

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include unit-cost, quantity and lump sum allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.

1.2 DEFINITIONS

- A. Unit Cost Allowance is a dollar amount for a specified unit of work established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Quantity Allowance is an extent of work established in lieu of specific direction in the Contract Documents, used to establish extent of certain work results whose actual scope have not been determined at the time the Contract Documents are issued. The requirements for systems, products, material, equipment and installation are included in the technical specification. Include in the lump sum bid all cost to perform the work established by Quantity Allowance. If necessary, additional requirements will be issued by Change Order.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific activities ordered by Owner under allowance and shall include delivery to Project site of material.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include delivery to Project site. Taxes are not included.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.8 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.9 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-

place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No 01: Site Lighting & Power Sleeves (2" Sch. 40 PVC)
1. Description: Include the quantities indicated for the installation of 2" schedule 40 PVC site lighting and site power sleeves not indicated in the construction documents.
 2. Unit of Measurement: LF
 3. Quantity Allowance: 200
- B. Allowance No 02: Mass Rock
1. Description: Include the quantity indicated for the removal of rock in open areas and disposal off-site at the discretion of the CMaR.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 15
- C. Allowance No 03: Trench Rock

1. Description: Include the quantity indicated for the removal of rock in trenches and pits and disposal off-site at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 15
- D. Allowance No 04: Unsuitable soils (On-site)
1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils or existing loose fill and disposal on-site at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 3,500
- E. Allowance No 05: Unsuitable Soils (Off-site)
1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils and disposal off-site at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 6,500
- F. Allowance No 06: Replacement Soil (Off-site)
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils from off-site suitable soil at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 8,000
- G. Allowance No 07: Replacement Aggregate Base Course (ABC).
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with aggregate base course (ABC), including placement and compaction at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 1,500
- H. Allowance No 08: Replacement No.57 Washed Stone.
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with No.57 washed stone, including placement and compaction at the discretion of the CMAr.
 2. Unit of Measurement: CY
 3. Quantity Allowance: 500
- I. Allowance No 09: Woven Geo-Textile Fabric in place.
1. Description: Include the quantity indicated for woven geo-textile fabric in place for soil separation, stabilization, and reinforcement at the discretion of the CMAr.
 2. Unit of Measurement: SY
 3. Quantity Allowance: 1,000
- J. Allowance No 10: Biaxial Geo-Grid in place.
1. Description: Include the quantity indicated for biaxial geo-grid in place for drainage, load distribution, soil separation, and stabilization at the discretion of the CMAr.
 2. Unit of Measurement: SY
 3. Quantity Allowance: 500
- K. Allowance No 11: High-Capacity French Drain.

