offeror represents that.

- (1) It is, is not an inverted domestic corporation; and
- (2) It is, is not a subsidiary of an inverted domestic corporation.

(End of provision)

L.5. 52.225-18 PLACE OF MANUFACTURE (SEPT 2006)

(a) *Definitions.* As used in this clause—

“Manufactured end product” means any end product in Federal Supply Classes (FSC) 1000-9999, except—

- (1) FSC 5510, Lumber and Related Basic Wood Materials;
- (2) Federal Supply Group (FSG) 87, Agricultural Supplies;
- (3) FSG 88, Live Animals;
- (4) FSG 89, Food and Related Consumables;
- (5) FSC 9410, Crude Grades of Plant Materials;
- (6) FSC 9430, Miscellaneous Crude Animal Products, Inedible;
- (7) FSC 9440, Miscellaneous Crude Agricultural and Forestry Products;
- (8) FSC 9610, Ores;
- (9) FSC 9620, Minerals, Natural and Synthetic; and
- (10) FSC 9630, Additive Metal Materials.

“Place of manufacture” means the place where an end product is assembled out of components, or otherwise made or processed from raw materials into the finished product that is to be provided to the Government. If a product is disassembled and reassembled, the place of reassembly is not the place of manufacture.

(b) For statistical purposes only, the offeror shall indicate whether the place of manufacture of the end products it expects to provide in response to this solicitation is predominantly—

- (1) In the United States (Check this box if the total anticipated price of offered end products manufactured in the United States exceeds the total anticipated price of offered end products manufactured outside the United States); or
- (2) Outside the United States.

(End of provision)

L.6 AUTHORIZED CONTRACTOR ADMINISTRATOR

If the offeror does not fill-in the blanks below, the official who signed the offer will be deemed to be the offeror's representative for Contract Administration, which includes all matters pertaining to payments.

| |
|-------------------|
| Name: |
| Telephone Number: |
| Address: |
| |

L.7 52.225-20 PROHIBITION ON CONDUCTING RESTRICTED BUSINESS OPERATIONS IN SUDAN – CERTIFICATION (AUG 2009)

(a) *Definitions.* As used in this provision—

“Business operations” means engaging in commerce in any form, including by acquiring, developing, maintaining, owning, selling, possessing, leasing, or operating equipment, facilities, personnel, products, services, personal property, real property, or any other apparatus of business or commerce.

“Marginalized populations of Sudan” means—

- (1) Adversely affected groups in regions authorized to receive assistance under section 8(c) of the Darfur Peace and Accountability Act (Pub. L. 109-344) (50 U.S.C. 1701 note); and
- (2) Marginalized areas in Northern Sudan described in section 4(9) of such Act.

“Restricted business operations” means business operations in Sudan that include power production activities, mineral extraction activities, oil-related activities, or the production of military equipment, as those terms are defined in the Sudan Accountability and Divestment Act of 2007 (Pub. L. 110-174). Restricted business operations do not include business operations that the person conducting the business can demonstrate—

- (1) Are conducted under contract directly and exclusively with the regional government of southern Sudan;
- (2) Are conducted pursuant to specific authorization from the Office of Foreign Assets Control in the Department of the Treasury, or are expressly exempted under Federal law from the requirement to be conducted under such authorization;
- (3) Consist of providing goods or services to marginalized populations of Sudan;
- (4) Consist of providing goods or services to an internationally recognized peacekeeping force or humanitarian organization;
- (5) Consist of providing goods or services that are used only to promote health or education; or
- (6) Have been voluntarily suspended.

(b) *Certification.* By submission of its offer, the offeror certifies that it does not conduct any restricted business operations in Sudan.

(End of provision)

ATTACHMENT 1

| | | |
|---|---|---|
| PERFORMANCE BOND <i>(See instructions on reverse)</i> | DATE BOND EXECUTED <i>(Must be same or later than date of contract)</i> | OMB Number: 9000-0045 Expiration Date: 6/30/2016 |
|---|---|---|

Public reporting burden for this collection of information is estimated to average 25 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (MVR), Federal Acquisition Policy Division, GSA, Washington, DC 20405

| | | | | | |
|---|---|---------------|--------------|------------|-------|
| PRINCIPAL <i>(Legal name and business address)</i> | TYPE OF ORGANIZATION ("X" one) <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> CORPORATION | | | | |
| STATE OF INCORPORATION | | | | | |
| SURETY(IES) <i>(Name(s) and business address(es))</i> | PENAL SUM OF BOND | | | | |
| | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:25%;">MILLION(S)</td> <td style="width:25%;">THOUSANDS</td> <td style="width:25%;">HUNDRED(S)</td> <td style="width:25%;">CENTS</td> </tr> </table> | MILLION(S) | THOUSANDS | HUNDRED(S) | CENTS |
| MILLION(S) | THOUSANDS | HUNDRED(S) | CENTS | | |
| | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:50%;">CONTRACT DATE</td> <td style="width:50%;">CONTRACT NO.</td> </tr> </table> | CONTRACT DATE | CONTRACT NO. | | |
| CONTRACT DATE | CONTRACT NO. | | | | |

OBLIGATION

We, the Principal and Surety (ies), are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS

The Principal has entered into the contract identified above.

THEREFORE

The above obligation is void if the Principal-

(a)(1) Performs and fulfills all the undertaking, covenants, terms, conditions, and agreements of the contract during the original term of the contract and any extensions thereof that are granted by the Government, with or without notice of the Surety(ies) and during the life of any guaranty required under the contract, and (2) performs and fulfills all the undertakings, covenants, terms conditions, and agreements of any and all duly authorized modifications of the contract that hereafter are made. Notice of those modifications to the Surety(ies) are waived.

(b) Pays to the Government the full amount of the taxes imposed by the Government, if the said contracts is subject to the Miller Act, (40 U.S.C. 270a-270e), which are collected, deducted, or withheld from wages paid by the Principal in carrying out the construction contract with respect to which this bond is furnished.

WITNESS

The Principal and Surety(ies) executed this performance bond and affixed their seals on the above date.

PRINCIPAL

| | | | | |
|--------------------------------------|--|--|--|----------------|
| SIGNATURE(S) | 1. _____ <div style="text-align: right;">(Seal)</div> | 2. _____ <div style="text-align: right;">(Seal)</div> | 3. _____ <div style="text-align: right;">(Seal)</div> | Corporate Seal |
| NAME(S) & TITLE(S) <i>(Typed)</i> | 1. _____ | 2. _____ | 3. _____ | |

INDIVIDUAL SURETY(IES)

| | | |
|---------------------------|--|--|
| SIGNATURE(S) | 1. _____ <div style="text-align: right;">(Seal)</div> | 2. _____ <div style="text-align: right;">(Seal)</div> |
| NAME(S) <i>(Typed)</i> | 1. _____ | 2. _____ |

CORPORATE SURETY(IES)

| | | | | | |
|-----------------|--------------------------------------|----------|---------------|----------------------|----------------|
| SURETY A | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT (\$) | Corporate Seal |
| | SIGNATURE(S) | 1. _____ | 2. _____ | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. _____ | 2. _____ | | |

CORPORATE SURETY(IES) (Continued)

| | | | | | |
|-----------------|--------------------------------------|----|---------------|----------------------|----------------|
| SURETY B | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT (\$) | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. | 2. | | |
| SURETY C | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT (\$) | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. | 2. | | |
| SURETY D | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT (\$) | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. | 2. | | |
| SURETY E | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT (\$) | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. | 2. | | |
| SURETY F | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT (\$) | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. | 2. | | |
| SURETY G | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT (\$) | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. | 2. | | |

| | | |
|---------------------|------------------------|------------|
| BOND PREMIUM | RATE PER THOUSAND (\$) | TOTAL (\$) |
|---------------------|------------------------|------------|

INSTRUCTIONS

1. This form is authorized for use in connection with Government contracts. Any deviation from this form will require the written approval of the Administrator of General Services.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., and attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. (a) Corporations executing the bond as sureties must appear on the department of the Treasury's list of approved sureties and must act within the limitation listed therein. Where more than one corporate surety is involved, their names and addresses shall appear in the spaces (Surety A, Surety B, etc.) headed "CORPORATE

SURETY(IES)." In the space designated "SURETY(IES)" on the face of the form, insert only the letter identification of the sureties.

(b) Where individual sureties are involved, a completed Affidavit of Individual Surety (standard Form 28) for each individual surety, shall accompany the bond. The Government may require the surety to furnish additional substantiating information concerning their financial capability.

4. Corporation executing the bond shall affix their corporate seals. Individual shall execute the bond opposite the word "Corporate Seal", and shall affix an adhesive seal if executed in Maine, New Hampshire, or any other jurisdiction requiring adhesive seals.

5. Type the name and title of each person signing this bond in the space provided.

ATTACHMENT #2

| | | |
|---|---|---------------------------|
| PAYMENT BOND <i>(See instructions on reverse)</i> | DATE BOND EXECUTED <i>(Must be same or later than date of contract)</i> | OMB No.: 9000-0045 |
|---|---|---------------------------|

Public reporting burden for this collection of information is estimate to average 25 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the FAR Secretariat (MVR), Federal Acquisition Policy Division, GSA, Washington, DC 20405

| PRINCIPAL <i>(Legal name and business address)</i> | TYPE OF ORGANIZATION (" <i>X</i> " one) <input type="checkbox"/> INDIVIDUAL <input type="checkbox"/> PARTNERSHIP <input type="checkbox"/> JOINT VENTURE <input type="checkbox"/> CORPORATION STATE OF INCORPORATION | | | | | | | | | | | | | | | | | | | | |
|---|---|-------------------|-------|--|--|------------|-------------|------------|-------|--|--|--|--|---------------|--|--------------|--|--|--|--|--|
| SURETY(IES) <i>(Name(s) and business address(es))</i> | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th colspan="4" style="text-align: center;">PENAL SUM OF BOND</th> </tr> <tr> <td style="width:25%;">MILLION(S)</td> <td style="width:25%;">THOUSAND(S)</td> <td style="width:25%;">HUNDRED(S)</td> <td style="width:25%;">CENTS</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td colspan="2">CONTRACT DATE</td> <td colspan="2">CONTRACT NO.</td> </tr> <tr> <td colspan="2"> </td> <td colspan="2"> </td> </tr> </table> | PENAL SUM OF BOND | | | | MILLION(S) | THOUSAND(S) | HUNDRED(S) | CENTS | | | | | CONTRACT DATE | | CONTRACT NO. | | | | | |
| PENAL SUM OF BOND | | | | | | | | | | | | | | | | | | | | | |
| MILLION(S) | THOUSAND(S) | HUNDRED(S) | CENTS | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| CONTRACT DATE | | CONTRACT NO. | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |

OBLIGATION:

We, the Principal and Surety(ies), are firmly bound to the United States of America (hereinafter called the Government) in the above penal sum. For payment of the penal sum, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally. However, where the Sureties are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" as well as "severally" only for the purpose of allowing a joint action or actions against any or all of us. For all other purposes, each Surety binds itself, jointly and severally with the Principal, for the payment of the sum shown opposite the name of the Surety. If no limit of liability is indicated, the limit of liability is the full amount of the penal sum.

CONDITIONS:

The above obligation is void if the Principal promptly makes payment to all persons having a direct relationship with the Principal or a subcontractor of the Principal for furnishing labor, material or both in the prosecution of the work provided for in the contract identified above, and any authorized modifications of the contract that subsequently are made. Notice of those modifications to the Surety(ies) are waived.

WITNESS:

The Principal and Surety(ies) executed this payment bond and affixed their seals on the above date.

| PRINCIPAL | | | | | |
|--------------------------------------|--|--|--|-----------------------------|----------------|
| SIGNATURE(S) | 1. _____ <div style="text-align: right; font-size: x-small;">(Seal)</div> | 2. _____ <div style="text-align: right; font-size: x-small;">(Seal)</div> | 3. _____ <div style="text-align: right; font-size: x-small;">(Seal)</div> | Corporate Seal | |
| NAME(S) & TITLE(S) <i>(Typed)</i> | 1. _____ | 2. _____ | 3. _____ | | |
| INDIVIDUAL SURETY(IES) | | | | | |
| SIGNATURE(S) | 1. _____ <div style="text-align: right; font-size: x-small;">(Seal)</div> | 2. _____ <div style="text-align: right; font-size: x-small;">(Seal)</div> | | | |
| NAME(S) <i>(Typed)</i> | 1. _____ | 2. _____ | | | |
| CORPORATE SURETY(IES) | | | | | |
| SURETY A | NAME & ADDRESS | 1. _____ | STATE OF INC. | LIABILITY LIMIT \$ _____ | Corporate Seal |
| | SIGNATURE(S) | 1. _____ | 2. _____ | | |
| | NAME(S) & TITLE(S) <i>(Typed)</i> | 1. _____ | 2. _____ | | |

CORPORATE SURETY(IES) (Continued)

| | | | | | |
|-----------------|-------------------------------|----|---------------|-----------------------|----------------|
| SURETY B | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT \$ | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) (Typed) | 1. | 2. | | |
| SURETY C | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT \$ | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) (Typed) | 1. | 2. | | |
| SURETY D | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT \$ | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) (Typed) | 1. | 2. | | |
| SURETY E | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT \$ | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) (Typed) | 1. | 2. | | |
| SURETY F | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT \$ | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) (Typed) | 1. | 2. | | |
| SURETY G | NAME & ADDRESS | | STATE OF INC. | LIABILITY LIMIT \$ | Corporate Seal |
| | SIGNATURE(S) | 1. | 2. | | |
| | NAME(S) & TITLE(S) (Typed) | 1. | 2. | | |

INSTRUCTIONS

1. This form, for the protection of persons supplying labor and material, is used when a payment bond is required under the Act of August 24, 1935, 49 Stat. 793 (40 U.S.C. 270a-270e). Any deviation from this form will require the written approval of the Administrator of General Services.

2. Insert the full legal name and business address of the Principal in the space designated "Principal" on the face of the form. An authorized person shall sign the bond. Any person signing in a representative capacity (e.g., an attorney-in-fact) must furnish evidence of authority if that representative is not a member of the firm, partnership, or joint venture, or an officer of the corporation involved.

3. (a) Corporations executing the bond as sureties must appear on the Department of the Treasury's list of approved sureties and must act within the limitation listed therein. Where more than one corporate surety is involved, their names and addresses shall appear in the spaces (Surety A, Surety B, etc.) headed "CORPORATE SURETY(IES)." In the space designated

"SURETY(IES)" on the face of the form, insert only the letter identification of the sureties.

(b) Where individual sureties are involved, a completed Affidavit of Individual Surety (Standard Form 28) for each individual surety, shall accompany the bond. The Government may require the surety to furnish additional substantiating information concerning their financial capability.

4. Corporations executing the bond shall affix their corporate seals. Individuals shall execute the bond opposite the word "Corporate Seal", and shall affix an adhesive seal if executed in Maine, New Hampshire, or any other jurisdiction requiring adhesive seals.

5. Type the name and title of each person signing this bond in the space provided.

ATTACHMENT #3 - SAMPLE LETTER OF BANK GUARANTY

Place _____
Date _____

Contracting Officer
U.S. Embassy, **Cairo**
8 Kamal El Din Salah Garden City
Cairo Egypt

Letter of Guaranty No. _____

SUBJECT: Performance and Guaranty

The Undersigned, acting as the duly authorized representative of the bank, declares that the bank hereby guarantees to make payment to the Contracting Officer by check made payable to the Treasurer of the United States, immediately upon notice, after receipt of a simple written request from the Contracting Officer, immediately and entirely without any need for the Contracting Officer to protest or take any legal action or obtain the prior consent of the Contractor to show any other proof, action, or decision by another authority, up to the sum of **[amount equal to 20% of the contract price in U.S. dollars during the period ending with the date of final acceptance and 10% of the contract price during contract guaranty period]**, which represents the deposit required of the Contractor to guarantee fulfillment of his obligations for the satisfactory, complete, and timely performance of the said contract **[contract number]** for **[description of work]** at **[location of work]** in strict compliance with the terms, conditions and specifications of said contract, entered into between the Government and **[name of contractor]** of **[address of contractor]** on **[contract date]**, plus legal charges of 10% per annum on the amount called due, calculated on the sixth day following receipt of the Contracting Officer’s written request until the date of payment.

The undersigned agrees and consents that said contract may be modified by Change Order or Supplemental Agreement affecting the validity of the guaranty provided, however, that the amount of this guaranty shall remain unchanged.

The undersigned agrees and consents that the Contracting Officer may make repeated partial demands on the guaranty up to the total amount of this guaranty, and the bank will promptly honor each individual demand.

This letter of guaranty shall remain in effect until 3 months after completion of the guaranty period of Contract requirement.

Depository Institution: **[name]**
Address: _____
Representatives: _____ Location: _____
State of Inc.: _____
Corporate Seal: _____

Certificate of Authority is attached evidencing authority of the signer to bind the bank to this document.