1. Description: Include the quantity indicated for the placement and installation of high-capacity French drain at the discretion of the CMAr.
 2. Unit of Measurement: LF
 3. Quantity Allowance: 200
- L. Allowance No 12: Lime Soil Stabilization.
1. Description: Include the quantity indicated for lime soil stabilization of unsuitable soils at the discretion of the CMAr.
 2. Unit of Measurement: SY
 3. Quantity Allowance: 1,000
- M. ~~Allowance No 13: Temporary Construction Road(s), Parking and Laydown areas – Aggregate Base Course (ABC).~~
- ~~1. Description: Include the quantity indicated for the placement and installation of aggregate base course (ABC) for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.~~
 - ~~2. Unit of Measurement: TON~~
 - ~~3. Quantity Allowance: TBD~~
- N. ~~Allowance No 14: Temporary Construction Road(s), Parking and Laydown areas – Tensar TX-160 Geo-Grid.~~
- ~~1. Description: Include the quantity indicated for the placement and installation of Tensar TX-160 Geo-Grid for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.~~
 - ~~2. Unit of Measurement: SY~~
 - ~~3. Quantity Allowance: TBD~~
- O. ~~Allowance No 15: Removal of ABC from **Maintenance of** Temporary Construction Road(s), Parking and Laydown areas.~~
- ~~1. Description: Include the quantity indicated for the removal and disposal of contaminated and non-contaminated aggregate base course (ABC) from the construction of temporary construction roads, parking, and laydown areas off-site at the discretion of the CMAr. **Base bid shall include a Lump Sum Allowance of \$100,000.00 for the maintenance of temporary construction roads, parking, and laydown areas off-site at the discretion of the CmaR.**~~
 - ~~2. Unit of Measurement: TON~~
 - ~~3. Quantity Allowance: TBD~~
- P. Allowance No 16: Orange Construction / Temporary Tree Protection Fence
1. Description: Include the quantities indicated and installation of temporary orange fencing for the use in construction and tree protection to be used at the direction of the CMAr.
 2. Unit of Measurement: LF
 3. Quantity Allowance: TBD
 4. Clarification: Quantities listed are in addition to those in the base bid.
- Q. ~~Allowance No 17~~ **13:** Removal of Unanticipated and Abandoned Structures, Tanks, or Refrigerant
1. Description: Bidder shall include in their Base Bid a Lump Sum Allowance of \$21,000.00 for Removal of Unanticipated and Abandoned Structures including but not limited to tanks, refrigerant, debris laden fill, underground utilities, and underground structures.
- R. ~~Allowance No 18~~ **14:** Exterior Signage

1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$5,000.00 for purchase and installation of Exterior signage, as directed by the owner, architect, or local AHJ.
 2. Clarification: Allowance usage is in addition to the signage indicated in the contract documents and shall not be utilized for signage identified within the contract documents.
- S. Allowance No ~~19~~ **15**: Standard Duty Asphalt Patching and Repair
1. Description: Include the quantity indicated for standard duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
 2. Unit of Measurement: SY
 3. Quantity Allowance: ~~TBD~~ **20**
 4. Clarification: Price to include saw cutting, removal and disposal of existing and/or damaged asphalt, replacement of subbase, and patching.
- T. Allowance No ~~20~~ **16**: Heavy Duty Asphalt Patching and Repair
1. Description: Include the quantity indicated for heavy duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
 2. Unit of Measurement: SY
 3. Quantity Allowance: ~~TBD~~ **200**
 4. Clarification: Price to include saw cutting, removal and disposal of existing and/or damaged asphalt, replacement of subbase, and patching.
- U. Allowance No ~~21~~ **17**: Buffer Plantings
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$10,000.00 for the purchase and installation of buffer plantings as directed by the owner, architect, or AHJ.
 2. Clarification: Allowance usage is for buffer planting in addition to those indicated on the contract drawings.
- V. Allowance No ~~22~~ **18**: Storm Pond Plantings
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$50,000.00 for the purchase and installation of storm pond plantings as required for erosion control phasing or as directed by the owner, architect, or AHJ.
 2. Clarification: Allowance usage is for storm pond planting in addition to those indicated on the contract drawings.
- W. Allowance No ~~23~~ **19**: Temporary 8' Chain-link Fencing
1. Description: Include the quantity indicated for 8' tall temporary chain-link fencing.
 2. Unit of Measurement: LF
 3. Quantity Allowance: ~~TBD~~ **200**
 4. Clarification: Price to include acquisition, installation, periodic maintenance, tear-down and removal from site.
- X. Allowance No ~~24~~ **20**: 24" x 24" Access Panels
1. Description: Include the quantity indicated and installation of 24" x 24" access panels installed in walls or ceilings as directed by the owner, architect, or AHJ.
 2. Unit of Measurement: EA
 3. Quantity Allowance: 15
 4. Clarification: Allowance to include all associated framing required. Allowance is for additional access panels not indicated in the contract documents.
- Y. Allowance No ~~25~~ **21**: Fire Extinguishers and Cabinets

1. Description: Include the quantity indicated and installation of both 10lb ABC fire extinguishers and associated extinguisher cabinets as directed by the owner, architect, or AHJ.
2. Unit of Measurement: EA
3. Quantity Allowance: 5
4. Clarification: Allowance usage is in addition to the fire extinguishers and cabinets indicated in the contract documents and shall not be utilized for fire extinguishers and cabinets identified within the contract documents.