ATTACHMENT #4 - Breakdown of Price by Divisions of Specifications

TENDER DOCUMENTS

BREAKDOWN OF PROPOSAL PRICES

PROJECT: 55 Road 17 & 11 RD 11 Apartment Renovation

| Div/Spec . No. | Item | | | | Base Year 3 BDR Apt. | | | |
|---|--|---|------|-----|-------------------------|----------|-------|------------|
| | No. | Description | Unit | Qty | Unit Cost EGP | | | Total Cost |
| | | | | | Labor | Material | Total | EGP |
| CLIN #1 (Apartment #13, at 55 RD 17 Maadi) | | | | | | | | |
| Salvaged Items | | | | | | | | |
| | 1 | Bathroom wooden vanities | l.s | 1 | | | | |
| | 2 | Bathroom fixtures and accessories | l.s | 1 | | | | |
| | 3 | Closets Shelves | l.s | 1 | | | | |
| | 4 | Granite tops | l.s | 1 | | | | |
| | 5 | Aluminum windows and balcony doors | l.s | 1 | | | | |
| | Totals of Salvaged Items | | | | | | | |
| DIVISION 1 GENERAL CONDITIONS | | | | | | | | |
| Mobilization, Temporary Utilities, Scaffolding, shutters, compliance with Safety and health requirements of the US Army Corps of Engineers, etc. | | | | | | | | |
| | 1 | Mobilization | l.s | 1 | | | | |
| | 2 | Compliance with safety | l.s | 1 | | | | |
| DIVISION 2 EXISTING CONDITIONS | | | | | | | | |
| 024119 | Selective Demolition | | | | | | | |
| | <i>Demolishing; removing and dismantling of the existing elements required for the new design including, but not limited to the following;</i> | | | | | | | |
| | 1 | Demolish existing ceramic Walls & Floors tiles of bathrooms & kitchen | m2 | 100 | | | | |
| | 2 | Demolish existing porcelain Floors in reception, lobby, masterbedroom, bedroom 2, bedroom 3, corridor, Walk-In closet 1, Walk-In closet 2, Utility room 1 & Utility room 2. | m2 | 156 | | | | |
| | 3 | Demolish existing Porcelain Baseboards in reception, lobby, master bedroom, bedroom 2, bedroom 3, corridor, Walk-In closet 1 & Walk-In closet 2, Utility room 1 ,Utility room 2 & Balconies | l.m | 158 | | | | |
| | 4 | Drop ceiling in entrance lobby, corridor & kitchen | m2 | 35 | | | | |
| | 5 | Drop ceiling in Bathroom 1 & 2 | m2 | 11 | | | | |
| | 6 | Linear chiseling for electric | l.s | 1 | | | | |
| | 7 | Water closet (salvaged to be reinstalled, and delivered to COR) | ea | 2 | | | | |
| | 8 | Bath tub (salvaged to be reinstalled, and delivered to COR) | ea | 1 | | | | |
| | 9 | Walk-in shower (salvaged to be reinstalled, and delivered to COR) | ea | 1 | | | | |
| | 10 | Wooden Vanity | ea | 2 | | | | |
| | 11 | Bathrooms Drop-In sink | ea | 2 | | | | |
| | 12 | Bathrooms and kitchen exposed plumbing piping and fitting | l.s | 1 | | | | |
| | 13 | Existing AC unit (Window type brand BARD or concealed type - Carrier or unionair) to be returned to embassy (government) | ea | 2 | | | | |

| | | | | |
|---|---|---|-----|-----|
| | 14 | Existing ductwork | l.s | 1 |
| | 15 | Existing thermostat | ea. | 2 |
| DIVISION 4 MASONRY | | | | |
| 042200 | Unit Masonry | | | |
| | 1 | Block openings in kitchen and bathrooms. | ls | 1 |
| | 2 | Block opening in reception balcony | ls | 1 |
| DIVISION 7 THERMAL AND MOISTURE PROTECTION | | | | |
| 071113 | Waterproofing | | | |
| | <i>Cold applied, Bituminous waterproofing emulsion for underground concrete and masonry surfaces, product of Insumat, Eamic, Sika, or equal approved, for;</i> | | | |
| | 1 | Bathrooms floors and walls for a height of 200mm, 2 coats of cold applied bitumen | m2 | 12 |
| DIVISION 9 FINISHES | | | | |
| 092400 | Cement Plastering | | | |
| | <i>Portland cement plaster; plain finish; including metal angle beads, stop beads; metal lathing; accessories for fittings; to</i> | | | |
| | 1 | New masonry walls in kitchen and bathrooms. | l.s | 1 |
| | 2 | Patch plaster | l.s | 1 |
| 092900 | Gypsum board | | | |
| | <i>Gypsum board suspended ceilings; including suspension system; to</i> | | | |
| | 1 | Entrance lobby | m2 | 12 |
| | 2 | Kitchen (green) | m2 | 18 |
| | 3 | Bedrooms corridor & closets | m2 | 20 |
| | 4 | Bathroom #1 (green) | m2 | 6.5 |
| | 5 | Bathroom #2 (green) | m2 | 5.5 |
| | 6 | The enclosed balcony | m2 | 9.5 |
| | 7 | Futec cornices (see Dwg. A06) | LM | 35 |
| 093013 | Ceramic and Porcelain Tiling | | | |
| | <i>Porcelain tiles and fittings, Local, including fixing, sand leveling, and mortar bedding as approved samples and as selected by the COR to (average price 500 LE/m2)</i> | | | |
| | Floors, minimum size of 600 X 600 mm | | | |
| | 1 | Entrance, reception, Kitchen, utility rooms, corridor, balconies and bedrooms and walk-in closets | m2 | 190 |
| | 2 | Skirting using same floor tiles, 100 mm height | l.m | 170 |
| | <i>Ceramic tiles and fittings; locally fabricated by El Gawhara, Cleopatra, or equal approved, including fixing; sand leveling and mortar bedding as approved samples; to (average price 150 LE/m2)</i> | | | |
| | 3 | Ceramic Floors & Wall Tiles, min. size is 300 x 300 mm for Bathrooms | m2 | 75 |
| | 4 | Ceramic Wall Tiles, min. size is 300 x 300 mm for Kitchen between the lower & upper cabinet | m2 | 15 |
| 096340 | Stone Flooring | | | |
| | <i>Marble and Granite shall be as specified and as per the approved sample including fixation using cement mortar or thin set adhesive</i> | | | |
| | Bathroom #1(Countertop 60cm depth, Baseboard 10cm and splash back 8cm) | | | |
| | 1 | (see Dwg. A08) | ls | 1 |

| | | | | |
|--------|---|---|----|-----|
| | 2 | Bathroom # 2 (Countertop 60cm depth and splash back 8cm) (see Dwg. A08) | ls | 1 |
| | 3 | Kitchen (Granite Countertop 60cm depth, Baseboard 10cm and splash back 8cm) (see Dwg. A07) | ls | 1 |
| | 4 | Thresholds "imported italian botticino marble" | ea | 4 |
| | 5 | Exterior Door Threshold (Government Furnish, Contractor Installed Items) | ea | 1 |
| | 6 | Marble-built-in walk-in shower, with border threshold, "italian botticino marble" Bathroom-2 | ea | 1 |
| 099100 | Painting | | | |
| | <i>Interior painting, acrylic emulsion paint washable; to concrete, masonry, render and plaster, Fenomastic of Jotun, or equal approved</i> | | | |
| | Interior Walls/ Drywall, Pre-painted | | | |
| | 1 | Painting walls & Ceiling (Pre-painted Wall) two coats of latex paint , following surface preparation (Clean old paint, apply putty, sand and smooth) | m2 | 750 |
| | Wood Painting | | | |
| | 1 | Re-finish Paneled doors 0.9m width, using semi-gloss enamel paint following surface preparation (remove previous paint layers, apply putty, sand and smooth) | ea | 7 |
| | 2 | Re-finish Paneled doors 0.7m width, using semi-gloss enamel paint following surface preparation (remove previous paint layers, apply putty, sand and smooth) | ea | 2 |
| | 3 | Re-finish Closet sliding doors, (Bedroom #2 & 3), 2.5 m width, using semi-gloss enamel paint following surface preparation (remove previous paint layers, apply putty, sand and smooth) | ea | 2 |
| | 4 | Re-finish Closet folding door, corridor (closet #3 & 4), 0.7m width, using semi-gloss enamel paint following surface preparation (remove previous paint layers, apply putty, sand and smooth) | ea | 2 |
| | 5 | Re-finish Closet sliding door, Lobby (1.72 width), using semi-gloss enamel paint following surface preparation (remove previous paint layers, apply putty, sand and smooth) | ea | 1 |
| | 6 | Painting Pre-Painted Wooden Kitchen Cabinets, using semi-gloss enamel paint following surface preparation (remove previous paint layers, apply putty, sand and smooth) | ls | 1 |
| | Metal Painting | | | |
| | 1 | Apartment Entrance Door, using semi-gloss enamel paint following surface preparation (remove previous paint layers, sand and smooth and apply primer) | ea | 1 |
| | 2 | Master bedroom door, using semi-gloss enamel paint following surface preparation (remove previous paint layers, sand and smooth and apply primer) | ea | 1 |
| 064020 | Carpentry | | | |
| | 1 | Bath # 1 wooden cabinets; oak veneer vanity doors with massive oak trims, all accessories to be German made (mirror box, shelves & hardware included) As per attached design drawing A08 | ls | 1 |
| | 2 | Bath # 2 wooden cabinet; oak veneer vanity doors with massive oak trims, all accessories to be German made (mirror box, shelves & hardware included) As per attached design drawing A08 | ls | 1 |

| | | | | |
|----------------------------|---|--|-----|----|
| | 3 | Closet #3 & 4 Shelves,Formica with wooden trim corridor | ls | 1 |
| | 4 | Bedroom #2 & 3 Closets Shelves 2.5x0.6 m, Formica with wooden trim corridor, | ea | 2 |
| | 5 | Walk-In Closets MDF, including shelves, drawers, cloth hangers and all accessories to be German made. As per attached design drawing A07 | l.s | 1 |
| | 6 | Wall mount Door stoppers | ea | 11 |
| | 7 | Paneled Doors Hardware for the paneled doors (including door handle with lock & hinges) | ea | 7 |
| | 8 | Closet Hangers, 2.5m width (Bedroom #2 & 3) | ea | 2 |
| | 9 | Curtain rods, double, 4 m (Reception) | ea | 2 |
| | 10 | Curtain rods, double, 2 m (Master bedroom, bedroom 2, bedroom 3) | ea | 3 |
| 085113 | Aluminum doors and windows | | | |
| | <i>Doors and windows shall be heavy duty "Techncal - Jumbo" profile or approved equal with architectural architrave, engraved "Tempered Glass" stamp for tempered, accessories and hardware as per the approved sample.</i> | | | |
| | 1 | Double, 6 mm, Balcony door, 4 panels, Sliding, 3.6 x 2.10m, Reception area | ea | 2 |
| | 2 | Double, 6 mm, Balcony door, 2 panels, Sliding, 1.8 x 2.10m, Bedrom #2, #3 and Master bedroom | ea | 3 |
| | Bathroom Accessories | | | |
| | 1 | Supply & Install Bathtub 170x90cm (ideal standard or equal approved) | ea | 1 |
| | 2 | Water Closet complete with faucet, seat, flush tank and all accessories. | ea | 2 |
| | 3 | Bathroom Drop-in sink (ideal standard or equal approved) | ea | 2 |
| | 4 | Kitchen Drop-in sink (ideal standard or equal approved) | ea | 1 |
| | 5 | Acrylic shower enclosure. 1.70m width (Duravit, Ideal Standard or equal approved) | ea | 2 |
| | 6 | Bathroom Sink faucet (Government Furnish, Contractor Installed Items) | ea | 2 |
| | 7 | kitchen sink faucet (Government Furnish, Contractor Installed Items) | ea | 1 |
| | 8 | Bathtub faucet (Government Furnish, Contractor Installed Items) | ea | 2 |
| | 9 | Towel rack, 60 cm (Government Furnish, Contractor Installed Items) | ea | 2 |
| | 10 | Towel rack, 45 cm (Government Furnish, Contractor Installed Items) | ea | 2 |
| | 11 | Towel ring (Government Furnish, Contractor Installed Items) | ea | 2 |
| | 12 | Coat hook (Government Furnish, Contractor Installed Items) | ea | 2 |
| | 13 | Soap Holder (Government Furnish, Contractor Installed Items) | ea | 2 |
| | 14 | Toilet paper holder (Government Furnish, Contractor Installed Items) | ea | 2 |
| Division22 Plumbing | | | | |
| | Bathrooms and kitchen Renovation | | | |
| 220523.14 | Check Valves for plumbing piping | | | |

| | | | | |
|--------------------|---|--|-----|-----|
| | | <i>Supply, install, connect, and test check valves for washing machine, dish washer, ... etc complete, including pipes and fittings according DIN 8062.</i> | | |
| | 1 | 20mm check valves | ea. | 4 |
| 220523 | | Gate Valves for plumbing piping | | |
| | 1 | Angle Valve (Grohe or approved equal) | ea. | 10 |
| 220719 | | Plumbing piping insulation | | |
| | 1 | Plumbing piping insulation with 1 inch flexible elastomeric insulation | l.s | 1 |
| 221116 | | Domestic Water Piping | | |
| | | <i>Supply, install, connect, and test poly propylene (PN 20) piping for water circulating systems located inside and outside complete, including pipes and fittings according DIN 8062.</i> | | |
| | 1 | Rough-in piping and fittings | l.s | 1 |
| 221316 | | Sanitary Waste and Vent Piping | | |
| | | <i>Supply, install, connect and test all soil, waste and vent U.P.V.C vertical & horizontal aboveground piping system from all plumbing fixtures to outside the building complete including pipes, fittings, couplings, supports, hangers, roof vent caps and all other accessories as specified</i> | | |
| | 1 | Rough-in piping and fittings (FLEXIBLE CONNECTIONS ARE PROHABITED FOR THE DRAINAGE SYSTEM) | l.s | 1 |
| Division 23 | | Heating ventilation and air conditioning systems | | |
| 230553 | | IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT | | |
| | 1 | Identification for HVAC piping and equipment | l.s | 1 |
| 230593 | | TESTING, ADJUSTING AND BALANCING FOR HVAC | | |
| | 1 | Testing and balancing for the HVAC ductwork per split unit | ea. | 2 |
| 230713 | | DUCT INSULATION | | |
| | | <i>Supplying installing , connecting external insulation of duct work two inch complete with vapor barrier and all accessories as shown on drawing and specification</i> | | |
| | 1 | 2 inch Duct Insulation | m2 | 35 |
| | 2 | Foster (non-flammable) jar | ea. | 1 |
| 230719 | | HVAC PIPING INSULATION | | |
| | | <i>Supplying, installing , connecting and testing of HVAC piping insulation for all the refrigerant piping complete with vapor barrier, silver tape insulation, and all accessories as shown on drawing and specification</i> | | |
| | 1 | Sizes from 1/2" to 1 1/8" refrigerant piping (Only applicable form Apt. 13) | l.m | 20 |
| | 2 | Aluminum foil tape (Only applicable form Apt. 13) | l.s | 1 |
| 232300 | | REFRIGERANT PIPING | | |
| | | <i>Supplying, installing , connecting and testing of HVAC refrigerant piping with different sizes complete with all accessories required and all accessories as shown on drawing and specification</i> | | |
| | 1 | Sizes from 3/4" & 3/8" refrigerant piping (Only applicable form Apt. 13) | l.m | 30 |
| 233113 | | METAL DUCTS | | |
| | | <i>Provide ductwork systems including ductwork, ductwork hangers and supports, equipment, materials, installation, workmanship, fabrication, assembly, erection, and inspection, shall be in accordance with SMACNA HVAC Duct Const Studs as modified and supplemented by the specifications and drawings.</i> | | |
| | 1 | Galvanized steel duct 0.8mm thickness (G90) | kg | 200 |
| | 2 | 6" Diameter Galvanized steel duct and fittings 0.8mm thickness (G90) | l.m | 4 |

| | | | | |
|------------------------------|--|---|-----|---|
| | 3 | 6" Diameter 304 Stainless steel duct and fitting (1.2 mm thickness) gauge 18 | l.m | 3 |
| | 4 | Canvas (Flexible connection) | ea. | 2 |
| 233300 | Air duct accessories | | | |
| | 1 | Opposed blade volume damper up to size 8" x 6" | ea. | 1 |
| | 2 | Opposed blade volume damper up to size 12" x 6" | ea. | 1 |
| | 3 | Opposed blade volume damper up to size 14" x 6" | ea. | 1 |
| | 4 | Opposed blade volume damper up to size 18" x 4" | ea. | 3 |
| | 5 | Opposed blade volume damper up to size 18" x 6" | ea. | 1 |
| 233416 | CENTRIFUGAL HVAC FANS | | | |
| | 1 | Decorative ceiling exhaust fan (100 CFM at 0.1 in.wg.) with Round outlet duct collar, integral backdraft damper and discharge grill - Approved manufactures: Greenheck, S&p or approved equal | ea. | 2 |
| 233713 | DIFFUSERS, REGISTERS AND GRILLES | | | |
| | <i>Supplying installing , connecting , balancing and commission of grille and square ceiling diffuser from painted aluminum section complete with all accessories as shown on drawings and specifications.</i> | | | |
| | 1 | Linear Supply grill c/w damper EGAT or approved equal (28"x6") | ea. | 5 |
| | 2 | Linear Supply grill c/w damper EGAT or approved equal (20"x6") | ea. | 1 |
| | 3 | Supply ceiling diffuser 12"x12" | ea. | 2 |
| | 4 | Supply ceiling diffuser 20"x20" | ea. | 1 |
| | 5 | Return ceiling diffuser 12"x12" | ea. | 1 |
| | 6 | Return ceiling diffuser 20"x20" | ea. | 2 |
| | 7 | Linear return grill c/w damper EGAT or approved equal (35"x10") | ea. | 3 |
| | 8 | Linear return grill c/w damper EGAT or approved equal (24"x6") | ea. | 2 |
| | 9 | Intake fresh air louver c/w manual damper and pre-filter MERV 7 (12"x12") | ea. | 2 |
| 238126 | Concealed Split AC units (Only applicable form Apt. 13) | | | |
| | <p><i>1. Install AC split units such that outdoor unit shall be located on the roof through existing core drills .</i></p> <p><i>2. All outdoor units shall be labeled to indicate the serviced apartment number</i></p> <p><i>3. The power / control cable from the split unit compressor to the evaporator unit shall be part of the contractor work.</i></p> <p><i>4. The control cables shall be provided in relevance to the thermostat.</i></p> <p><i>5. The connection from the thermostat to the unit shall be part of the contractor responsibilities.</i></p> <p><i>6. The connection from the disconnect switch to the unit shall be part of the contractor responsibilities.</i></p> | | | |
| | 1 | Install (Gov. Furnished) split concealed unit 36000 BTU/hr c/w with thermostat Outdoor unit to be installed on the roof as detailed | ea. | 2 |
| | 2 | Outdoor unit roof bracket (manufacturer's standard) | ea. | 2 |
| | 3 | Steel support for disconnect switch, minimum thickness 2mm and for base plate 3mm, primer coated and painted. | ea. | 1 |
| | 4 | Concrete blocks 40cm x 40cm for the steel supports. | ea. | 1 |
| Division26 Electrical | | | | |

Provide electrical services as described in the specification to include supports, hangers, clamps, fittings, etc.