Z. Allowance No ~~26~~ **22**: Interior Signage

1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$3,000.00 for the purchase and installation of interior signage as directed by the owner, architect, or AHJ.
2. Clarification: Allowance usage is in addition to the signage indicated in the contract documents and shall not be utilized for signage identified within the contract documents.

AA. Allowance No ~~27~~ **23**: Fire Sprinkler Heads

1. Description: Include the quantity indicated and installation of fire sprinkler heads at locations as directed by the owner, architect, or AHJ.
2. Unit of Measurement: EA
3. Quantity Allowance: 20
4. Clarification: Include 15 linear feet of branch piping and associated fittings for a complete installation of each fire sprinkler head.

BB. Allowance No ~~28~~ **24**: Occupancy Sensors

1. Description: Include the quantity indicated and installation of occupancy sensors at locations as directed by the owner or architect.
2. Unit of Measurement: EA
3. Quantity Allowance: 10
4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each occupancy sensor. Allowance usage is in addition to occupancy sensors indicated in the contract documents and shall not be utilized for occupancy sensors identified within the contract documents.

CC. Allowance No ~~29~~ **25**: Duplex Receptacles

1. Description: Include the quantity indicated and installation of duplex receptacles at locations as directed by the owner or architect.
2. Unit of Measurement: EA
3. Quantity Allowance: 10
4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each duplex receptacle. Allowance usage is in addition to duplex receptacles indicated in the contract documents and shall not be utilized for duplex receptacles identified within the contract documents.

DD. Allowance No ~~30~~ **26**: Emergency Lights

1. Description: Include the quantity indicated and installation of emergency lights at locations as directed by the owner, architect, or AHJ.
2. Unit of Measurement: EA
3. Quantity Allowance: 10
4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each emergency light. Allowance usage is in addition to emergency lights indicated in the contract documents and shall not be utilized for emergency lights identified within the contract documents.

EE. Allowance No ~~34~~ **27**: Exit Lights

1. Description: Include the quantity indicated and installation of exit lights at locations as directed by the owner, architect, or AHJ.
2. Unit of Measurement: EA
3. Quantity Allowance: 5
4. Clarification: Include 30 linear feet of conduit and wire for a complete installation of each exit light. Allowance usage is in addition to exit lights indicated in the contract documents and shall not be utilized for exit lights identified within the contract documents.

FF. Allowance No ~~32~~ **28**: 110CD speaker/strobe Fire Alarms

1. Description: Include the quantity indicated and installation of Fire Alarm Speaker/Strobes in either the ceiling or wall at locations as directed by the owner, architect, or AHJ.
2. Unit of Measurement: EA
3. Quantity Allowance: 10
4. Clarification: Include 30 linear feet of conduit and 200' of wire for a complete installation of each device. Allowance usage is in addition to fire alarm speaker/strobes indicated in the contract documents and shall not be utilized for fire alarm speaker/strobes identified within the contract documents.

GG. Allowance No ~~33~~ **29**: Fire Alarm Pull Stations

1. Description: Include the quantity indicated and installation of manual Fire Alarm Pull Stations with protective shields at locations as directed by the owner, architect, or AHJ.
2. Unit of Measurement: EA
3. Quantity Allowance: 10
4. Clarification: Include 30 linear feet of conduit and 200' of wire for a complete installation of each device. Allowance usage is in addition to fire alarm pull stations indicated in the contract documents and shall not be utilized for fire alarm pull stations identified within the contract documents.

HH. Allowance No ~~34~~ **30**: Fire Alarm Duct Detector & Remote Annunciator Indicator Light (RAIL)

1. Description: Include the quantity indicated and installation of Fire Alarm Duct Detector & RAIL at locations as directed by the owner, architect, or AHJ.
2. Unit of Measurement: EA
3. Quantity Allowance: 5
4. Clarification: Include 30 linear feet of conduit and 30' of wire for each duct detector and 50 linear feet of conduit and 30' of wiring for each RAIL for a complete installation of each device. Allowance usage is in addition to duct detectors and RAIL indicated in the contract documents and shall not be utilized for duct detectors and RAIL identified within the contract documents.

II. Allowance No ~~35~~ **31**: 2-Port Data Outlets

1. Description: Include the quantity indicated and installation of 2-port data outlets at locations as directed by the owner or architect.
2. Unit of Measurement: EA
3. Quantity Allowance: 10
4. Clarification: Include 30 linear feet of conduit and 30' of cabling per drop for a complete installation of each device. Allowance usage is in addition to 2-port data outlets indicated in the contract documents and shall not be utilized for 2-port data outlets identified within the contract documents.

JJ. Allowance No ~~36~~ **32**: BDA System

1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$75,000.00 for a complete BDA system.

KK. Allowance No ~~37~~ **33**: CCTV Cameras

1. Description: Include the quantity indicated and installation of CCTV security cameras at locations as directed by the owner or architect.
2. Unit of Measurement: EA
3. Quantity Allowance: 5
4. Clarification: Include 30 linear feet of conduit and 30' of cabling for a complete installation of each device. Allowance usage is in addition to security cameras indicated in the contract documents and shall not be utilized for security cameras identified within the contract documents.

LL. Allowance No ~~38~~ **34**: Wireless Clocks

1. Description: Include the quantity indicated and installation of wireless wall clocks at locations as directed by the owner or architect.
2. Unit of Measurement: EA
3. Quantity Allowance: 10

~~MM. Allowance No 39: Temporary/Permanent Power~~

- ~~1. Description: Base bid shall include a Lump Sum Allowance of \$20,000.00 for temporary and permanent power and water fees to be used at the discretion of the CMAA.~~

~~NN. Allowance No 40: Temporary/Permanent Water~~

- ~~1. Description: Base bid shall include a Lump Sum Allowance of \$50,000.00 for temporary and permanent power and water fees to be used at the discretion of the CMAA.~~

~~OO. Allowance No 41: Duke Energy Permanent Power Fees~~

- ~~1. Description: Base bid shall include a Lump Sum Allowance of \$50,000.00 for Duke Energy permanent power fees to be used at the discretion of the CMAA.~~

~~PP. Allowance No 42: Dumpster Cost~~

- ~~1. Description: Base bid shall include a Lump Sum Allowance of \$75,000.00 for temporary dumpster fees to be used at the discretion of the CMAA.~~

~~QQ. Allowance No 43: Liquid Asphalt Escalation~~

- ~~1. Description: Base bid shall include a Lump Sum Allowance of \$ TBD for escalation of liquid asphalt to be used at the discretion of the CMAA.~~

~~RR. Allowance No 44: Topping Out Ceremony~~

- ~~1. Description: Base bid shall include a Lump Sum Allowance of \$2,000.00 **\$5,000.00** for a topping out ceremony to be used at the discretion of the Owner.~~

SS. Allowance No 45: Plumbing Disconnect for **Existing** Modular Classroom Units

1. Description: Include the quantity indicated for the safe disconnect of all plumbing services within the modular classroom units.
2. Unit of Measurement: EA
3. Quantity Allowance: 2

TT. Allowance No 46: Mechanical Disconnect for **Existing** Modular Classroom Units

1. Description: Include the quantity indicated for the safe disconnect of all mechanical services within the modular classroom units.
2. Unit of Measurement: EA
3. Quantity Allowance: 2

UU. Allowance No 47: Electrical Disconnect for ~~Existing~~ Modular Classroom Units