1. The power, lighting and control cable shall be part of the contractor work.
2. All raceways, conduits shall be rigid PVC plenum rated and / or EMT for above ceiling.
3. All connections shall be using wire nuts.
4. All LED installations shall be connected using hard wiring.
5. All receptacles shall be installed with consistent wiring allocation (P-N-G).

| | | | |
|----|--|----|----|
| 1 | Rough-in for electric & piping | ls | 1 |
| 2 | Ceiling Plafonira - (F4) (Government Furnish, Contractor Installed Items) | ea | 1 |
| 3 | Wall Light Sconces - (F3) (Government Furnish, Contractor Installed Items) | ea | 2 |
| 4 | Ceiling fan w/ light fixture - (F1) (Government Furnish, Contractor Installed Items) | ea | 3 |
| 5 | LED light fixture 30x120CM (F5) | ea | 2 |
| 6 | Down light LED Spot 1x9W (S1) | ea | 15 |
| 7 | Down light LED Spot 1x6W (S2) | ea | 8 |
| 8 | Above mirror light unit with 5 LED bulb - (F6) (Government Furnish, Contractor Installed Items) | ea | 2 |
| 9 | Ceiling globe LED 1x12W (F2) | ea | 2 |
| 10 | LED strips 10W/Lm | LM | 45 |
| 11 | Door bell | ea | 1 |
| 12 | Exhaust fan with switched receptacle | ea | 2 |
| 13 | Light switch, one gang | ea | 6 |
| 14 | Light switch, two gang | ea | 5 |
| 15 | Light switch, two gang (W.P.) | ea | 2 |
| 16 | Light switch, two way one gang | ea | 4 |
| 17 | Light switch, two way two gang | ea | 2 |
| 18 | Limit switch for closets | ea | 5 |
| 19 | Single receptacles 10A, 250V (Schukko) | ea | 31 |
| 20 | Duplex receptacles 10A, 250V (Schukko) | ea | 7 |
| 21 | Duplex receptacle 15A,110V GFI (Government Furnish, Contractor Installed Items) | ea | 5 |
| 22 | Power receptacle 30A,dryer GFI (Government Furnish, Contractor Installed Items) | ea | 1 |
| 23 | Power receptacle 30A,stove GFI (Government Furnish, Contractor Installed Items) | ea | 1 |
| 24 | Power Panel 380V, 50Hz | ea | 1 |
| 25 | Power Panel 110V, 50Hz | ea | 1 |
| 26 | Water proof outlets for Kitchen and bathrooms | ea | 5 |
| 27 | Outlet for two RJ45 sockets for communication complete with sockets, wiring, face plates. | | 6 |
| 28 | Outlet for TV RG6 sockets for TV complete with sochets, wiring, face plates. | | 5 |
| 29 | A/C switch, 32 A, 2P | | 2 |
| 30 | Kitchen Hood (Government Furnish, Contractor Installed Items) | ea | 1 |

TOTAL FOR CLIN 1 (Base Bid)

CLIN #2 (Add Alternate #1) Apartment #13, at 55 RD 17

096340

Stone Flooring

Marble and Granite shall be as specified and as per the approved sample including fixation using cement mortar or thin set adhesive

| | | | |
|---|--|----|-----|
| 1 | Marble Floors, Teriesta Marble, 2cm thick Entrance, reception, Kitchen, utility rooms, corridor, balconies and bedrooms and walk-in closets | m2 | 190 |
|---|--|----|-----|

TOTAL FOR CLIN 2 (Add Alternate #1)

CLIN #3 (Add Alternate #2) -Apartment #41, at 11 RD 11 Maadi

| | | | |
|--|--|-----|-----|
| <i>Renovation of Apartment #41, at 11 RD 11 Maadi</i> | | | |
| <i>Same items of CLIN #1 <u>excluding</u> the below mentioned items:</i> | | | |
| 1 | CLIN 1 | l.s | 1 |
| 2 | Sizes from 1/2" to 1 1/8" refrigerant piping (Only applicable form Apt. 13) | l.m | 20 |
| 3 | Aluminum foil tape (Only applicable form Apt. 13) | l.s | 1 |
| 4 | Sizes from 3/4" & 3/8"" refrigerant piping (Only applicable form Apt. 13) | l.m | 30 |
| TOTAL FOR CLIN 3 (Add Alternate #2) | | | |
| CLIN #4 (Add Alternate #3) -Marble flooring at Apartment #41, at 11 RD 11 Maadi | | | |
| 1 | Marble Floors, Teriesta Marble, 2cm thick Entrance, reception, Kitchen, utility rooms, corridor, balconies and bedrooms and walk-in closets | m2 | 190 |
| TOTAL FOR CLIN 4 (Add Alternate #3) | | | |
| Defense Base Act (DBA) insurance premium cost | | | |
| 1 | Defense Base Act (DBA) insurance premium cost | ls | 1 |
| CONTRACT VALUE | | | |
| Total For CLIN 1 (Base Bid) | | | |
| Total For CLIN 2 - (Add Alternate #1)- Marble Flooring | | | |
| Total For CLIN 3 - (Add Alternate #2)- Renovation of Apt. 41 at 11 RD 11 | | | |
| Total For CLIN 4- (Add Alternate #3)- Marble flooring at Apt. 41 at 11 RD 11 | | | |
| Salvaged Items (-ve) Apt. 13 | | | |
| Salvaged Items (-ve) Apt. 41 | | | |
| Defense Base Act (DBA) insurance premium cost | | | |
| <u>Total Contract Value (EGP)</u> | | | |
| <u>Total Contract Value (USD) rate 15.6 EGP</u> | | | |

Notes:

1. The above prices includes all required labor , material, overhead, and profit for the completion of all works specified under this contract.
2. The total price shall be the total lump-sum price.
3. The contractor shall quote for the salvaged items to be deducted from the total price.

ATTACHMENT 5: Drawings and Specifications

Apartment Renovation

55RD17 #13

11RD11 #41



Description, Specifications, Drawings

And

Work Statement

January 2021

TABLE OF CONTENETS

DIVISION 1 GENERAL CONDITIONS

| | |
|--------|-------------------------------------|
| 011000 | SUMMARY OF WORK |
| 012300 | ALTERNATES |
| 013200 | CONSTRUCTION PROGRESS DOCUMENTATION |
| 013300 | SUBMITTAL PROCEDURES |
| 014000 | QUALITY REQUIREMENTS |
| 015000 | TEMPORARY FACILITIES AND CONTROLS |
| 017300 | EXECUTION |
| 017700 | CLOSEOUT PROCEDURES |

DIVISION 2 EXISTING CONDITIONS

| | |
|--------|----------------------|
| 024119 | SELECTIVE DEMOLITION |
|--------|----------------------|

DIVISION 4 MASONRY

| | |
|--------|-------------------------|
| 042200 | UNIT MASONRY ASSEMBLIES |
|--------|-------------------------|

DIVISION 6 WOOD, PLASTICS AND COMPOSITES

| | |
|--------|--|
| 064020 | 064020 SF- INTERIOR ARCHITECTURAL WOODWORK |
|--------|--|

DIVISION 7 THERMAL AND MOISTURE PROTECTION

| | |
|--------|-------------------------|
| 071113 | BITUMINOUS DAMPPROOFING |
|--------|-------------------------|

DIVISION 8 OPENINGS

| | |
|--------|----------------------------|
| 085113 | ALUMINUM DOORS AND WINDOWS |
|--------|----------------------------|

DIVISION 9 FINISHES

| | |
|--------|------------------------------|
| 092400 | CEMENT PLASTERING |
| 092900 | GYPSUM BOARD |
| 093013 | CERAMIC AND PORCELAIN TILING |
| 096340 | STONE FLOORING |
| 099100 | INTERIOR PAINTING |

DIVISION 22 PLUMBING

| | |
|-----------|--|
| 220513 | COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT |
| 220523.14 | CHECK VALVES FOR PLUMBING PIPING |
| 220523.15 | GATE VALVES FOR PLUMBING PIPING |
| 220719 | PLUMBING PIPING INSULATION |
| 221116 | DOMESTIC WATER PIPING |

221316 SANITARY WASTE AND VENT PIPING

DIVISION 23 HEATING VENTILATING AND AIR CONDITIONING

230513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713 DUCT INSULATION
230719 HVAC PIPING INSULATION
232300 REFREGERANT PIPING
233113 METAL DUCTS
233300 AIR DUCT ACCESSORIES
233416 CENTRIFUGAL HVAC FANS
233713 DIFFUSERS, REGISTERS, AND GRILLES
238126 SPLIT-SYSTEM AIR-CONDITIONERS

DIVISION 26 ELECTRICAL

260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260533 RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
262416 PANELBOARDS
262726 WIRING DEVICES
265119 LED INTERIOR LIGHTING

END OF TABLE OF CONTENTS

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Access to site.
5. Work restrictions
6. Government Furnished Items.

1.2 PROJECT INFORMATION

- A. Project Location: This statement of work covers the work required at US government owned residential complexes located in 55 road 17 & 11 road 11, Maadi.

The complexes are 4 stories, constructed of concrete skeleton type construction with reinforced concrete masonry unit walls.

- B. Work of this contract shall include the complete renovation of **one (1) three bedrooms apartment Type B** at US government owned apartment at 55 RD 17, Maadi as the base bid with an alternate # 1 of **one (1) Three bedrooms apartment Type B** at 11 road 11, Maadi.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

The general scope of work for each apartment can be summarized as follows:

1. Demolition of drop ceilings, marble baseboard, ceramic tiles in bathrooms & Kitchen and for electric installations as detailed herein.
2. Remove all bathroom's fixtures, accessories, bathroom's cabinets, aluminum windows, and kitchen granite tops (items salvaged by the contractor and quoted accordingly).
3. Masonry work to block up wall openings as shown in DWG. A03.
4. Plaster/patch plaster work for the newly built masonry work, Baseboards of all areas where the marble baseboard is removed and Plaster for electrical installations.
5. Complete interior paint work.
6. Installation of drywall suspended ceilings as shown in DWG. A06.
7. Installation of Porcelain flooring for the reception area, bedrooms & its corridor, and the utility room off the bedroom corridor.
8. Installation of ceramic tiles of the bathrooms walls & floors.
9. Installation of ceramic tiles of the kitchen floors and the walls between the lower and upper cabinet.
10. Waterproofing of the Bathrooms floors.
11. Replacement of all aluminum windows and balcony doors complete with hardware, units shall be double-glazed, hinged, sliding, tilted or fixed as specified.

12. Rough & finished carpentry work, replacement of interior closets doors and installation of closet shelving.
13. Removal of the exterior metal door, installation of the temporary door (GF), cutting of the metal door to fit the height after the installation of the laminate flooring, shop painting of the metal door according to the approved color, installation of the hardware to include the knocker and the vision eye.
14. Refinish the Kitchen cabinets, interior doors and closet doors.
15. Installation of double curtain rods for the entire apartment.
16. Installation of an acrylic shower enclosure.
17. Installation of bathrooms' fixtures & accessories, chandeliers, sconces and ceiling fans (Government Furnished Contractor Installed).
18. Installation of new ductwork and grilles for the air conditioning system.
19. Complete rough-in & finish work for the plumbing system of the entire apartment.
20. Provide two power panels 380V, 3ph and 110V, 1ph for the apartment.
21. Complete rough-in & finish work for electric, telephone, and TV cable networks of the entire apartment. The 110V duplex receptacles are Government Furnished Contractor Installed.
22. Deliver salvaged bathroom fixtures to FAC.

A. The Embassy in-house staff shall be responsible for the following scope of work:

1. Inspection and testing of all the appliances.

B. Type of Award.

1. Project will be constructed under one Lump sum contract based on breakdown of prices for the apartments.

1.4 PHASED CONSTRUCTION

- A. The Work shall be conducted in one phase, the Notice to Proceed shall be issued one week after contract award.
- B. The contractor shall receive a letter of authorization to represent the Embassy throughout the process of the local city permit and shall start in the permit process immediately after receiving the NTP and the letter of authorization.
- C. Before commencing work, submit an updated copy of Contractor's construction schedule showing the sequence, commencement, and completion dates.

1.5 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a good condition throughout construction period. Repair damage caused by construction operations.

1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to the working hours of 8:00 a.m. to 6:00 p.m., Sunday through Thursday, unless otherwise indicated.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities unless permitted by the COR. Notify the COR not less than two work days in advance of proposed utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and or other disruption to occupants with the COR.

1.7 GOVERNMENT FURNISHED ITEMS

- A. Some materials/equipment shall be Government Furnished, Contractor Installed (**GFCD**), contractor's price shall be the cost of installation only. Government Furnished items shall be delivered to the contractor at project site. The contractor shall inspect and receive the items and shall be responsible for their storage and installation.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION (Not Used)**

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1, Marble Flooring for apartment 13 at 55 RD 17
- B. Alternate No. 2, one Three (3) bedrooms apartment Type B at (apartment 41 at 11 road 11, Maadi.
- C. Alternate No. 3, Marble Flooring for apartment 41 at 11 RD 11

END OF SECTION 012300

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Site condition reports.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic file.
- B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.

- E. Daily Construction Reports: Submit at **weekly** intervals.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

- A. Coordinate Contractor's construction schedule with the submittal schedule, progress reports, payment requests, and other required schedules and reports.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for **commencement of the Work** to date of **Final Completion**.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than **10** days, unless specifically allowed by the COR.
 - 2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 3. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for inspection and acceptance by the COR.
 - 4. Punch List and Final Completion: Include not more than **5** days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.

- F. Recovery Schedule: When periodic update indicates the Work is **5** or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.
- G. Computer Scheduling Software: Prepare schedules using current version of **Microsoft Project**.
- H. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

2.2 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. Approximate count of personnel at Project site.
 - 2. Material deliveries.
 - 3. General weather conditions.
 - 4. Accidents.
 - 5. Meetings and significant decisions.
 - 6. Unusual events.
 - 7. Stoppages, delays, shortages, and losses.
 - 8. Emergency procedures.
 - 9. Change Orders received and implemented.
 - 10. **Construction Work** Change Directives received and implemented.
 - 11. Services connected and disconnected.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At bi-weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule 2 days before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require COR's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require COR's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by COR' and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Electronic copies of digital data files of the Contract Drawings may be provided for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on COR's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow **10** days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. COR will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Resubmittal Review: Allow 10 days for review of each resubmittal.

- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
- F. Options: Identify options requiring selection by COR.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from COR's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements:
 - 1. Submit electronic submittals via email as PDF electronic files.
 - a. COR will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Action Submittals: Submit two paper copies of each submittal unless otherwise indicated. COR will return one copy.
 - 3. Informational Submittals: Submit one paper copy of each submittal unless otherwise indicated. COR will not return copies.
 - 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a notarized statement on original paper copy for the local permit.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - 4. Submit Product Data before or concurrent with Samples.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Submit Shop Drawings in the following format:
 - a. **Two** opaque (bond) copies of each submittal. COR will return **one** copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
- E. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- F. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- I. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to COR.
- B. Project Closeout: See requirements in Section 017700 "Closeout Procedures."

3.2 COR's ACTION

- A. General: COR will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: COR will review each submittal, make marks to indicate corrections or revisions required, and return it. COR will stamp each submittal with an action stamp.
- C. Informational Submittals: COR will review each submittal and will not return it, or will return it if it does not comply with requirements.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.
- F. The contractors shall submit, **as part of their bid:**
 - 1. Qualification Data: For the contractor to demonstrate their capabilities and experience in similar projects in type and scale. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified during the last five years.
 - 2. Qualification data for the project manager and site engineer.
 - 3. The preliminary project schedule.
 - 4. Special work procedures
 - 5. Quality Control and Assurance program and plan
 - 6. Safety Program and plan according to the SAFETY AND HEALTH REQUIREMENTS of the US Army Corps of Engineers-EM 385-1-1 which will be reviewed by the A/POSHO
 - 7. Technical data, manufacturer's catalog.
 - 8. List of all suppliers and sub-contractors
- G. The contractor shall submit **after contract award** submittals as included in specification sections

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by The COR.
- C. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Name and signature of laboratory inspector.
 12. Recommendations on retesting and re-inspecting.
- B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.4 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Testing Agency Qualifications: an independent agency with the experience and capability to conduct testing and inspecting indicated.
- F. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.5 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 2. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

- B. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- C. Testing Agency Responsibilities: Cooperate with COR in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Facilities for storage and field curing of test samples.
- D. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. Water and Sewer Service from Existing System: Water from existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- B. Electric Power Service from Existing System: Electric power from existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Wood Enclosure Fence, corrugated sheets or portable chain link fence around construction area.

2.2 TEMPORARY FACILITIES

- A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations if required.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
- B. Water Service: Connect to existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Electric Power Service: Connect to existing electric power service. Maintain equipment in a condition acceptable to Occupant.
- D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
- E. Telephone Service: Provide superintendent with cellular telephone.

3.2 SUPPORT FACILITIES INSTALLATION

- A. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project. Provide temporary, directional signs for construction personnel and visitors.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Tree and Plant Protection: Comply with requirements of the COR on the protection of trees and plants.
- D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Post warnings and information.

3.4 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended.

3.5 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill acceptable to authorities having jurisdiction on daily bases.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site. Remove construction debris on a daily basis and not on outside sidewalk or across the road.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

END OF SECTION 015000

SECTION 017300 - EXECUTION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Installation of the Work.
 - 3. Cutting and patching.
 - 4. Progress cleaning.
 - 5. Starting and adjusting.

- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Do not cut and patch construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. General: Comply with requirements specified in other Sections.

- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: Before beginning site-work, investigate and verify the existence and location of underground utilities, **mechanical and electrical systems**, and other construction affecting the Work.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.
 - 4. The submission of the bid will be a conclusive evidence that the bidder has complied with all conditions related to the character, quality and quantity of work requirements to be performed. No claims for additional time or compensation due to variations between existing and conditions encountered during construction will be honored. Failure of the contractor to thoroughly inspect and identify defects, if any, shall not release him from the responsibility to guarantee the whole works (Existing to remain, and new works) for the period specified in the contract terms.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 SPECIAL WORK PROCEDURES

- A. Working Hours: All work shall be performed during hours from 8:00 a.m. to 6:00 p.m., Sunday through Thursday except for the holidays identified in the holiday schedule attached, which are considered non-working days. Working after hours and weekends may be required and approved by the COR with at least 24 hours advance notice, especially in demolition work, for shut down of utilities, or when the work obstruct the regular function of the building.
- B. Scaffolding, shores, material hoist and trash disposal shall be the responsibility of the contractor.
- C. Security Procedures: All contractors' personnel shall be subject to all the security procedures required for clearance of personnel working inside U.S. Embassy Compounds. These requirements shall include:
 - 1. Submission of valid finger prints, addressed to the U.S. Embassy and copy of the Egyptian ID, two week prior to the required date to access the site.
 - 2. Access for trucks shall be granted on a 48 hours (two working days) advance notice showing: 1) Drivers name, 2) Copy of driver's ID, 3) Truck description and plate number, and 4) date and time access required.

3. Access for daily laborers can be given for three days, with a 48 hours advance notice showing the name of the persons, ID #, date and place of issue, and a copy of the ID. Access will be given for one time only (three days) for day laborers.
4. All contractor personnel shall be subject to a daily check (in and out) by the US government guard personnel.
5. Failure of the contractor to fulfill any security requirement in a timely manner shall not be construed as a base for any time and money extension.
6. Delay or suspension of work due to the U.S. government security regulations or requirements shall not be a base for claims

3.3 PREPARATION

- A. Existing Utility Information: Furnish information to the COR that is necessary to adjust, move, or relocate existing utility lines, services, or other utility appurtenances located in or affected by construction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.4 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey. If discrepancies are discovered, notify the COR promptly.
- B. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- C. Building Lines and Levels: Locate and lay out control lines and levels for column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations from two or more locations.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
 - C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
 - D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
 - E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
 - F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
 - G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
 - H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
 - J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

- E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction.
- F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
- G. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than two days.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces using only cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

3.8 SECURITY AND SITE ACCESS PROCEDURES

- D. All contractors' personnel shall be subject to all the security procedures required for clearance of personnel working inside U.S. Embassy Compounds. These requirements shall include:
 - 1. Submission of valid finger prints, addressed to the U.S. Embassy and copy of the Egyptian ID, two week prior to the required date to access the site.
 - 7. Access for trucks shall be granted on a 48 hours (two working days) advance notice showing: 1) Drivers name, 2) Copy of driver's ID, 3) Truck description and plate number, and 4) date and time access required.
 - 8. Access for daily laborers can be given for three days, with a 48 hours advance notice showing the name of the persons, ID #, date and place of issue, and a copy of the ID. Access will be given for one time only (three days) for day laborers.

9. All contractor personnel shall be subject to a daily check (in and out) by the US government guard personnel.
10. Failure of the contractor to fulfill any security requirement in a timely manner shall not be construed as a base for any time and money extension.
11. Delay or suspension of work due to the U.S. government security regulations or requirements shall not be a base for claims

3.9 SAFETY

- A. The contractor must comply to the following:
 1. DOSAR Accident Prevention Clause 652-236-70, included below in full text.
 2. SAFETY AND HEALTH REQUIREMENTS of the US Army Corps of Engineers - EM 385-1-1.
<http://www.usace.army.mil/SafetyandOccupationalHealth/SafetyandHealthRequirementsManual.aspx>
 3. Safety requirements that is specific to the job and will be addressed and documented during the pre-construction meeting.