1. ~~Description: Include the quantity indicated for the safe disconnect of all electrical services within the modular classroom units.~~
2. ~~Unit of Measurement: EA~~
3. ~~Quantity Allowance: 2~~

VV. ~~Allowance No. 48: Additional Aggregate Piers~~

1. ~~Description: Include the quantity indicated for the design and installation of Rammed Aggregate Pier(s).~~
2. ~~Unit of Measurement: EA~~
3. ~~Quantity Allowance: 1~~

WW. Allowance No. 49: Groundbreaking Ceremony

1. ~~Description: Base bid shall include a Lump Sum Allowance of \$5,000.00 for a groundbreaking ceremony to be used at the discretion of the Owner.~~

END OF SECTION 012100

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices, including quantity allowances.
- B. Related Sections include the following:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Form of Proposal, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. Quantity Allowance is an extent of work established in lieu of specific direction in the Contract Documents, used to establish extent of certain work results whose actual scope has not been determined at the time the Contract Documents are issued. The requirements for systems, products, material, equipment and installation are included in the technical specification. Include in the lump sum bid all cost to perform the work established by Quantity Allowance. If necessary, additional requirements will be issued by Change Order.

1.3 QUANTITY ALLOWANCES

- A. Include in the lump sum contract all costs related to the work described in the quantity allowances.
- B. Measurement: Owner will engage third party soils and material engineer to verify quantities of rock and soil, measured in place.
- C. Perform Work under quantity allowances only as authorized. Authorized work includes work required by Drawings and the Specifications and work authorized in writing by Architect.
- D. When work is performed and actual quantity or extent is measured, the Contract Sum will be adjusted by Change Order based on Unit Cost indicated in the Agreement.
- E. Submit claims for increased costs because of a change in scope or nature of the work described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- C. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. Unit Price No 1: Site Lighting & Power Sleeves (2" Sch. 40 PVC)
 - 1. Description: Include the quantities indicated for the installation of 2" schedule 40 PVC site lighting and site power sleeves not indicated in the construction documents.
 - 2. Unit of Measurement: Linear Foot (LF)
 - 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- B. Unit Price No 2: Mass Rock
 - 1. Description: Include the quantity indicated for the removal of rock in open areas and disposal off-site at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Legal disposal of all materials.
 - e. All disposal fees.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- C. Unit Price No 3: Trench Rock
 - 1. Description: Include the quantity indicated for the removal of rock in trenches and pits and disposal off-site at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.

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- d. Legal disposal of all materials.
 - e. All disposal fees.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- D. Unit Price No 4: Unsuitable soils (On-site)
- 1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils or existing loose fill and disposal on-site at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Legal disposal of all materials.
 - e. All disposal fees.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- E. Unit Price No 5: Unsuitable Soils (Off-site)
- 1. Description: Include the quantity indicated for the removal of undercut and waste unsuitable soils and disposal off-site at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.
 - 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site, excavation and labor.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Legal disposal of all materials.
 - e. All disposal fees.
 - 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- F. Unit Price No 6: Replacement Soil (Off-site)
- 1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils from off-site suitable soil at the discretion of the CMAA.
 - 2. Unit of Measurement: Cubic Yard (CY)
 - 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Suitable soil materials from contractor's off-site source.
 - e. Placement and compaction of soil into void remaining from removed rock or unsuitable/existing loose soil.
 - 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- G. Unit Price No 7: Replacement Aggregate Base Course (ABC).