3.10 ACCIDENT PREVENTION CLAUSE (APR 2004) (IN FULL TEST)

(a) General. The contractor shall provide and maintain work environments and procedures which will safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to contractor operations and activities; avoid interruptions of Government operations and delays in project completion dates; and, control costs in the performance of this contract. For these purposes, the contractor shall:

- (1) Provide appropriate safety barricades, signs and signal lights;
- (2) Comply with the standards issued by any local government authority having jurisdiction over occupational health and safety issues; and,
- (3) Ensure that any additional measures the contracting officer determines to be reasonably necessary for this purpose are taken.
- (4) For overseas construction projects, the contracting officer shall specify in writing additional requirements regarding safety if the work involves:
 - (i) Scaffolding;
 - (ii) Work at heights above two (2) meters;
 - (iii) Trenching or other excavation greater than one (1) meter in depth;
 - (iv) Earth moving equipment;
 - (v) Temporary wiring, use of portable electric tools, or other recognized electrical hazards. Temporary wiring and portable electric tools require the use of a ground fault circuit interrupter (GFCI) in the affected circuits; other electrical hazards may also require the use of a GFCI;
 - (vi) Work in confined spaces (limited exits, potential for oxygen less than 19.5 percent or combustible atmosphere, potential for solid or liquid engulfment, or other hazards considered to be immediately dangerous to life or health such as water tanks, transformer vaults, sewers, cisterns, etc.);
 - (vii) Hazardous materials - a material with a physical or health hazard including but not limited to, flammable, explosive, corrosive, toxic, reactive or unstable, or any operations which creates any kind of contamination inside an occupied building such as dust from demolition activities, paints, solvents, etc.; or
 - (viii) Hazardous noise levels.

(b) Records. The contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to or theft of property, materials, supplies, or equipment. The contractor shall report this data in the manner prescribed by the contracting officer.

(c) Subcontracts. The contractor shall be responsible for its subcontractor's compliance with this clause.

(d) Written program. Before commencing work, the contractor shall:

- (1) Submit a written plan to the contracting officer for implementing this clause. The plan shall include specific management or technical procedures for effectively controlling hazards associated with the project; and,
- (2) Meet with the contracting officer to discuss and develop a mutual understanding relative to administration of the overall safety program.

(e) Notification. The contracting officer shall notify the contractor of any non-compliance with these requirements and the corrective actions required. This notice, when delivered to the contractor or the contractor's representative

on site, shall be deemed sufficient notice of the non-compliance and corrective action required. After receiving the notice, the contractor shall immediately take corrective action. If the contractor fails or refuses to promptly take corrective action, the contracting officer may issue an order suspending all or part of the work until satisfactory corrective action has been taken. The contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any suspension of work order issued under this clause.

(End of clause)

3.11 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

3.12 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:

1.2 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of **5** days prior to date the work will be completed and ready for final inspection.
 - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION PROCEDURES

- A. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, COR will either proceed with inspection or notify Contractor of unfulfilled requirements.
 - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned.

PART 3 - EXECUTION**3.1 FINAL CLEANING**

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.

END OF SECTION 017700

SECTION 024119 - SELECTIVE DEMOLITION**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.3 FIELD CONDITIONS

- A. Notify COR of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- B. Storage or sale of removed items or materials on-site is not permitted.
- C. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

3.5 CLEANING

- A. Remove demolition waste materials from Project site [**and dispose of them in an approved construction and demolition waste landfill acceptable to authorities having jurisdiction.**]
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 042200 - UNIT MASONRY ASSEMBLIES**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. Section Includes:
1. Hollow Concrete Blocks.
 2. Mortar and Grout.

1.2 RELATED SECTIONS

- A. Section 092400 – Cement Plastering

1.3 SUBMITTALS

- A. Submit Manufacturer's product data for each type including design mix and admixture limitations.
- B. Samples: Submit two samples of each type and size of block units, obtain approval before placing orders with suppliers.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ES 1292.
- B. Testing: independent testing laboratory in accordance with ES 1292 & ES 1349.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site.
- B. Maintain packaged materials clean, dry, and protected against dampness, and foreign matter.
- C. Storing: stack blocks so that they are stable and clear of the ground. Protect from inclement weather and keep dry.
- D. Cement: deliver in sealed bags bearing the manufacturer's name and store in piles not more than ten bags high in perfectly dry weatherproof sheds clear from ground on planks or other damp-proofing supports.
- E. Sand: aggregates shall be stored in separate stockpiles and to be free from all foreign materials which may become mixed with them.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:
1. Tooblat
Cairo Alexandria Desert Road, Kilo 26
Tel: 5390719 – 20 – 21 –22 – 23 –24
Fax: 5390725
 2. Arab Brick
3 Ahmed Oraby Street, Mohandessin
Tel: 5010926 - 25
 3. Misr Brick
15 May City, Helwan
Tel: 5500812 – 5501385
Fax: 5506528

2.2 BLOCKS

- A. Mortar and grout: Mortar aggregate, natural color ES 1108.
- B. Concrete Blocks, unless otherwise specified, are to be to ES 1292, manufactured from ordinary Portland cement to ES 373 and natural aggregates to ES 1109.
1. Hollow Concrete Blocks shall be:
 - Density: 1500 kg/m³
 - Total volume of holes shall not exceed 50% of the unit volume
 - Shell and membrane thickness of the solid portion shall not be less than 20mm
- C. Testing Hollow Concrete Blocks: ten blocks from each batch are to be selected by the COR for testing for compressive strength. Results are to be as follows:
- Individual block: not less than 25 kg/cm² of gross area
 - Average of 10 blocks: not less than 30 kg/cm² of gross area.

2.3 MORTAR AND GROUT MATERIALS

- A. Ingredients for mortar shall be measured in proper clean gauge boxes.
- B. Cement: Ordinary Portland cement to ES 373. Do not use cementitious materials that have become damp.
- C. Aggregates: Comply to ES 1108. Except for the joints less than 6mm, use aggregates graded with 100% passing sieve no. 16.
- D. Water: Clean and potable.

2.4 ACCESSORIES

- A. Joint reinforcing: Welded wire with deformed side rods
 - 1. Steel Wire: 9 gauge (4.8 mm) galvanized steel.
 - 2. Type: Ladder or truss type.
- B. Ties and Anchors:
 - 1. Bent Wire Ties: Galvanized Steel
 - 2. Rigid Anchors: Galvanized steel straps.
 - 3. Masonry to concrete frame: Two pieces galvanized steel anchor.
 - 4. Unit type masonry inserts in concrete: Malleable iron.
 - 5. Anchor Bolts: ASTM A307, grade A, galvanized.
- C. Masonry Accessories:
 - 1. Non metallic expansion joint strips.
 - 2. Preformed control joint gaskets.
 - 3. Bond breaker strips.

2.5 MORTAR

- A. Mortar: shall be cement-sand mortar.
 - 1. Consisting of 350 kgs Portland Cement, 1m³ sand and a minimum amount of water to produce a workable consistency.
 - 2. Mixed mortar components dry and then add water until the correct consistency is obtained.
 - 3. Use mortar within 1 hour of the addition of water.
 - 4. Limit cementitious materials in mortar to Portland cement and lime.
- B. Grout: shall be fine grout of 1 part ordinary Portland cement to 2 or 3 parts of fine aggregates by volume. Fine aggregate to be measured in damp loose condition.

PART 3 - EXECUTION

3.1 GENERAL

- A. Comply with referenced unit masonry Egyptian standard and other requirements.
- B. Construct walls with all materials fully bonded or tied together to ensure compliance with design requirements for stability, strength, fire resistance, thermal and sound insulation as relevant.

3.2 LAYING

- A. Concrete Blocks: do not use non-autoclaved concrete blocks until four weeks after casting. Do not wet concrete blocks. Use approved water-retaining admixture in mortar to suit suction.
- B. Uniformity: carry up work including both leaves of cavity work, with no portion more than 1.2 m above another at any time, racking back between levels. Do not carry up work higher than 1.5 m in one day.
- C. Lay Blocks on full bed of mortar with joints filled to consistent thickness of not more than 12 mm.
- D. Lay Hollow Blocks with cavity downward. Do not fill hollows in hollow blocks. Use cut or special shape blocks to make up courses and piece-in.
- E. Accuracy: keep courses level, true to line and evenly spaced. Accurately plumb all faces, angles and features. Set out carefully to ensure satisfactory junctions and joints with adjoining or built-in elements and components.
- F. Stopping and resuming work: rack back a distance of ½ unit length or 200 mm in each course. Clean exposed surfaces of set masonry, wet units lightly and remove loose masonry units and mortar prior to laying fresh masonry.
- G. Curing: all walls and partitions shall be properly cured by sprinkling water twice a day for a period of not less than five (5) days after completion of laying the course.

3.3 BONDING AND JOINTING

- A. Block work Bond, unless otherwise specified, is to be stretching half lap.
- B. Lintel Bearings: carefully predetermine setting out so those full blocks occur beneath ends of lintels.
- C. Joints not visible in finished work are to be struck off with the trowel as work proceeds.
- D. Joints for Plaster: strike off and leave rough joints in block work to be plastered or rendered.

3.4 MORTAR BEDDING AND JOINTING

- A. Bedding: lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, and columns and where adjacent to cells or cavities to be filled with mortar. For starting courses on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- B. Joints: if not other wise indicated lay masonry walls with 10mm joints. Maintain joint widths shown,

except for minor variations required to maintain bond alignment. Cut joints flush for masonry walls, which are to be concealed or to be covered by other materials.

- C. Walls to be plastered shall have joints raked out to a depth of 12 mm to form a key.
- D. Remove concrete masonry units disturbed after laying, clean and lay in fresh mortar. Do not pound corners at jambs to fit stretcher units, which have been set in position. If adjustments are required, remove units clean off mortar and set in fresh mortar.

3.5 REINFORCED MASONRY JAMB

- A. Build masonry jamb with hollow concrete blocks with dimensions as shown on the drawings
- B. Both sides of openings to be filled with cement grout as specified herein.

3.6 TOLERANCE

- A. Comply with construction tolerances of referenced Egyptian code of practice.

END OF SECTION 04810

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior standing and running trim, including doorframes and jambs.
2. Kitchen cabinets
3. Wooden bathroom vanities.
4. Field installation of architectural woodwork.

1.2 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items, unless concealed within other construction before woodwork installation.

1.3 SUBMITTALS

A. Shop Drawings:

1. Submit Shop Drawings of woodwork showing location of each item, dimensioned plans and elevations, large scale details, joints, sections and connections to adjacent Work.
2. Include details of framing, blocking and furring and coordination for interface Work at substrates.
3. Include hardware schedule for cabinet hardware.

B. Samples:

1. Transparent finished samples: Submit three samples for each type of specie showing full range of grain, color, texture and finish expected in completed Work. Indicate high, middle and low range of color and finish for each type of specie.
2. Submit samples of each type of stone species and finish for stone countertops indicating anticipated range of stone color and texture in finished Work.
3. Submit samples for each type of cabinet, door, closet hardware and accessories for the selection and approval of the COR.

1.4 QUALITY ASSURANCE

- A. Installer and fabricator Qualifications: An experienced firm who has completed multiple projects with architectural woodwork similar in quality, material, design, and extent to that indicated for this Project, and whose work can be demonstrated to have resulted in construction with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: To match existing building finishes. Wood Products: Comply with the following:
 1. Hardboard: AHA A135.4.
 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD-Exterior Glue.
 3. Softwood Plywood: DOC PS 1, Medium Density Overlay.
 4. Hardwood Plywood and Face Veneers: HPVA HP-1.

2.2 CABINET HARDWARE AND ACCESSORIES

- A. Butt Hinges: 70-mm, 5-knuckle steel hinges made from 2.4-mm-thick metal, and as follows:
 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
 2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135, or 170 degrees of opening, self-closing.

- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, 100 mm long, 8 mm in diameter or 127 mm long, 62 mm deep, and 8 mm in diameter.
- E. Catches: Magnetic catches, BHMA A156.9, B03141.
- F. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- G. Drawer Slides: Side-mounted, full-extension, zinc-plated steel drawer slides with steel ball bearings, BHMA A156.9, B05091, and rated for the following loads:
 - 1. Box Drawer Slides: 440 N.
 - 2. File Drawer Slides: 890 N.
 - 3. Pencil Drawer Slides: 200 N.
 - 4. Keyboard Slide: 330 N.
 - 5. Trash Bin Slides: 890 N.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.
- K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Provide Custom grade interior woodwork complying with the referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 19 mm Thick or Less: 1.5 mm.
 - 2. Edges of Rails and Similar Members More Than 19 mm Thick: 3 mm.
 - 3. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members and Rails: 1.5 mm.

- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- E. Fabricate in accordance with AWI's "Architectural Woodwork Quality Standards."
- F. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.4 SHOP FINISHING

- A. Quality Standard:
 - 1. Grade: Provide finishes of same grades as items to be finished.
- B. General: The entire finish of interior architectural woodwork is specified in this Section, regardless of whether shop applied or applied after installation. The extent to which the final finish is applied at fabrication shop is Contractor's option, except shop-apply at least the prime coat before delivery.
- C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

- B. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 3 mm in 2400 mm.
- C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- D. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
- E. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06402

SECTION 071113 - BITUMINOUS WATERPROOFING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section includes cold-applied, emulsified-asphalt waterproofing.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS**2.1 COLD-APPLIED, EMULSIFIED-ASPHALT WATERPROOFING**, products of EMEC, Sika, or equal approved.

- A. Trowel Coats: ASTM D 1227, Type II, Class 1.

2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with bituminous waterproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

PART 3 - EXECUTION**3.1 APPLICATION, GENERAL**

- A. Comply with manufacturer's written instructions for substrate preparation, waterproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply waterproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

- B. Where waterproofing interior face of above-grade, exterior [**concrete**] [**and**] [**masonry**] [**single-wythe masonry**] walls, continue waterproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by waterproofing wall before constructing intersecting walls.

3.2 COLD-APPLIED, EMULSIFIED-ASPHALT WATERPROOFING

- A. Concrete Foundations[**and Parged Masonry Foundation Walls**]: Apply two brush or spray coats at not less than **(0.6 L/sq. m)** for first coat and **(0.4 L/sq. m)** for second coat, one fibered brush or spray coat at not less **(1.2 L/sq. m)**, or one trowel coat at not less **(1.6 L/sq. m)**.
- B. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than **(0.6 L/sq. m)** for first coat and **(0.4 L/sq. m)** for second coat, primer and one fibered brush or spray coat at not less than **(1.2 L/sq. m)**,) or primer and one trowel coat at not less than **(2 L/sq. m)**.
- C. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than **(0.5 L/sq. m)**.
- D. Unexposed Face of Masonry Retaining Walls: Apply primer and one brush or spray coat at not less than **(0.5 L/sq. m)**.
- E. Concrete Backup for [**Brick Veneer Assemblies**] [**Stone Veneer Assemblies**] [**and**] [**Dimension Stone Cladding**]: Apply one brush or spray coat at not less than **(0.4 L/sq. m)**.
- F. Masonry Backup for [**Brick Veneer Assemblies**] [**Stone Veneer Assemblies**] [**and**] [**Dimension Stone Cladding**]: Apply primer and one brush or spray coat at not less than **(0.4 L/sq. m)**.
- G. Interior Face of [**Single-Wythe**] Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and one brush or spray coat at not less than **(0.4 L/sq. m)**.

3.3 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured waterproofing. Comply with waterproofing-material and protection-course manufacturers' written instructions for attaching protection course.

END OF SECTION 071113

SECTION 085113 – ALUMINUM DOORS AND WINDOWS**PART 1 - GENERAL****1.1 RELATED SECTIONS**

- A. Section 09220 - Plastering

1.2 SUBMITTALS

- A. The contractors shall submit, **as part of their bid:**
 - 1. Manufacturer's specifications, technical data, and standard cross sections.
 - 2. Technical data for all hardware items.
- B. The contractor shall submit **10 days after contract award,** shop drawings for the fabrication and installation of each window and balcony type, include plans, elevations, sections, details, hardware, attachments to other work, operational clearances and include the following:
 - 1. Aluminum windows, frames, screen panels and fixed panels.
 - 2. Flashing and drainage details
 - 3. Weather-stripping details
 - 4. Glazing details
 - 5. Window system operators: show locations, mounting, and details for installing operator components and controls.
 - 6. Methods of attaching all components to the existing frames, trimming and finishing.
- C. The contractor shall submit, **after final completion and acceptance of the work,** the warranty certificate

1.3 QUALITY ASSURANCE

- A. Aluminum units: Provide units produced by a firm with not less than five years of successful experience in the fabrication of aluminum doors, windows, screens and frames, of the types required for this project. All work shall meet UBC and local code requirements for wind loads and seismic zone 2A, earthquakes.
- B. Weather resistance: Fabricate windows, frames, and screen panels, to include weather stripping and thresholds to prevent the uncontrolled penetration of air and water under normal weather conditions from the interior and the exterior. Glass shall be sealed into the window frame from outside to provide full insulation. Provisions for condensation water drainage should be included.
- C. The contractor shall take field measurements prior to preparation of shop drawings and fabrication to ensure proper installation and fit.
- D. Performance Requirements
 - 1. General: Provide units capable of complying with performance requirements indicated herein.

2. Air infiltration: Provide units with sufficient air infiltration rate.
3. Water resistant: Provide units with no water penetration.
4. Thermal movements: Provide units including anchorage that accommodates thermal movements resulting changes in the ambient temperature without buckling, distortion, opening of joints, failure of joint sealant, damaging loads and stresses on glazing and connections, and other detrimental defects.

PART 2 – PRODUCTS

1.1 Aluminum profiles

Sections and profiles shall be made of extruded aluminum alloys free from defects impairing strength or appearance, medium weight systems, 1.6 mm thickness, frame. Depth and profiles shall be as recommended by manufacturer for system, strength, corrosion resistance, and application of required finish. Provisions for condensation drainage should be included in the profiles

1.2 Fasteners

Galvanized, aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, color to match, guaranteed by the manufacturer to be compatible with the windows, frames, screens, hardware, anchors and other items being fastened.

Do not use exposed fasteners except where unavoidable for the assembly of units, and unavoidable for the application of hardware. Provide only concealed screws in glazing stops.

1.3 Compression weather-stripping

Provide manufacturer's standard replaceable stripping of EPDM gaskets complying with ASTM, including central, lateral, and glass beading gaskets, as recommended and guaranteed by the manufacturer to remain permanently elastic, non-shrinking, non-migrating and weatherproofed for the life of the building.

1.4 Glazing

Double, 6mm thick, clear float glass.

1.5 Finish and colors

Powder coated, electrostatic, off-white color.

1.6 Accessories & hardware

Anti-rust, of the best quality available, aluminum, stainless steel, carbon steel or other corrosion resistant material, designed to smoothly operate, tightly close, and securely lock windows.

For hinged and fixed units: Heavy duty hinges, locks in door leafs, locking gear and plates, pull handles, limit stop and cylinder in door leaf

For sliding systems: Heavy duty nylon rollers, latch lock self closing in window leaf and manual closing in doors.

PART 3 - EXECUTION**3.1 Fabrication**

- A. Sizes and profiles: The required sizes for windows, and the profile requirements are stated herein and shown on the drawings.
- B. Verify all windows and balcony openings by field measurements prior to fabrication and indicate measurements on the shop drawings.
- C. To the greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work shall be completed before shipment to project site. Disassemble components only as necessary for shipment and installation. All corners, meeting stiles/rails shall be mitered square and reinforced. All frames shall be pre-cut to receive hardware.
- D. Glazing: Fabricate window units with glazing stops & supports to provide a completely sealed unit, weather tight & water tight. Glazing shall be double.

3.2 Installation:

- A. Installation, general: Comply with manufacturer's specifications and recommendations for the installation of the panels, accessories, hardware, etc. Maintain continuity of line and accurate relation of planes and angles. Install in accordance with the manufacturer's installation instructions and the approved shop drawings.
- B. All units shall be installed on mitered finished plaster, no wooden frames will be installed.
- C. Aluminum frames should be installed using liquid foam around the frames to provide water and air tight units. Trims should be installed either as part of the frame section or separately to provide finished surrounding for the units.
- D. All jambs, heads and sills shall be set in correct locations, level, square, plumb and in alignment with other work.
- E. Drill and tap frames and doors and apply surface mounted hardware items, complying with hardware manufacturer's and template requirements. Use concealed fasteners wherever possible.
- F. Adjust operating hardware to function properly, without binding, and to provide tight fit at contact points and weather stripping.
- G. Glass and Glazing: Water-tight and airtight installation of glass product required. Each installation must withstand normal temperature changes, wind loading, impact loading, without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.
- H. Clean complete system, inside and outside, promptly after installation of glass and sealants. Exercise care to avoid damage to the finish. Remove excess glazing and sealant compounds, dirt and other substances.
- I. Testing: The contractor shall notify the COR in advance of testing. Testing shall be carried out using water hose. Reseal any leakage, which may occur and repeat test until no leakage is observed.

End of section 085113

SECTION 092400 - CEMENT PLASTERING**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. This Section includes the following:
 - 1. Portland cement plaster.

1.2 SUBMITTALS

- A. Material Certificates: Submit certificate signed by manufacturer for each kind of plaster aggregate certifying that materials comply with requirements.
- B. Design mix for each type of plaster

1.3 QUALITY ASSURANCE

- A. Mockups: Prior to installing plaster work, construct panels for each type of finish and application required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups, using materials indicated for final unit of Work. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by the COR. Obtain the COR's approval of mockups before start of plaster work.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number.
- B. Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.

1.5 PROJECT CONDITIONS

- A. Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.
- B. Ventilation: Provide natural or mechanical means of ventilation to properly dry interior spaces after Portland Cement Plaster has cured.

- C. Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work.

PART 2 - PRODUCTS

2.1 ACCESSORIES

- A. Cornerbeads: Small nose cornerbeads fabricated from the following metal, with expanded flanges of large-mesh diamond-metal lath allowing full plaster encasement.
 - 1. PVC Plastic: Minimum (0.89 mm) thick.
 - 2. Aluminum: Minimum (1.2 mm) thick.
- B. Casing Beads: Square-edged style, with expanded flanges of the following material:
 - 1. PVC Plastic: Minimum (0.89 mm) thick.
 - 2. Aluminum: Minimum (1.2 mm) thick.
- C. Curved Casing Beads: Square-edged style, fabricated from aluminum coated with clear plastic, preformed into curve of radius indicated.
- D. Control Joints: Prefabricated, of material and type indicated below:
 - 1. PVC Plastic: Minimum 0.035 inch (0.89 mm) thick.
 - 2. Aluminum: Minimum 0.050 inch (1.2 mm) thick.

2.2 PLASTER MATERIALS

- A. Base-Coat Cements: Type as indicated below:
 - 1. Portland cement, ASTM C 150, Type I.
- B. Job-Mixed Finish-Coat Cement: Material and color as indicated below:
 - 1. Portland cement, ASTM C 150, Type I.
- C. Cement Color: Gray.
- D. Sand Aggregate for Base Coats and finish coats: ASTM C 897.

2.3 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable.
- B. Bonding Agent: ASTM C 932.

- C. Acid-Etching Solution: Muriatic acid (10 percent solution of commercial hydrochloric acid) mixed 1 part to not less than 6 nor more than 10 parts water.
- D. Dash-Coat Material: 2 parts portland cement to 3 parts fine sand, mixed with water to a mushy-paste consistency.

2.4 PLASTER MIXES AND COMPOSITIONS

- A. General: Comply with ASTM C 926 for base- and finish-coat mixes as applicable to plaster bases, materials, and other requirements indicated.
- B. Base-Coat Mixes and Compositions: Proportion materials for respective base coats in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.
- C. Three-Coat Work over Metal Lath: Base-coat proportions as indicated below:
 - 1. Scratch Coat: 1 part Portland Cement, 1 to 2 parts masonry cement, 2-1/2 to 4 parts aggregate.
 - 2. Brown Coat: 1 part Portland Cement, 1 to 2 parts masonry cement, 3 to 5 parts aggregate.
- D. Two-Coat Work over Concrete Unit Masonry: Base-coat proportions as indicated below:
 - 1. Base Coat: 1 part masonry cement, 3 to 4 parts aggregate.
- E. Job-Mixed Finish Coats: Proportion materials for finish coats in parts by volume for cementitious materials and parts by volume per sum of cementitious materials to comply with the following requirements:
 - 1. Proportions using sand aggregates: 1 part portland cement, 1 part masonry cement, 3 parts sand.

2.5 MIXING

- A. Mechanically mix cementitious and aggregate materials for plasters to comply with applicable referenced application standard and with recommendations of plaster manufacturer.

PART 3 - EXECUTION

3.1 PREPARATIONS FOR PLASTERING

- A. Clean plaster bases and substrates for direct application of plaster, removing loose material and substances that may impair the Work.
- B. Etch concrete and concrete unit masonry surfaces indicated for direct plaster application. Scrub with acid-etching solution on previously wetted surface and rinse thoroughly with clean water. Repeat application, if necessary, to obtain adequate suction and mechanical bond of plaster (where dash coat, bonding agent, or additive is not used).

- C. Apply bonding agent on concrete and concrete unit masonry surfaces indicated for direct plaster application; comply with manufacturer's written instructions for application.
- D. Apply dash coat on concrete surfaces indicated for direct plaster application. Moist-cure dash coat for at least 24 hours after application and before plastering.
- E. Install temporary grounds and screeds to ensure accurate rodding of plaster to true surfaces; coordinate with scratch-coat work.
- F. Flashing: Refer to Division 7 Sections for installing flashing as indicated.
- G. Surface Conditioning: Immediately before plastering, dampen concrete and concrete unit masonry surfaces that are indicated for direct plaster application, except where a bonding agent has been applied. Determine and apply amount of moisture and degree of saturation that will result in optimum suction for plastering.

3.2 INSTALLATION OF PLASTERING ACCESSORIES

- A. General: Comply with referenced lathing and furring installation standards for provision and location of plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and in alignment during plastering. Install accessories of type indicated at following locations:
 - 1. External Corners: Install corner reinforcement at external corners.
 - 2. External Corners: Bend lath around external angles without using cornerbeads or reinforcement.
 - 3. Terminations of Plaster: Install casing beads, unless otherwise indicated.
 - 4. Control Joints: Install at locations indicated or, if not indicated, at locations complying with the following criteria and approved by the COR:
 - a. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane.
 - b. Distance between Control Joints: Not to exceed (5.4 m) in either direction or a length-to-width ratio of 2-1/2 to 1.
 - c. Wall Areas: Not more than. (13 sq. m).
 - d. Horizontal Surfaces: Not more than. (9 sq. m) in area.
 - e. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.

3.3 PLASTER APPLICATION

- A. Plaster Application Standard: Apply plaster materials, composition, and mixes to comply with ASTM C 926.
- B. Do not use excessive water in mixing and applying plaster materials.

- C. Flat Surface Tolerances: Do not deviate more than plus or minus (3 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a (3-m) straightedge placed at any location on surface.
- D. Grout hollow-metal frames, bases, and similar work occurring in plastered areas, with base-coat plaster material, and before lathing where necessary.
- E. Sequence plaster application with installation and protection of other work so that neither will be damaged by installation of other.
- F. Plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground, unless otherwise indicated. Where interior plaster is not terminated at metal frame by casing beads, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
- G. Corners: Make internal corners and angles square; finish external corners flush with cornerbeads on interior work, square and true with plaster faces on exterior work.
- H. Number of Coats: Apply plaster of composition indicated, to comply with the following requirements:
 - 1. Three Coats: Over Metal lath.
 - 2. Two Coats: Over the following plaster bases:
 - a. Concrete unit masonry.
 - b. Concrete, cast-in-place or precast when surface condition complies with ASTM C 926 for plaster bonded to solid base.
- I. Finish Coats: Apply finish coats to comply with the following requirements:
 - 1. Float Finish: Apply finish coat to a minimum thickness of (3 mm) to completely cover base coat, uniformly floated to a true even plane with fine-textured finish matching the approved sample.
 - 2. Trowel-Textured Finish: Apply finish coat with hand-troweled-textured finish matching Architect's sample.
- J. Moist-cure plaster base and finish coats to comply with ASTM C 926.

3.4 CUTTING AND PATCHING

- A. Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

3.5 CLEANING AND PROTECTING

- A. Remove temporary covering and other provisions made to minimize spattering of plaster on other work. Promptly remove plaster from door frames, windows, and other surfaces not to be plastered. Repair

surfaces stained, marred or otherwise damaged during plastering work. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.

- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 092400

SECTION 092900 - GYPSUM BOARD**PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. This Section includes the following:
 - 1. Interior gypsum board.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS**2.1 PANELS, GENERAL**

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. G-P Gypsum.
- b. National Gypsum Company.
- c. USG Corporation.

- B. Wall Type:

1. Thickness: 5/8 inch (15.9 mm), Type x
2. Long Edges: Tapered.
3. Foil Face Backing

- C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.
3. Foil Face Backing

2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces, unless otherwise indicated.
 - 2. Ceiling Type: Ceiling surfaces.
 - 3. Moisture- and Mold-Resistant Type: At bathrooms.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - 3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 3. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board

manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

- A. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by COTR for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 - 2. Bullnose Bead: Use where indicated.
 - 3. LC-Bead: Use at exposed panel edges.
 - 4. L-Bead: Use where indicated.
 - 5. U-Bead: Use at exposed panel edges.
 - 6. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 2: Panels that are substrate for tile.
 - 2. Level 3: Where indicated on Drawings.
 - 3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 -CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Ceramic/Porcelain floor tile.
2. Ceramic/Porcelain wall tile.

1.2 SUBMITTALS

A. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.

1.3 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tiles of same type and color or finish from one source or producer, its grade of quality.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.
- B. Store tile and cementations materials on elevated platforms, under cover, and in a dry location.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Provide tile and tile products by one of the following manufacturers:

1. Cermica royal
2. Gloria
3. Cleopatra
4. Gawhara
5. Imported Porcelain

2.2 SETTING AND GROUTING MATERIALS

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
- B. Water-Cleanable, Tile-Setting Epoxy Adhesive.
- C. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.

2.3 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for

straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- E. Lay out tile wainscots to next full tile beyond dimensions indicated.

3.3 TILE INSTALLATION

- A. General: Install tile to comply with the approved tile patterns and designs.
- B. Joint Widths: Install ceramic and porcelain tiles with joint widths of 1.6mm.
- C. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.4 CLEANING AND PROTECTING

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

END OF SECTION 09310

SECTION 096340 - STONE FLOORING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
 - 1. Dimension stone thresholds.
 - 2. Dimension stone counter tops

1.2 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, sections, details, and attachments to other work.
- B. Samples:
 - 1. For each stone type indicated. Include at least **two** or more Samples in each set and show the full range of color and other visual characteristics in completed Work.

1.3 QUALITY ASSURANCE

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

PART 2 - PRODUCTS**2.1 GRANITE**

- A. Material Standard: Comply with ASTM C 615.
- B. Varieties and Sources: Subject to compliance with requirements, use one of the following sources, or equal approved:
 - 1. Marmonil
 - 2. Wadi El Nil
 - 3. Egymarble
- C. Finish: Polished, or Honed, as indicated and according to the approved sample.

2.2 MARBLE

- A. Material Standard: Comply with ASTM C 503.
- B. Varieties and Sources: Subject to compliance with requirements, use one of the following sources, or equal approved:

1. Marmonil
 2. Wadi El Nil
 3. Egymarble
- C. Finish: Polished, or Honed, as indicated and according to the approved sample.

2.3 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II.
- B. Aggregate: ASTM C 144.; use aggregate graded with 100 percent passing **No. 16 (1.18-mm)** sieve.
- C. Latex Additive: Manufacturer's standard water emulsion.
- D. Thin-Set Mortar:
1. Dry-Set Portland Cement Mortar: ANSI A118.1.
 2. Latex-Portland Cement Mortar: ANSI A118.4.
- E. Water: Potable.

2.4 GROUT

- A. Grout Colors: Match stone.
- B. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate to produce required color.
- C. Standard Cement Grout: ANSI A118.6.
1. Unsanded grout mixture for joints **1/8 inch (3 mm)** and narrower.
 2. Sanded grout mixture for joints wider than **1/8 inch (3 mm)**.
- D. Polymer-Modified Cement Grout: ANSI A118.7.
1. Unsanded grout mix for joints **1/8 inch (3 mm)** and narrower.
 2. Sanded grout mix for joints wider than **1/8 inch (3 mm)**.

2.5 ACCESSORIES

- A. Abrasive Inserts for Stair Treads: Abrasive strips consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder, fabricated for installing in routed grooves of stair treads to provide slip resistance. Provide epoxy-resin installation adhesive compatible with inserts.
1. Width: **6.4 mm**.
 2. Depth: **12.7 mm**.
 3. Length: **100 mm** less than stair width.
- B. Cleaner: Stone cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone produce and by sealer manufacture. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.

- C. Floor Sealer: Colorless, slip- and stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

2.6 MORTAR AND GROUT MIXES

- A. Mortar: Comply with referenced standards and with manufacturers' written instructions to produce mortar of uniform quality and with optimum performance characteristics.
- B. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions and to produce a stiff mixture with a moist surface when bed is ready to receive stone.
- C. Joint Grout: Comply with mixing requirements in referenced ANSI standards and with manufacturer's written instructions.

2.7 STONE FABRICATION

- A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
- B. Cut stone to produce pieces of thickness, size, and shape indicated.
- C. Pattern Arrangement: Fabricate and arrange stone units with veining and other natural markings to comply with the following requirements:
 - 1. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
 - 2. Arrange units **in blend pattern**.
- D. Fabricate stone thresholds in sizes and profiles as indicated or required to provide transition between adjacent floor finishes.
- E. Fabricate stone stair treads in sizes and profiles indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. **Sweep** concrete substrates to remove dirt, dust, debris, and loose particles.
- B. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- C. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials.

3.2 INSTALLATION, GENERAL

- A. Do necessary field cutting as stone is set. Cut lines straight and true and finish field-cut edges to match shop-cut edges.

- B. Scribe and field cut stone as necessary to fit at obstructions.
- C. Provide control and expansion joints of widths and at locations indicated. Keep control and expansion joints free of mortar, grout, and other rigid materials.

3.3 INSTALLATION TOLERANCES

- A. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1.5 mm or one-fourth of nominal joint width, whichever is less.
- B. Variation in Surface Plane: Do not exceed 3 mm in 3 m maximum from level or slope indicated.
- C. Variation in Plane between Adjacent Units: Do not exceed 0.8-mm difference between planes of adjacent units.

3.4 INSTALLATION OF STONE BONDED TO CONCRETE

- A. Saturate concrete with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.
- B. Apply mortar-bed bond coat to damp concrete and broom to provide an even coating that completely covers the concrete. Do not exceed 1.5-mm thickness. Limit area of mortar-bed bond coat to avoid its drying out before placing setting bed.
- C. Apply mortar bed immediately after applying mortar-bed bond coat. Spread, tamp, and screed to uniform thickness at elevations required for setting stone to finished elevations indicated.
- D. Mix and place only that amount of mortar bed that can be covered with stone before initial set. Cut back, bevel edge, and discard material that has reached initial set before stone can be placed.
- E. Place stone before initial set of mortar occurs. Immediately before placing stone on setting bed, apply uniform 1.5-mm thick bond coat to mortar bed or to back of each stone unit.
- F. Tamp and beat stone with a wooden block or rubber mallet to obtain full contact with mortar bed and to bring finished surfaces within indicated tolerances. Set each unit in a single operation before initial set of mortar; do not return to areas already set and disturb stone for purposes of realigning finished surfaces or adjusting joints.
- G. Rake out joints to depth required to receive grout as units are set.
- H. Point joints after setting. Tool joints flat, uniform, and smooth, without visible voids.

3.5 STONE THRESHOLD INSTALLATION

- A. At locations adjacent to stone flooring, install stone thresholds in same type of setting bed as abutting stone flooring unless otherwise indicated.
- B. At locations not adjacent to stone flooring, install stone thresholds in thin-set, latex-portland cement mortar.

3.6 STONE STAIR TREAD AND RISER INSTALLATION

- A. Install stone stair treads and risers to comply with "Installation of Stone Bonded to Concrete" Article.

3.7 GROUTING

- A. Grout stone joints to comply with ANSI A108.10 and with manufacturer's written instructions.
 - 1. Do not use sanded grout for polished stone.
 - 2. Grout joints as soon as possible after initial set of setting bed. After initial set of grout, finish joints by tooling to produce a slightly concave polished joint, free of drying cracks.

3.8 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stonework as work progresses.
- B. Clean stonework after setting and grouting are complete. Use procedures recommended by stone fabricator for application types.
- C. Apply sealer to cleaned stonework according to sealer manufacturer's written instructions.

3.9 PROTECTION

- A. Prohibit traffic from installed stone for a minimum of 72 hours.
- B. Protect installed stonework during construction with nonstaining kraft paper. Where adjoining areas require construction work access, cover stonework with a minimum of 20-mm untreated plywood over nonstaining kraft paper.

END OF SECTION 096340

SECTION 09910 – INTERIOR PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation and field application of paints and coatings.

1.2 RELATED SECTIONS

- A. Section 09220 Plastering.
- B. Division 06 Wood and Plastics.

1.3 REFERENCES

- A. ASTM D16 – Terminology for Paint and Related Coatings, Materials and Applications.
- B. ASTM D4442 - Test Method for Direct Moisture Content Measurement of Wood and Wood Base Materials.
- C. NACE (National Association of Corrosion Engineers) - Industrial Maintenance Painting.
- D. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual.

1.4 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.5 SUBMITTALS

- A. Product Data: Provide data on all finishing products.
- B. Samples: Submit two samples, actual in size illustrating range of colors and textures available for each surface finishing product scheduled.
- C. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating requirements for finishes.

1.8 FIELD SAMPLES

- A. Provide field sample panel, 1.00 m long by 1.00 m wide, illustrating special coating color, texture, and finish.
- B. Accepted sample may not remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing. Do not deliver to site containers larger than 20 kg in weight.
- C. Store paint materials at minimum ambient temperature of 7 degrees C and a maximum of 32 degrees C, in ventilated area, and as required by manufacturer's instructions.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Do not apply exterior coatings during rain or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- C. Minimum Application Temperatures for Latex Paints: 7 degrees C for interiors; 10 degrees C for exterior; unless required otherwise by manufacturer's instructions.

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the work include the following or approved equal:
 - 1. Jotun, Egypt
 - 2. Scib Chemicals, S.A.E.
 - 3. Chemicals for Modern Building

2.2 COATING MATERIALS

- A. Manufacturer: coating materials are to be approved brands and obtained from one approved manufacturer unless otherwise specified.
- B. Emulsion paint: PVA resin based emulsion to produce a durable, flexible and water-resistant coating suitable for repeated washing and scrubbing.

- C. Oil paint: oleo-resinous; non-toxic; drying to a smooth; highly opaque to produce a durable; flexible and water-resistant coating with excellent adhesion and color retention. Undercoat is to be suitable to receive further coatings. Finish is to be high gloss; semi-gloss; semi-gloss or matt; to be selected by the COR or designated representative.
- D. Epoxy paint: epoxy paint shall have a high degree of resistance to acids, alkalis and water. It shall be easily applied over surfaces that have been primed with a primer containing an inhibitive pigment and shall present a glossy finish. One coat of primer and two finish coats shall be applied with minimum thickness of 0.075 mm per coat.
- E. Acrylic paint: ready mixed; waterproof and decorative coating comprising synthetic rubber base; selected pigment sand line aggregate for texture surfaces. The following selection of paint shall be applied as shown on the drawing.