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1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with aggregate base course (ABC), including placement and compaction at the discretion of the CMAA.
 2. Unit of Measurement: Cubic Yard (CY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Certified ABC materials from contractor's off-site source.
 - e. Placement and compaction of soil into void remaining from removed rock or unsuitable/existing loose soil.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- H. Unit Price No 8: Replacement No.57 Washed Stone.
1. Description: Include the quantity indicated for the replacement of removed rock or unsuitable soils with No.57 washed stone, including placement and compaction at the discretion of the CMAA.
 2. Unit of Measurement: Cubic Yard (CY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 - d. Certified #57 washed stone from contractor's off-site source.
 - e. Placement and compaction of soil into void remaining from removed rock or unsuitable/existing loose soil.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- I. Unit Price No 9: Woven Geo-Textile Fabric in place.
1. Description: Include the quantity indicated for woven geo-textile fabric in place for soil separation, stabilization, and reinforcement at the discretion of the CMAA.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- J. Unit Price No 10: Biaxial Geo-Grid in place.
1. Description: Include the quantity indicated for biaxial geo-grid in place for drainage, load distribution, soil separation, and stabilization at the discretion of the CMAA.
 2. Unit of Measurement: Square Yard (SY)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

K. Unit Price No 11: High-Capacity French Drain.

1. Description: Include the quantity indicated for the placement and installation of high-capacity French drain at the discretion of the CMAr.
2. Unit of Measurement: Linear Foot (LF)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

L. Unit Price No 12: Lime Soil Stabilization

1. Description: Include the quantity indicated for the placement and installation of Lime Soil Stabilization at the discretion of the CMAr.
2. Unit of Measurement: Square Yard (SY)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

M. Unit Price No 13: Temporary Construction Road(s), Parking and Laydown areas – Aggregate Base Course (ABC).

1. Description: Include the quantity indicated for the placement and installation of aggregate base course (ABC) for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.
2. Unit of Measurement: TON
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

N. Unit Price No 14: Temporary Construction Road(s), Parking and Laydown areas – Tensar TX-160 Geo-Grid.

1. Description: Include the quantity indicated for the placement and installation of Tensar TX-160 Geo-Grid for the construction of temporary construction roads, parking, and laydown areas at the discretion of the CMAr.
2. Unit of Measurement: Square Yard (SY)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

- O. ~~Unit Price No 15: Removal of ABC from Maintenance of Temporary Construction Road(s), Parking and Laydown areas.~~
1. ~~Description: Include the quantity indicated for the removal and disposal of contaminated and non-contaminated aggregate base course (ABC) from the construction of temporary construction roads, parking, and laydown areas off-site at the discretion of the CMAA. **Base bid shall include a Lump Sum Allowance of \$100,000.00 for the maintenance of temporary construction roads, parking, and laydown areas off-site at the discretion of the CMAA.**~~
 2. ~~Unit of Measurement: TON **Lump Sum (LS)**~~
 3. ~~Method of Measurement: Quantities shall be verified by a soils and materials engineer employed by the Owner.~~
 4. ~~Include the following in the unit price:~~
 - a. ~~All materials, equipment, transport to site, excavation and labor.~~
 - b. ~~Overhead and profit.~~
 - c. ~~Include all other related costs in the contract sum.~~
 - d. ~~Legal disposal of all materials.~~
 - e. ~~All disposal fees.~~
 5. ~~Quantity **Lump Sum** Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- P. ~~Unit Price No 16: Orange Construction / Temporary Tree Protection Fence~~
1. ~~Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.~~
 2. ~~Description: Include the quantities indicated and installation of temporary orange fencing for the use in construction and tree protection to be used at the direction of the CMAA.~~
 3. ~~Unit of Measurement: Linear Foot (LF)~~
 4. ~~Include the following in the unit price:~~
 - a. ~~All materials, equipment, transport to site and labor for complete installation.~~
 - b. ~~Overhead and profit.~~
 - c. ~~Include all other related costs in the contract sum.~~
 5. ~~Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- Q. ~~Unit Price No 47 **13**: Removal of Unanticipated and Abandoned Structures, Tanks, or Refrigerant~~
1. ~~Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.~~
 2. ~~Bidder shall include in their Base Bid a Lump Sum Allowance of \$21,000.00 for Removal of Unanticipated and Abandoned Structures including but not limited to tanks, refrigerant, debris laden fill, underground utilities, and underground structures.~~
 3. ~~Unit of Measurement: Lump Sum (LS)~~
 4. ~~Include the following in the unit price:~~
 - a. ~~All materials, equipment, transport to/from site and labor for complete demolition and removal.~~
 - b. ~~Overhead and profit.~~
 - c. ~~Include all other related costs in the contract sum.~~
 5. ~~Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- R. ~~Unit Price No 48 **14**: Exterior Signage~~
1. ~~Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.~~