2.3 PREPARATION AND PRIMING MATERIALS

- A. Preparation materials: cleaning, stopping, filling, sealing etc... materials are to be types recommended by their manufacturers and the coating manufacturer for the situation and surfaces being prepared, unless otherwise specified.
- B. Primer for concrete; masonry, rendering and plaster: natural oil and alkali resistant resin based priming paint.
- C. Primer for wood: ready mixed aluminum priming paint, water-borne priming paint, or solvent-borne priming paint to provide high moisture resistance and suitable for use with type of wood and preservative treatment.
- D. Primer for iron and steel: non-lead based priming paint.
- E. Primer for galvanized iron and steel: zinc chromate priming paint.

PART 3 - EXECUTION

3.1 GENERALLY

- A. Quality of work: operatives must be appropriately skilled and experienced in the use of specified materials and methods of application. Prepare surfaces and apply coatings in accordance with manufacturer's recommendations.
- B. Coating materials:
 1. Where possible are to be from one manufacturing batch; where more than one batch is to be used, keep separate, allocate to distinct parts or areas of the work and inform the COR or designated representative accordingly
 2. To be delivered in sealed containers, clearly labeled with type of material, brand name, intended use and manufacturer's batch numbers
 3. Store in a clean, dry area protected from extreme temperatures and in accordance with manufacturer's recommendations; use in order of delivery.
- C. Compatibility:

1. Check that all materials to be used are recommended by their manufacturers for the particular surface and conditions of exposure and that they are compatible with each other.
 2. Where surfaces have been treated with preservatives, check with treatment manufacturer that coating materials are compatible with the treatment and do not inhibit its performance.
 3. Inform the COR or designated representative of any discrepancy in specification of coatings and obtain instructions before proceeding with application.
- D. Color range: carry out decoration in colours or within range produce by particular coating manufacturer as appropriate and as selected by the COR or designated representative.
- E. Off site work: off site preparation and coating is to be carried out under cover in a suitable environment with adequate lighting. Store all items, both before and after coating, in a clean, dry area protected from the weather and mechanical damage, properly stacked with spaces to permit air circulation and prevent sticking of surfaces.
- F. Protection: adequately protect both internal and external surfaces which are not to be coated, by covering with dust sheets or other suitable materials. Place “wet paint “signs and provide barriers where necessary to prevent damage to freshly applied coatings.
- G. Control samples: for each type of coating, prepare sample areas of the finished work, including preparation, in advance of the remainder. Make arrangements with the COR or designated representative for the full time supervision of the application of each coat. Obtain approval of appearance before proceeding. Control samples may, at the COR or designated representative’s discretion, be used as the basis for comparative testing of dry film thickness of complete coating systems.
- H. Inspection of work: permit coating manufacturers to inspect the work in progress and take samples of their products from site if requested.
- I. Inspection of work: inspection of the whole of the work at each stage may be made, at the direction of the COR or designated representative. Agree with the COR or designated representative a program which will facilitate such inspections and notify him when each part and stage of the work is ready for inspection. Do not proceed with subsequent stages of the work until authorized.

3.2 PREPARATION

- A. Preparation materials: use in accordance with manufacturer’s recommendations.
- B. Masonry and rendering: remove dirt, surface deposits, loose and flaking material with a stiff brush. Fill holes and cracks flush with surface.
- C. Plaster: remove dirt and surface deposits with a stiff brush. Rub down to remove nibs, trowel marks and plaster splashes. Lightly rub over-trowelled glossy plaster with worn abrasive paper. Fill all depressions, holes and cracks and lightly rub down flush with surface.
- D. Plasterboard: fill imperfections and/or minor damage to leave a smooth; blemish-free surface.
- E. Uncoated wood: Ensure that large and loose knots are removed and made good with sound wood of the same species and sand flush. Ensure that surfaces are clean and remove oil, grease and excessive natural oils with suitable solvents. Sand to a smooth, even finish with

arrises rounded or eased. Remove resinous exudations by heat. Ensure that heads of fastenings are countersunk sufficiently to hold stopping / filling; fill nail and screw holes, joints, cracks, holes, depressions, open or coarse grain with stopper / filler worked well in and finished off flush with surface; sand smooth and remove dust.

- F. Priming wood: before priming preservative treated wood ensure that any cut surfaces have been re-treated and solvents have completely dried out. Apply primer to all surfaces including rebates, beads, backs etc... which will be concealed when components are fixed in place. Liberally coat all end grain, allow soaking in, and then, re-coating.
- G. Pre-primed wood: remove dirt and grease from satisfactorily pre-primed surfaces and sand lightly. Sand down chalking, powdery and other defective areas to the bare surface, remove dust, and re-prime as necessary.
- H. Stopping, filling and priming: apply oil based stoppers / fillers after priming. Apply water based stoppers / fillers before priming unless otherwise recommended by manufacturer. Patch prime water based stoppers / fillers when applied after priming.
- I. Stopper/filler for clear coatings: carefully adjust color so that after coatings have been applied it closely matches the color of the wood, to approval.
- J. Concealed metal surfaces: apply black bitumen coating solution to concealed surfaces of metal components before fixing.
- K. External doors: prime and paint bottom edges before hanging.
- L. Ironmongery: remove from surfaces to be coated and refix on completion. Do not remove hinges unless instructed to do so.
- M. Doors and windows: ensure that doors and opening windows etc... are eased as necessary before coating. Prime any resulting bare areas.
- N. Galvanized surfaces: remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- O. Uncoated steel and iron surfaces: remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- P. Shop primed steel surfaces: sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

3.3 APPLICATION

- A. Generally: apply products in accordance with manufacturer's instructions
- B. Unsuitable conditions: do not apply coatings to surfaces affected by moisture, when relative humidity is more than 80% or when heat is likely to cause blistering or wrinkling. Take necessary precautions including restrictions on working hours, providing temporary protection and allowing extra drying time, to ensure that coatings are not adversely affected by climatic conditions before, during and after application.

C. Painting generally:

1. Do not thin or intermix paint materials unless otherwise specified or recommended; if materials are found to have been thinned without authorization, the COR or designated representative may require the application of additional coats.
2. Apply priming coats as soon as possible on the same day a preparation is completed; ensure that they are of adequate thickness and suit surface porosity.
3. Adjacent coating of the same material must be of a different tint to ensure that each coat provides complete coverage.
4. Apply coatings by brush unless otherwise specified or approved; keep brushes, tools and equipment in a clean condition.
5. Apply coatings to clean, dust free, suitably dry surfaces in dry atmospheric conditions and after any previous coats have hardened; lightly abrade between coats as necessary.
6. Apply coatings evenly to give smooth finish of uniform color, free from brush marks, nibs, sags, runs and other defects; cut in neatly and cleanly; do not splash or mark adjacent surfaces.
7. Keep all surfaces clean and free from dust during coating and drying; adequately protect completed work from damage.

D. Completion: ensure that opening lights and other moving parts move freely. Remove all masking tape and protective wrappings.

3.4 SCHEDULE - EXTERIOR SURFACES

A. Concrete, cement plaster:

1. One coat of alkali resistant primer.
2. Two coats of block filler.
3. A minimum of two coats of acrylic emulsion paint.

B. Steel: All steel surfaces shall be painted using enamel, Semi-gloss paints .

END OF SECTION 09910

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.2 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.

- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

SECTION 220523.14 - CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bronze swing check valves.
 - 2. Iron swing check valves.
 - 3. Iron swing check valves with closure control.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G **and NSF 372**.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 4. ASME B16.18 for solder joint.
 - 5. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.

- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow in horizontal position with hinge pin level.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Pump-Discharge Check Valves:
 - a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with **bronze** disc.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG ([1035 kPa]) OR LESS)

A. Pipe **NPS 2 (DN 50)** and Smaller:

1. Horizontal and Vertical Applications: Bronze swing check valves, Class 125, **bronze** disc with **threaded** end connections.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe **NPS 2 (DN 50)** and Smaller: Bronze swing check valves, Class 125, **bronze** disc with **threaded** end connections.

END OF SECTION 220523.14

SECTION 220523.15 - GATE VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bronze gate valves.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 4. ASME B16.18 for solder joint.
 - 5. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE GATE VALVES

- A. Class 125, NRS, Bronze Gate Valves:
 - 1. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig (1380 kPa).
 - c. Body Material: Bronze with integral seat and screw-in bonnet.
 - d. Ends: Threaded or solder joint.
 - e. Stem: Bronze.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. Use gate valves for shutoff service only.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG ([1035 kPa]) OR LESS)

- A. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 125, with **threaded** ends.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 (DN 50) and Smaller: Bronze gate valves, Class 125, with **threaded** ends.

END OF SECTION 220523.15

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule,"
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

2.4 SEALANTS

- A. ASJ Flashing Sealants, and Vinyl and PVDC Sealants:
 - 1. Materials shall be compatible with insulation materials and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: **Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C)**.
 - 4. Color: White.

2.5 TAPES

- A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 - 1. Width: **2 inches (50 mm)**.
 - 2. Thickness: **6 mils (0.15 mm)**.
 - 3. Adhesion: **64 ounces force/inch (0.7 N/mm)** in width.
 - 4. Elongation: 500 percent.
 - 5. Tensile Strength: **18 lbf/inch (3.3 N/mm)** in width.
- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 - 1. Width: **2 inches (50 mm)**.
 - 2. Thickness: **3.7 mils (0.093 mm)**.
 - 3. Adhesion: **100 ounces force/inch (1.1 N/mm)** in width.
 - 4. Elongation: 5 percent.
 - 5. Tensile Strength: **34 lbf/inch (6.2 N/mm)** in width.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least **4 inches (100 mm)** beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Use firestopping and fire-resistive joint sealers.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 FINISHES

- A. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly by removing insulation in layers in reverse order of their installation. Extent of inspection shall include straight pipe, threaded fittings, welded fittings, of threaded strainers, welded strainers, threaded valves, and flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:
1. Flexible Elastomeric: **1 inch (25 mm)** thick.
- B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be the following:
1. Flexible Elastomeric: **1 inch (25 mm)** thick.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

- A. Product Data: For piping, fittings, transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: **Type M (ASTM B 88M, Type C)** water tube, drawn temper.
- B. Soft Copper Tube: **ASTM B 88, Type L (ASTM B 88M, Type B)** water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- G. Copper Pressure-Seal-Joint Fittings:
 - 1. Fittings for **NPS 2 (DN 50)** and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2. Fittings for **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.2 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 1. AWWA C110/A21.10, rubber, flat face, **1/8 inch (3.2 mm)** thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.3 TRANSITION FITTINGS

- A. General Requirements:
 1. Same size as pipes to be joined.
 2. Pressure rating at least equal to pipes to be joined.
 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 1. Standard: ASSE 1079.
 2. Pressure Rating: **150 psig (1035 kPa) minimum at 180 deg F (82 deg C)**.
 3. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
 1. Standard: ASSE 1079.
 2. Factory-fabricated, bolted, companion-flange assembly.
 3. Pressure Rating: **150 psig (1035 kPa) minimum at 180 deg F (82 deg C)**
 4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

- D. Dielectric-Flange Insulating Kits:
 - 1. Nonconducting materials for field assembly of companion flanges.
 - 2. Pressure Rating: **150 psig (1035 kPa)**
 - 3. Gasket: Neoprene or phenolic.
 - 4. Bolt Sleeves: Phenolic or polyethylene.
 - 5. Washers: Phenolic with steel backing washers.

- E. Dielectric Nipples:
 - 1. Standard: IAPMO PS 66.
 - 2. Electroplated steel nipple complying with ASTM F 1545.
 - 3. Pressure Rating and Temperature: **300 psig (2070 kPa) at 225 deg F (107 deg C)**.
 - 4. End Connections: Male threaded or grooved.
 - 5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance.
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping level **without pitch** and plumb.
- F. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- J. Install piping to permit valve servicing.

- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.
- N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors.

3.2 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for **NPS 1-1/2 (DN 40)** and Smaller: Fitting-type coupling.

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for **NPS 2 (DN 50)** and Smaller: Use dielectric **couplings or nipples or unions**.
- C. Dielectric Fittings for **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)** : Use dielectric **flanges**.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. **100 Feet (30 m)** and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than **100 Feet (30 m)**: MSS Type 43, adjustable roller hangers.
 - c. Longer Than **100 Feet (30 m)** if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs **100 Feet (30 m)** or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.

- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of **3/8 inch (10 mm)**.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. **NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.**
 - 2. **NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.**
 - 3. **NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.**
 - 4. **NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.**
 - 5. **NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.**
- E. Install supports for vertical copper tubing every **10 feet (3 m)**.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
 - 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.6 IDENTIFICATION

- A. Identify system components with labels to match existing.
- B. Label pressure piping with system operating pressure.

3.7 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for re-inspection.
- c. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- d. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.8 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

- 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.9 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Aboveground domestic water piping, **NPS 2 (DN 50) and smaller**, shall be the following:

- 1. Hard copper tube, ASTM B 88, Type M (ASTM B 88M, Type C); cast-copper, solder-joint fittings; and soldered joints.

END OF SECTION 221116

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
 - 1. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- E. Solvent Cement: ASTM D 2564.
 - 1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, **Service** class, schedule 40.
- B. Gaskets: ASTM C 564, rubber.
- C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: **1 percent** downward in direction of flow for piping **NPS 4 (DN 100)** and larger.
 - 2. Vent Piping: **1 percent** down toward vertical fixture vent or toward vent stack.
- K. Install aboveground PVC piping according to ASTM D 2665.
- L. Install underground **PVC** piping according to ASTM D 2321.
- M. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.3 VALVE INSTALLATION

- A. Backwater Valves: Install backwater valves in piping subject to backflow.
 - 1. Horizontal Piping: Horizontal backwater valves.
 - 2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Support horizontal piping and tubing within **12 inches (300 mm)** of each fitting, **valve** and coupling.
- B. Install hangers for **PVC** piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. **NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm)** with **3/8-inch (10-mm)** rod.
 - 2. **NPS 3 (DN 80): 48 inches (1200 mm)** with **1/2-inch (13-mm)** rod.
 - 3. **NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches (1200 mm)** with **5/8-inch (16-mm)** rod.

- C. Install supports for vertical **PVC** piping every **48 inches (1200 mm)**.
- D. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Install horizontal backwater valves **with cleanout cover flush with floor**.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections **NPS 2-1/2 (DN 65)** and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.6 FIELD QUALITY CONTROL

- A. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than **10-foot head of water (30 kPa)**. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 3. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of **1-inch wg (250 Pa)**. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without

- introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

3.7 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Exposed **PVC** Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.8 PIPING SCHEDULE

- A. Aboveground, soil and waste piping **NPS 4 (DN 100) and smaller** shall be the following:
 1. PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Cast-iron soil pipe and fittings; gaskets; and gasketed joints.
- B. Aboveground, vent piping **NPS 4 (DN 100) and smaller** shall be the following:
 1. PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Cast-iron soil pipe and fittings; gaskets; and gasketed joints.
- C. Underground, soil, waste, and vent piping **NPS 4 (DN 100) and smaller** shall be the following:
 1. PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 221316

- **SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

PART 1 - GENERAL**1.1 SUMMARY**

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 1. Motor controllers.
 2. Torque, speed, and horsepower requirements of the load.
 3. Ratings and characteristics of supply circuit and required control sequence.
 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS**2.1 MOTOR CHARACTERISTICS**

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.2 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 1. Permanent-split capacitor.
 2. Split phase.
 3. Capacitor start, inductor run.
 4. Capacitor start, capacitor run.

- B. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- C. Motors 1/20 HP and Smaller: Shaded-pole type.
- D. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Equipment labels.
 2. Pipe labels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, **1/16 inch (1.6 mm) 1/8 inch (3.2 mm)** thick, and having predrilled holes for attachment hardware.
 2. Letter Color: **Black**.
 3. Background Color: **White**.
 4. Maximum Temperature: Able to withstand temperatures up to **160 deg F (71 deg C)**.
 5. Minimum Label Size: Length and width vary for required label content, but not less than **2-1/2 by 3/4 inch (64 by 19 mm)**.
 6. Minimum Letter Size: **1/2 inch (13 mm)** for viewing distances up to **72 inches (1830 mm)**, and proportionately larger lettering for greater viewing distances.
 7. Fasteners: Stainless-steel **rivets or self-tapping screws**.
 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number,
- C. Equipment Label Schedule: For each item of equipment to be labeled, on **8-1/2-by-11-inch (A4)** bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.

- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to **partially cover** circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: **At least 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm) and proportionately larger lettering for greater viewing distances.**

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of **50 feet (15 m)** along each run. Reduce intervals to **25 feet (7.6 m)** in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:

1. Chilled-Water Piping: **White letters on a safety-green background.**
2. Condensate-Water Piping: **White letters on a safety-green background.**
3. Refrigerant Piping: **White letters on a safety-black background.**

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

- A. LEED Submittals:
 - 1. Air-Balance Report for Prerequisite IEQ 1: Documentation indicating that work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
 - 2. TAB Report for Prerequisite EA 2: Documentation indicating that work complies with ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.4 INFORMATIONAL SUBMITTALS

- A. Strategies and Procedures Plan: Within **60** days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by **AABC** or **NEBB** or **TABB**.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by **AABC** or **NEBB** or **TABB**.
 2. TAB Technician: Employee of the TAB specialist and certified by **AABC** or **NEBB** or **TABB** as a TAB technician.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.
- L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Duct systems are complete with terminals installed.
 - b. Volume, smoke, and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. Fans are operating, free of vibration, and rotating in correct direction.
 - e. Variable-frequency controllers' startup is complete and safeties are verified.
 - f. Automatic temperature-control systems are operational.
 - g. Ceilings are installed.
 - h. Windows and doors are installed.
 - i. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in **inch-pound (IP) and metric (SI)** units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from **Mechanical Engineer** for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 - 1. Measure airflow of submain and branch ducts.
 - 2. Adjust submain and branch duct volume dampers for specified airflow.
 - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
 - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 - 2. Measure inlets and outlets airflow.
 - 3. Adjust each inlet and outlet for specified airflow.
 - 4. Re-measure each inlet and outlet after they have been adjusted.

3.6 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: **Plus, or minus 10 percent.**
 - 2. Air Outlets and Inlets: **Plus, or minus 10 percent.**
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.7 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
 - 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB specialist.
 - 3. Project name.
 - 4. Project location.
 - 5. Owner's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 - 12. Nomenclature sheets for each item of equipment.
 - 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 - 14. Notes to explain why certain final data in the body of reports vary from indicated values.

15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.

- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
 1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Pipe and valve sizes and locations.
 4. Terminal units.
 5. Balancing stations.
 6. Position of balancing devices.

- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches (mm), and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.

 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches (mm), and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm (L/s).
 - b. Total system static pressure in inches wg (Pa).
 - c. Fan rpm.

- d. Discharge static pressure in inches wg (Pa).
- e. Filter static-pressure differential in inches wg (Pa).
- f. Preheat-coil static-pressure differential in inches wg (Pa).
- g. Cooling-coil static-pressure differential in inches wg (Pa).
- h. Heating-coil static-pressure differential in inches wg (Pa).
- i. Outdoor airflow in cfm (L/s).
- j. Return airflow in cfm (L/s).
- k. Outdoor-air damper position.
- l. Return-air damper position.
- m. Vortex damper position.

F. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

- a. System identification.
- b. Location.
- c. Make and type.
- d. Model number and size.
- e. Manufacturer's serial number.
- f. Arrangement and class.
- g. Sheave make, size in inches (mm), and bore.
- h. Center-to-center dimensions of sheave and amount of adjustments in inches (mm).

2. Motor Data:

- a. Motor make, and frame type and size.
- b. Horsepower and rpm.
- c. Volts, phase, and hertz.
- d. Full-load amperage and service factor.
- e. Sheave make, size in inches (mm), and bore.
- f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
- g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

- a. Total airflow rate in cfm (L/s).
- b. Total system static pressure in inches wg (Pa).
- c. Fan rpm.
- d. Discharge static pressure in inches wg (Pa).
- e. Suction static pressure in inches wg (Pa).

G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

- a. System and air-handling-unit number.
- b. Location and zone.
- c. Traverse air temperature in deg F (deg C).
- d. Duct static pressure in inches wg (Pa).

- e. Duct size in inches (mm).
- f. Duct area in sq. ft. (sq. m).
- g. Indicated airflow rate in cfm (L/s).
- h. Indicated velocity in fpm (m/s).
- i. Actual airflow rate in cfm (L/s).
- j. Actual average velocity in fpm (m/s).
- k. Barometric pressure in psig (Pa).

H. Air-Terminal-Device Reports:

- 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft. (sq. m).
- 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm (L/s).
 - b. Air velocity in fpm (m/s).
 - c. Preliminary airflow rate as needed in cfm (L/s).
 - d. Preliminary velocity as needed in fpm (m/s).
 - e. Final airflow rate in cfm (L/s).
 - f. Final velocity in fpm (m/s).
 - g. Space temperature in deg F (deg C).

I. Instrument Calibration Reports:

- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.8 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of **Mechanical Engineer**.
- B. **Mechanical Engineer** shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements

recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 - 3. If the second verification also fails, **Mechanical Engineer** may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.9 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

1.4 INFORMATIONAL SUBMITTALS

- A. Strategies and Procedures Plan: Within **60** days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by **AABC** or **NEBB** or **TABB**.
 - 1. TAB Field Supervisor: Employee of the TAB specialist and certified by **AABC** or **NEBB** or **TABB**.
 - 2. TAB Technician: Employee of the TAB specialist and certified by **AABC** or **NEBB** or **TABB** as a TAB technician.

- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.

- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as grills.
- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Duct systems are complete with terminals installed.
 - b. Volume, smoke, and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. Fans are operating, free of vibration, and rotating in correct direction.
 - e. Variable-frequency controllers' startup is complete and safeties are verified.
 - f. Automatic temperature-control systems are operational.
 - g. Ceilings are installed.
 - h. Windows and doors are installed.
 - i. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."

- C. Mark equipment and balancing devices, including damper-control positions, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in **inch-pound (IP) and metric (SI)** units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.

- b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 4. Obtain approval from **Mechanical Engineer** for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
1. Measure airflow of submain and branch ducts.
 2. Adjust submain and branch duct volume dampers for specified airflow.
 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 2. Measure inlets and outlets airflow.
 3. Adjust each inlet and outlet for specified airflow.
 4. Re-measure each inlet and outlet after they have been adjusted.

3.6 TOLERANCES

- A. Set HVAC system's airflow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: **Plus, or minus 10 percent.**
 2. Air Outlets and Inlets: **Plus, or minus 10 percent.**
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.7 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Owner's name and address.
 6. Contractor's name and address.
 7. Report date.
 8. Signature of TAB supervisor who certifies the report.
 9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 10. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 11. Nomenclature sheets for each item of equipment.
 12. Data for terminal units, including manufacturer's name, type, size, and fittings.
 13. Notes to explain why certain final data in the body of reports vary from indicated values.
 14. Test conditions for fans performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Settings for supply-air, static-pressure controller.
 - g. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Duct, outlet, and inlet sizes.
 3. Terminal units.
 4. Balancing stations.

5. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Number, make, and size of belts.
 - i. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in **cfm (L/s)**.
 - b. Total system static pressure in **inches wg (Pa)**.
 - c. Fan rpm.
 - d. Discharge static pressure in **inches wg (Pa)**.
 - e. Filter static-pressure differential in **inches wg (Pa)**.
 - f. Cooling-coil static-pressure differential in **inches wg (Pa)**.
 - g. Heating-coil static-pressure differential in **inches wg (Pa)**.
 - h. Outdoor airflow in **cfm (L/s)**.
 - i. Return airflow in **cfm (L/s)**.
- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.

- d. Full-load amperage and service factor.
3. Test Data (Indicated and Actual Values):
- a. Total airflow rate in **cfm (L/s)**.
 - b. Total system static pressure in **inches wg (Pa)**.
 - c. Fan rpm.
 - d. Discharge static pressure in **inches wg (Pa)**.
 - e. Suction static pressure in **inches wg (Pa)**.
- G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
- 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in **deg F (deg C)**.
 - d. Duct static pressure in **inches wg (Pa)**.
 - e. Duct size in **inches (mm)**.
 - f. Duct area in **sq. ft. (sq. m)**.
 - g. Indicated airflow rate in **cfm (L/s)**.
 - h. Indicated velocity in **fpm (m/s)**.
 - i. Actual airflow rate in **cfm (L/s)**.
 - j. Actual average velocity in **fpm (m/s)**.
 - k. Barometric pressure in **psig (Pa)**.
- H. Instrument Calibration Reports:
- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.8 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of **Mechanical Engineer**.
- B. **Mechanical Engineer** shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 - 3. If the second verification also fails, **Mechanical Engineer** may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.9 ADDITIONAL TESTS

- A. Within 30 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION 230593

- **SECTION 230713 - DUCT INSULATION**

PART 1 - GENERAL**1.1 SUMMARY****A. Section includes insulating the following duct services:**

1. Indoor, concealed supply, return and outdoor air.
2. Indoor, exposed supply and outdoor air.

1.2 ACTION SUBMITTALS**A. Product Data:** For each type of product indicated.**B. Shop Drawings:** Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.3 QUALITY ASSURANCE**A. Surface-Burning Characteristics:** For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS**2.1 INSULATION MATERIALS****A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," articles for where insulating materials shall be applied.**

- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- D. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation.

2.2 ADHESIVES

- A. Approved manufacturer: Foster (non-flammable) or approved equal
- B. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, **0.013 perm (0.009 metric perm)** at **43-mil (1.09-mm)** dry film thickness.
 2. Service Temperature Range: **Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C)**.
 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 4. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.

3. Service Temperature Range: **Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C)**.
4. Color: Aluminum.
5. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately **1 oz./sq. yd. (34 g/sq. m)** with a thread count of **10 strands by 10 strands/sq. in. (4 strands by 4 strands/sq. mm)**, in a Leno weave, for ducts.

2.6 TAPES

- A. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
 1. Width: **2 inches (50 mm)**.
 2. Thickness: **3.7 mils (0.093 mm)**.
 3. Adhesion: **100 ounces force/inch (1.1 N/mm)** in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: **34 lbf/inch (6.2 N/mm)** in width.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install multiple layers of insulation with longitudinal and end seams staggered.

- E. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- F. Install insulation with least number of joints practical.
- G. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- H. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- I. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- J. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least **4 inches (100 mm)** beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for **100 percent** coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions **18 inches (450 mm)** and smaller, place pins along longitudinal centerline of duct. Space **3 inches (75 mm)** maximum from insulation end joints, and **16 inches (400 mm)** o.c.
 - b. On duct sides with dimensions larger than **18 inches (450 mm)**, place pins **16 inches (400 mm)** o.c. each way, and **3 inches (75 mm)** maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

- d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing **2 inches (50 mm)** from one edge and one end of insulation segment. Secure laps to adjacent insulation section with **1/2-inch (13-mm)** outward-clinching staples, **1 inch (25 mm)** o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below **50 deg F (10 deg C)** at **18-foot (5.5-m)** intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than **3 inches (75 mm)**.
 5. Overlap unfaced blankets a minimum of **2 inches (50 mm)** on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of **18 inches (450 mm)** o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with **6-inch- (150-mm-)** wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced **6 inches (150 mm)** o.c.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to **one** location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.5 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber **blanket, 2 inches (50 mm)** thick and **3-lb/cu. ft. (48-kg/cu. m)** nominal density.
- B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber **blanket, 2 inches (50 mm)** thick and **3-lb/cu. ft. (48-kg/cu. m)** nominal density.

END OF SECTION 230713

SECTION 230719 - PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
1. Refrigerant suction and hot-gas piping, **indoors and outdoors**.
 2. Condensate drain piping.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 2. Detail attachment and covering of heat tracing inside insulation.
 3. Detail insulation application at pipe expansion joints for each type of insulation.
 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 5. Detail removable insulation at piping specialties.
 6. Detail application of field-applied jackets.
 7. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- D. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- C. Keep insulation materials dry during application and finishing.
- D. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- E. Install insulation with least number of joints practical.

3.3 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

3.4 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install mitered sections of pipe insulation.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 3. Install insulation to flanges as specified for flange insulation application.
 - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.5 FIELD-APPLIED JACKET INSTALLATION

- A. Where metal jackets are indicated, install with **2-inch (50-mm)** overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands **12 inches (300 mm)** o.c. and at end joints.

3.6 INDOOR PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Flexible Tubing: **Flexible elastomeric 1 inch (25 mm)** thick.

3.7 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

- A. Refrigerant Suction and Hot-Gas Piping: Insulation shall be the following:
 - 1. Flexible Elastomeric: [**1 inches (25 mm)**] thick.

- B. Refrigerant Suction and Hot-Gas Flexible Tubing: Insulation shall be the following:
 - 1. Flexible Elastomeric: [1 inches (25 mm)] thick.
- C. Condensate drain Piping: Insulation shall be the following:
 - 1. Flexible Elastomeric: [1 inches (25 mm)] thick.

3.8 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. Duct tape Silver wrap double layer.
- D. Piping, Exposed:
 - 1. Duct tape Silver wrap double layer.

3.9 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. Duct tape Silver wrap double layer.

END OF SECTION 230719

SECTION 232300 - REFRIGERANT PIPING**PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes:
1. Refrigerant pipes and fittings.
 2. Refrigerant piping valves and specialties.
 3. Refrigerants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty.
- B. Shop Drawings:
1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
 2. Show interface and spatial relationships between piping and equipment.

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Line Test Pressure for Refrigerant R-410A & R22:
1. Suction Lines for Air-Conditioning Applications: **300 psig (2068 kPa)**.
 2. Suction Lines for Heat-Pump Applications: **535 psig (3689 kPa)**.
 3. Hot-Gas and Liquid Lines: **535 psig (3689 kPa)**.

2.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: **ASTM B 88, Type M (ASTM B 88M, Type C)**.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum **3/4-inch (20-mm)** misalignment in minimum **7-inch- (180-mm-)** long assembly.
4. Working Pressure Rating: Factory test at minimum **500 psig (3450 kPa)**.
5. Maximum Operating Temperature: **250 deg F (121 deg C)**.

2.3 VALVES AND SPECIALTIES

A. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: **0.50 psig (3.4 kPa)**.
8. Working Pressure Rating: **500 psig (3450 kPa)**.
9. Maximum Operating Temperature: **275 deg F (135 deg C)**.

2.4 REFRIGERANTS

- A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.
- B. R-22

PART 3 - EXECUTION**3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A**

- A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with **soldered** joints.
- B. Hot-Gas and Liquid Lines, **and Suction Lines for Heat-Pump Applications**: Copper, **Type M** drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.

- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- L. Install refrigerant piping in protective conduit where installed belowground.
- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs every 4 meters.
 - 4. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

3.3 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.

- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
 - 1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod, 1/4 inch (6.4 mm).
 - 2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod, 1/4 inch (6.4 mm).
 - 3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod, 1/4 inch (6.4 mm).
 - 4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod, 3/8 inch (9.5 mm).
 - 5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod, 3/8 inch (9.5 mm).
- D. Support multifloor vertical runs at least at each floor.

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Comply with ASME B31.5, Chapter VI.

2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
- B. Prepare test and inspection reports.

3.6 SYSTEM CHARGING

- A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
 4. Charge system with a new filter-dryer core in charging line.

3.7 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Sheet metal materials.
3. Sealants and gaskets.
4. Hangers and supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Equipment installation based on equipment being used on Project.
5. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
6. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.

- b. Air outlets and inlets.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Minimum duct size shall be 0.8mm (gauge 22) for all duct work.
- C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: **G60 (Z180)** or **G90 (Z275)**.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with **ASTM B 209 (ASTM B 209M)** Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, **1/4-inch (6-mm)** minimum diameter for lengths **36 inches (900 mm)** or less; **3/8-inch (10-mm)** minimum diameter for lengths longer than **36 inches (900 mm)**.

2.3 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: [**3 inches (76 mm)**] [**4 inches (102 mm)**] [**6 inches (152 mm)**].
 - 3. Sealant: Modified styrene acrylic.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. Maximum Static-Pressure Class: **10-inch wg (2500 Pa)**, positive and negative.
 - 7. Service: Indoor and outdoor.
 - 8. Service Temperature: **Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C)**.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 - 10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.

3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
 6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.4 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

3.3 HANGER AND SUPPORT INSTALLATION

- A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).
- E. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Concealed AC Units:
 - a. Pressure Class: Positive **1-inch wg (250 Pa)**.
 - b. Minimum SMACNA Seal Class: **[A]**

B. Return Ducts:

1. Ducts Connected to Concealed AC Units:
 - a. Pressure Class: Positive or negative **1-inch wg (250 Pa)**
 - b. Minimum SMACNA Seal Class: **[A]**.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative **1-inch wg (250 Pa)**.
 - b. Minimum SMACNA Seal Class: **[A]** if negative pressure, and A if positive pressure.
2. Ducts Connected to Kitchen Hoods: Comply with NFPA 96.
 - a. Exposed to View: Type 304, stainless-steel sheet, **No. 4** or **No. 3**.
 - b. Concealed: **Type 304, stainless-steel sheet, No. 2D finish.**
 - c. Welded seams and joints.
 - d. Pressure Class: Positive or negative **[2-inch wg (500 Pa)]**.
 - e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
 - f. SMACNA Leakage Class: 3.

END OF SECTION 233113

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Flange connectors.
 - 3. Turning vanes.
 - 4. Flexible connectors.
 - 5. Duct accessory hardware.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 - "Systems and Equipment."
 - 2. Product Data for Prerequisite EA 2: Documentation indicating that duct insulation R-values comply with tables in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air Conditioning."
- C. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control-damper installations.
 - d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
 - e. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: **G60 (Z180)** or **G90 (Z275)**.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a [No. 2] 304 finish for concealed ducts and 304 finish for exposed ducts.
- C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- D. Tie Rods: Galvanized steel, **1/4-inch (6-mm)** minimum diameter for lengths **36 inches (900 mm)** or less; **3/8-inch (10-mm)** minimum diameter for lengths longer than **36 inches (900 mm)**.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Approved manufacturers EGAT or approved equal
 - 2. Standard leakage rating [, **with linkage outside airstream**].
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Frame: Hat-shaped, **0.094-inch- (2.4-mm-)** thick, **galvanized sheet steel**
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized steel, **0.064 inch (1.62 mm)** thick.
 - 6. Blade Axles: **Galvanized steel**.

7. Bearings:
 - a. **Oil-impregnated bronze.**
 - b. Dampers in ducts with pressure classes of **3-inch wg (750 Pa)** or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

2.4 FLANGE CONNECTORS

- A. Description: factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- B. Material: Galvanized steel.
- C. Gage and Shape: Match connecting ductwork.

2.5 TURNING VANES

- A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- C. Vane Construction: **Single** wall.

2.6 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip **3-1/2 inches (89 mm)** or **5-3/4 inches (146 mm)** wide attached to two strips of **2-3/4-inch- (70-mm-)** wide, **0.028-inch- (0.7-mm-)** thick, galvanized sheet steel . Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: **26 oz./sq. yd. (880 g/sq. m).**
 2. Tensile Strength: **480 lbf/inch (84 N/mm)** in the warp and **360 lbf/inch (63 N/mm)** in the filling.
 3. Service Temperature: **Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).**
- E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

2.7 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

To minimize duct noise generated by volume dampers, SMACNA recommends locating dampers at least **two duct diameters** from fittings and as far away as possible from outlets.

- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 1. Install steel volume dampers in steel ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 1. At outdoor-air intakes and mixed-air plenums.
 2. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
- G. Install access doors with swing against duct static pressure.
- H. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
 2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
 3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
 4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 5. Body Access: 25 by 14 inches (635 by 355 mm).
 6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).
- I. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- J. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
1. Operate dampers to verify full range of movement.
 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233416 - CENTRIFUGAL HVAC FANS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: For each product.
 - 1. Backward-inclined centrifugal fans.
 - 2. Forward-curved centrifugal fans.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Include rated capacities, furnished specialties, and accessories for each fan.
 - 2. Certified fan performance curves with system operating conditions indicated.
 - 3. Certified fan sound-power ratings.
 - 4. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 5. Material thickness and finishes, including color charts.
 - 6. Dampers, including housings, linkages, and operators.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
 - 4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show fan room layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate and certify field measurements.
- B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For centrifugal fans to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AMCA Compliance: Comply with AMCA performance requirements and bear the AMCA-Certified Ratings Seal.
- B. Capacities and Characteristics:
 - 1. Total Airflow: **100 cfm (L/s)**.
 - 2. External Static Pressure: **0.1 inches wg**.
 - 3. Housing Material: **Aluminum**.
 - 4. Drive Type: **Direct**.
 - 5. Motor:
 - a. Electrical Characteristics:
 - 1) Volts: **230**.
 - 2) Phase: **Single**.
 - 3) Hertz: 50.
 - 6. Vibration Isolators: Neoprene vibration isolation for hanging installation.

2.2 BACKWARD-INCLINED CENTRIFUGAL FANS

- A. Approved Manufacturers: Greenheck, S&P or approved equal.
- B. Description:
 - 1. Factory-fabricated, -assembled, -tested, and -finished, direct-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
 - 2. Suspended cabinet-type ceiling exhaust fans shall be centrifugal type, direct-driven. Fans shall have acoustically insulated housing. Integral backdraft damper shall be chatter-proof. The integral face grille shall be of egg-crate design or louver design. Mount fan motors on vibration isolators. Furnish unit with mounting flange for hanging unit from above. Fans shall be U.L. listed
 - 3. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
 - 4. Factory-installed and -wired disconnect switch.
- C. Housings:
 - 1. Formed panels to make curved-scroll housings with shaped cutoff.
 - 2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.

D. Backward-Inclined Wheels:

1. Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades, and fastened to shaft with set screws.
2. Welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate.

E. Shafts:

1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Grease-Lubricated Shaft Bearings:

1. Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.

G. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
3. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
4. Discharge Dampers: Assembly with **opposed** blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
5. Inlet Screens: Grid screen of same material as housing.
6. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
7. Spark-Resistant Construction: AMCA 99.
8. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
9. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.
10. Round Hooded Wall Cap.
11. Round Duct Connection.
12. Designer Grille.
13. Isolation kit.

2.3 FORWARD-CURVED CENTRIFUGAL FANS

A. Approved Manufacturers: Greenheck, S&P or approved equal.

B. Description:

1. Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor, drive assembly, and support structure.
2. Deliver fans as factory-assembled units, to the extent allowable by shipping limitations.
3. Factory-installed and -wired disconnect switch.

C. Housings:

1. Formed panels to make curved-scroll housings with shaped cutoff.
2. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.

D. Forward-Curved Wheels:

1. Black-enameled or galvanized-steel construction with inlet flange, backplate, shallow blades with inlet and tip curved forward in direction of airflow.
2. Mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.

E. Shafts:

1. Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with adjustable alignment and belt tensioning.
2. Turned, ground, and polished hot-rolled steel with keyway. Ship with protective coating of lubricating oil.
3. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Grease-Lubricated Shaft Bearings:

1. Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.

G. Accessories:

1. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
2. Companion Flanges: Rolled flanges for duct connections of same material as housing.
3. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft for double-width fans.
4. Discharge Dampers: Assembly with [**parallel**] [**opposed**] blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.
5. Inlet Screens: Grid screen of same material as housing.
6. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.
7. Spark-Resistant Construction: AMCA 99.
8. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.
9. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.
10. Round Hooded Wall Cap.

11. Round Duct Connection.
12. Designer Grille.
13. Isolation kit.

2.4 SOURCE QUALITY CONTROL

- A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install centrifugal fans level and plumb.
- B. Disassemble and reassemble units, as required for moving to the final location, according to manufacturer's written instructions.
- C. Lift and support units with manufacturer's designated lifting or supporting points.
- D. Equipment Mounting:
 1. Mount the ceiling exhaust fan using manufacturer's standard mounting kit and use manufacturer's standard Neoprene vibration isolation.
- E. Install units with clearances for service and maintenance.
- F. Label fans according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to fans to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Verify that shipping, blocking, and bracing are removed.
 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 5. Adjust damper linkages for proper damper operation.
 6. Verify lubrication for bearings and other moving parts.
 7. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 8. See Section 230593 "Testing, Adjusting, and Balancing For HVAC" for testing, adjusting, and balancing procedures.
 9. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Controls and equipment will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 233416

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Rectangular and square ceiling diffusers.
 2. Perforated diffusers.
 3. Linear slot diffusers.
 4. Linear bar grilles.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

Approved manufacturers EGAT or approved equal

2.1 CEILING DIFFUSERS

1. Devices shall be specifically designed for variable-air-volume flows.
 2. Material: **Aluminum**.
 3. Finish: **Baked enamel, white**.
 4. Face Style: **Four** cone.
 5. Mounting: Duct connection.
- B. Rectangular and Square Ceiling Diffusers:
1. Devices shall be specifically designed for variable-air-volume flows.
 2. Material: **Aluminum**.
 3. Finish: **Baked enamel, white**.
 4. Face Size: **24 by 24 inches (600 by 600 mm)**.
 5. Face Style: **Four** cone.
 6. Pattern: **Fixed**.

C. Louver Face Diffuser:

1. Devices shall be specifically designed for variable-air-volume flows.
2. Material: **Aluminum**.
3. Finish: **Baked enamel, white**.
4. Accessories:
 - a. Square to round neck adaptor.
 - b. Adjustable pattern vanes.
 - c. Throw reducing vanes.
 - d. Equalizing grid.
 - e. Plaster ring.
 - f. Safety chain.
 - g. Wire guard.
 - h. Sectorizing baffles.
 - i. Operating rod extension.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Bar Diffuser:

1. Devices shall be specifically designed for variable-air-volume flows.
2. Material: **Aluminum**.
3. Finish: **Baked enamel, white**.
4. Narrow Core Spacing Arrangement: **1/8-inch- (3-mm-)** thick blades spaced **1/4 inch (6 mm)** apart, [**zero**] [**15**]-degree deflection.
5. Frame: **1 inch (25 mm)** wide.

B. Linear Slot Diffuser:

1. Devices shall be specifically designed for variable-air-volume flows.
2. Material - Shell: **Aluminum**.
3. Material - Pattern Controller and Tees: Aluminum.
4. Finish - Face and Shell: **Baked enamel, black**.
5. Finish - Pattern Controller: **Baked enamel, black**.
6. Number of Slots: **Three**.
7. Length: **40 inches (1000 mm)**.

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Material: **Aluminum**.
2. Finish: **Baked enamel, white**.
3. Face Blade Arrangement: **Horizontal** spaced **3 inches (76 mm)** apart.
4. Core Construction: **Removable**.
5. Accessories:

- a. **Front** blade gang operator.
 - b. Filter.
- B. Linear Bar Grille:
- 1. Material: **Aluminum**.
 - 2. Finish: **Baked enamel, white**.
 - 3. Distribution plenum.
 - a. Internal insulation.
 - b. Inlet damper.

2.4 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
 - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.8 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

GFCI: Government furnished contractor installed

2.1 MANUFACTURERS

- A. Carrier or approved equal.

2.2 INDOOR UNITS

- A. Concealed Evaporator-Fan:

Carrier 36,000 BTU/HR

2.3 OUTDOOR UNITS

- A. Air-Cooled, Compressor-Condenser:

Carrier 36,000 BTU/HR

2.4 ACCESSORIES

- A. Thermostat: (included)
 - 1. **Wall-mounted** thermostat with LCD display and the following features:
 - a. Heat-cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. **Exposed** set point.

- B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
 1. Compressor time delay.
 2. 24-hour time control of system stop and start.
 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
 4. Fan-speed selection including auto setting.
- C. Automatic-reset timer to prevent rapid cycling of compressor.
- D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- E. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units' level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install roof-mounted, compressor-condenser components on manufacturers equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.
- D. Equipment Mounting:
 1. Install compressor-condenser components manufacturers standard roof bracket
- E. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply **and return** ducts to split-system air-conditioning units with flexible duct connectors.

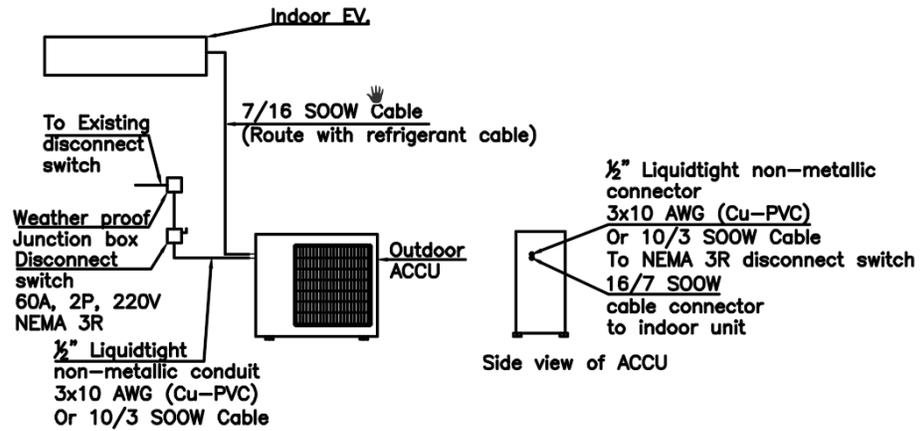
3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

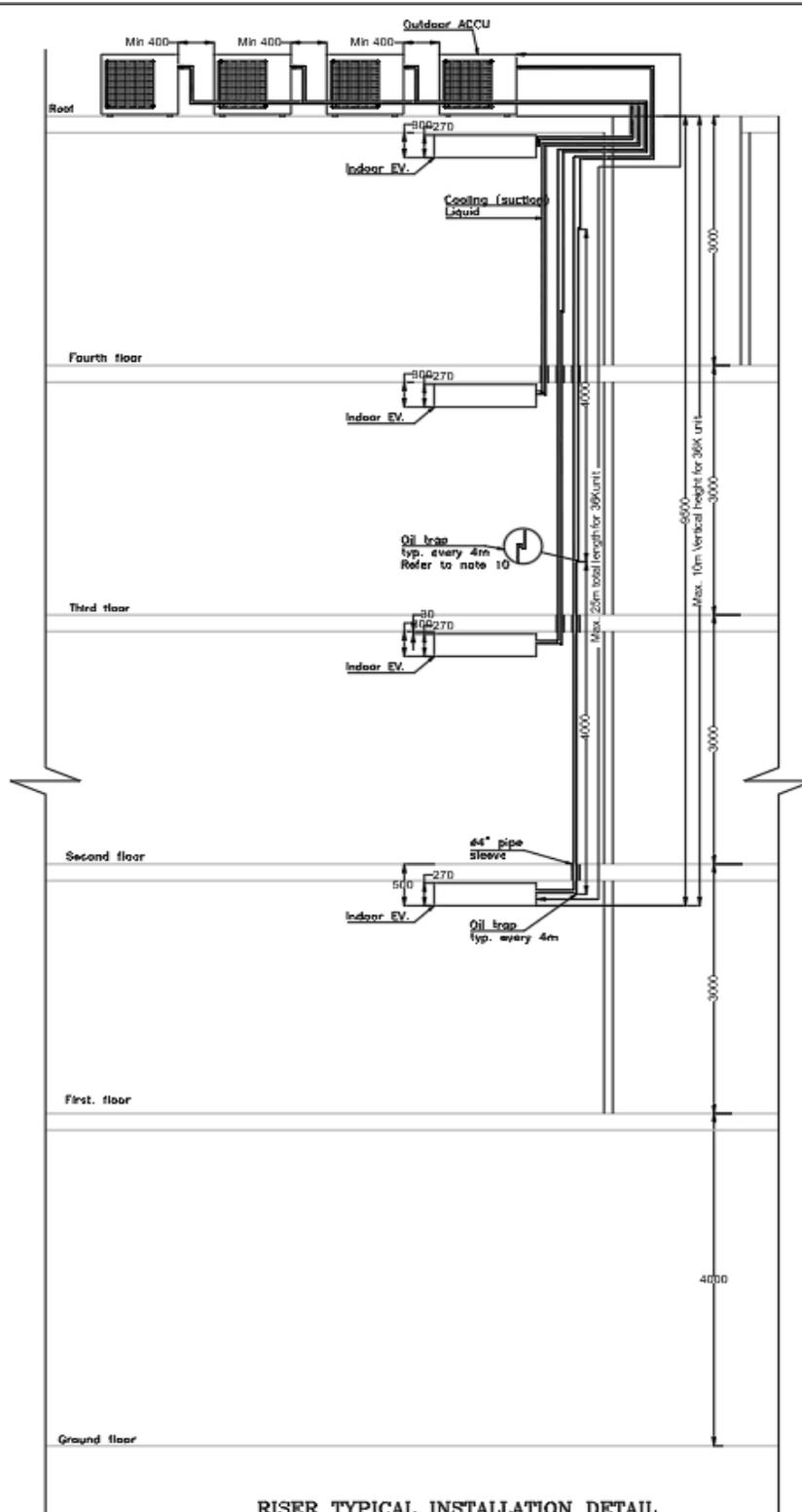
- 1. Complete installation and startup checks according to manufacturer's written instructions.

PART 4 - Details



Split AC unit
installation schematic

TYPICAL ELECTRICAL INSTALLATION DETAIL
 OUTDOOR UNIT TO BE INSTALLED ON THE ROOF
 DISCONNECT SWITCH TO BE FIXED ON THE OUTDOOR UNIT BRACKET



END OF SECTION 238126

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. **Copper** Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with IEC for XLPE/PVC or PVC/PVC.
- C. Multiconductor Cable: Comply with IEC for XLPE/PVC or PVC/PVC with ground wire.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: **Copper for all feeders.** Solid for No. 10 AWG (6 mm²) and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for **No. 12** AWG (4 mm²) and smaller; stranded for **No. 10** AWG (6 mm²) and larger.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Wiring at Outlets: Install conductor at each outlet, with at least **12 inches (300 mm)]** of slack at the lighting fixtures.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform each visual and mechanical inspection and electrical Megger test for 1000V stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- B. Test and Inspection Reports: Prepare a written report to record the following:
 - 1. Procedures used.
 - 2. Results that comply with requirements.
 - 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Furse, ERCO or approved equal.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: **Copper** wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

2.4 CONNECTORS

- A. Bolted Connectors for Conductors and Pipes: Copper.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless **compression**-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel **3/4 inch by 10 feet 19 mm by 3 m**.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install stranded conductors unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, **No. 8** AWG minimum.
 - 1. Bury at least **24 inches (600 mm)** below grade.
- C. Conductor Terminations and Connections:
 - 1. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 2. Connections to Ground Rods at Test Wells: Bolted connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are **2 inches (50 mm)** below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least **three** rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes shall be at least **12 inches (300 mm)** deep, with cover.
 - 1. Test Wells: Install at least one test well for each service unless otherwise indicated.

- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 260526

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Boxes, enclosures, and cabinets.

1.2 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. IMC: Comply with ANSI C80.6 and UL 1242.
- C. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: **Steel**.
 - b. Type: Compression.
 - 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of **0.040 inch (1 mm)**, with overlapping sleeves protecting threaded joints.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. RNC: **Type schedule 40-RPVC**, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- C. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, **Type 3R** unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, **aluminum**, Type FD, with gasketed cover.
- D. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, **cast aluminum** with gasketed cover.
- E. Cabinets:
 - 1. NEMA 250, **Type 3R** galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: **IMC**.
 - 2. Boxes and Enclosures, Aboveground: NEMA 250, **Type 3R**.
- B. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings.
 - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- C. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within **12 inches (300 mm)** of changes in direction.
- D. Support conduit within **12 inches (300 mm)** of enclosures to which attached.
- E. Raceways Embedded underground:
 - 1. Run conduit larger than **1-inch (27-mm)** trade size, parallel or at right angles.
 - 2. Change from RPVC to **[IMC]** before rising above floor.
- F. Threaded Conduit Joints, Exposed to Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to **1-1/4-inch (35-mm)** trade size and insulated throat metal bushings on **1-1/2-inch (41-mm)** trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

- I. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

3.3 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.

1.2 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
 - 3. Detail bus configuration, current, and voltage ratings.
 - 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 - 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 - 6. Include wiring diagrams for power, signal, and control wiring.
 - 7. Provide arc flash calculation and application according to NEC 2014 article 110.16 and 110.24.

1.4 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 - 1. Panelboard Warranty Period: One Year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Enclosures: **Surface**-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Locations: **Type 1**
 - 2. Height: **84 inches (2.13 m)** maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions. Trims shall cover all live parts and shall have no exposed hardware.
 - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- D. Incoming Mains Location: **Bottom**.
- E. Phase, Neutral, and Ground Buses: **Hard-drawn copper, 98 percent conductivity**.
- F. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: **Hard-drawn copper, 98 percent conductivity**.
 - 2. Main and Neutral Lugs: **Mechanical** type, with a lug on the neutral bar for each pole in the panelboard.
 - 3. Ground Lugs and Bus-Configured Terminators: **Mechanical** type, with a lug on the bar for each pole in the panelboard.
 - 4. Feed-Through Lugs: **Mechanical** type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices. Include label or manual with size and type of allowable upstream and branch devices listed and labeled for series-connected short-circuit rating.

2.2 LIGHTING PANELBOARDS

- A. Manufacturer: Schneider Electric, ABB or approved equal.
- B. Panelboards: NEMA 3R outdoor type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1. For doors more than [**36 inches (914 mm)**] high, provide two latches, keyed alike.

- D. Mains: **Circuit breaker**.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: **Bolt-on circuit breakers**.
- F. Contactors in Main Bus: NEMA ICS 2, Class A, **electrically** held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturer: Schneider Electric, ABB or approved equal.
- B. MCCB: Comply with UL 489, with **interrupting capacity** to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 - 3. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (10-mA trip).
 - 4. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: **Compression** style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: **Integrally mounted** relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

2.4 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door (English and Arabic), mounted in **transparent card holder**.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards and accessories according to **NEMA PB 1.1**.
- B. Mount top of trim 1800 **mm** above finished floor unless otherwise indicated.
- C. Mount panelboard cabinet plumb and rigid without distortion of box.
- D. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- E. Make grounding connections and bond neutral for services to ground. Make connections to grounding electrodes,
- F. Install filler plates in unused spaces.

3.2 IDENTIFICATION

- A. Create a directory to indicate installed circuit loads.
- B. Panelboard Nameplates: Label each panelboard with a nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test for low-voltage circuit breakers stated in NETA Acceptance Testing Specification.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Weather-resistant receptacles.
 - 3. Snap switches and wall-box dimmers.
 - 4. Solid-state fan speed controls.
 - 5. Communications outlets.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Legrand or equal approved.
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.4 GFCI RECEPTACLES

- A. General Description:
 - 1. Straight blade, **feed**-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles

2.5 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 220 V, 16 A:
 - 1. Single Pole:
 - 2. Two Pole:
 - 3. Three Way:
- C. Pilot-Light Switches, 20 A:
 - 1. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

2.6 DECORATOR-STYLE DEVICES

- A. Convenience Receptacles: Square face, 220 V, 16 A; comply with schukko type (2P+E).
- B. Toggle Switches, Square Face, 220 V, 16 A.

2.7 RESIDENTIAL DEVICES

- A. Fan Speed Controls:
 - 1. Modular, 220-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.

2. Comply with UL 1917.
 3. Continuously adjustable **toggle switch**.
 4. Three-speed adjustable **slider**.
- B. Telephone Outlet:
1. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with [Category 5e] . Comply with UL 1863.
- C. Combination TV and Telephone Outlet:
1. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with [Category 5e] . Comply with UL 1863.

2.8 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable [**slider**] [**toggle switch**] [**rotary knob**]; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
1. 600 W; dimmers shall require no derating when ganged with other devices.[**Illuminated when "off."**]

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
1. Material for Finished Spaces: **Smooth, high-impact thermoplastic**.
 2. Material for Unfinished Spaces: **Smooth, high-impact thermoplastic**.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant **thermoplastic** with lockable cover.

2.10 FINISHES

- A. Device Color:
1. Wiring Devices Connected to Normal Power System: **White** unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: [**Red**].
 3. TVSS Devices: Blue.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than **6 inches (152 mm)** in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.

- 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles **down**, and on horizontally mounted receptacles to the **right**.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- H. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 2. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 3. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 4. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 5. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, arranged by designation.
- B. Shop Drawings: For nonstandard or custom luminaires.
 - 1. Include plans, elevations, sections, and mounting and attachment details.
 - 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:
- B. Product Certificates: For each type of luminaire.

1.5 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
- C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- D. Recessed Fixtures: Comply with NEMA LE 4.
- E. CRI of **80**. CCT of [**3000 K**] .
- F. Rated lamp life of [**50,000**] hours.
- G. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- H. Internal driver.
- I. Nominal Operating Voltage: [**240 V ac**].
 - 1. Lens Thickness: At least **0.125 inch (3.175 mm)** minimum unless otherwise indicated.
- J. Housings:
 - 1. **Extruded-aluminum** housing and heat sink.

2.2 DOWNLIGHT

- A. Minimum **1,000** lumens. Minimum allowable efficacy of **100** lumens per watt.
- B. Universal mounting bracket.
- C. Integral junction box with conduit fittings.

2.3 RECESSED LINEAR

- A. Minimum **3,000** lumens. Minimum allowable efficacy of 100 lumens per watt.
- B. Integral junction box with conduit fittings.

2.4 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers, and Globes:
 - 1. **Tempered glass**
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
 - 3. Lens Thickness: At least **0.125 inch (3.175 mm)** minimum unless otherwise indicated.
- D. Housings:
 - 1. **Extruded-aluminum** housing and heat sink.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Ceiling-Mounted Luminaire Support:
 - 1. Ceiling mount with [**two**] **5/32-inch- (4-mm-)** diameter aircraft cable supports.
- G. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
 2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- H. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.
- I. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265119