2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$5,000.00 for purchase and installation of Exterior signage, as directed by the owner, architect, or local AHJ.
3. Unit of Measurement: Lump Sum (LS)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

S. Unit Price No ~~49~~ **15**: Standard Duty Asphalt Patching and Repair

1. Description: Include the quantity indicated for standard duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
2. Unit of Measurement: Square Yard (SY)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

T. Unit Price No ~~20~~ **16**: Heavy Duty Asphalt Patching and Repair

1. Description: Include the quantity indicated for heavy duty asphalt pavement repairs and patching per 2" pavement section to be used at the direction of the owner.
2. Unit of Measurement: Square Yard (SY)
3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

U. Unit Price No ~~24~~ **17**: Buffer Plantings

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$10,000.00 for the purchase and installation of buffer plantings as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Lump Sum (LS)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

V. Unit Price No ~~22~~ **18**: Storm Pond Plantings

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.

2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$50,000.00 for the purchase and installation of buffer plantings as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Lump Sum (LS)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

W. Unit Price No ~~23~~ **19**: Temporary 8' Chain-link Fencing

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated for 8' tall temporary chain-link fencing.
3. Unit of Measurement: Linear Foot (LF)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

X. Unit Price No ~~24~~ **20**: 24" x 24" Access Panels

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of 24" x 24" access panels installed in walls or ceilings as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

Y. Unit Price No ~~25~~ **21**: Fire Extinguishers and Cabinets

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of both 10lb ABC fire extinguishers and associated extinguisher cabinets as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

Z. Unit Price No ~~26~~ **22**: Interior Signage

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$3,000.00 for the purchase and installation of interior signage as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Lump Sum (LS)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

AA. Unit Price No ~~27~~ **23**: Fire Sprinkler Heads

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of fire sprinkler heads at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

BB. Unit Price No ~~28~~ **24**: Occupancy Sensors

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of occupancy sensors at locations as directed by the owner or architect.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

CC. Unit Price No ~~29~~ **25**: Duplex Receptacles

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of duplex receptacles at locations as directed by the owner or architect.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.

5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

DD. Unit Price No ~~30~~ **26**: Emergency Lights

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of emergency lights at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

EE. Unit Price No ~~34~~ **27**: Exit Lights

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of exit lights at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

FF. Unit Price No ~~32~~ **28**: 110CD speaker/strobe Fire Alarms

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of Fire Alarm Speaker/Strobes in either the ceiling or wall at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

GG. Unit Price No ~~33~~ **29**: Fire Alarm Pull Stations

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of manual Fire Alarm Pull Stations with protective shields at locations as directed by the owner, architect, or AHJ.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:

- a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- HH. Unit Price No ~~34~~ **30**: Fire Alarm Duct Detector & Remote Annunciator Indicator Light (RAIL)
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of Fire Alarm Duct Detector & RAIL at locations as directed by the owner, architect, or AHJ.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- II. Unit Price No ~~35~~ **31**: 2-Port Data Outlets
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of 2-port data outlets at locations as directed by the owner or architect.
 3. Unit of Measurement: Per device (1 location) (EA)
 4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- JJ. Unit Price No ~~36~~ **32**: BDA System
1. Description: Bidder shall include in their base bid a Lump Sum Allowance of \$75,000.00 for a complete BDA system.
 2. Unit of Measurement: Lump Sum (LS)
 3. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
 4. Lump-Sum Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."
- KK. Unit Price No ~~37~~ **33**: CCTV Cameras
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
 2. Description: Include the quantity indicated and installation of CCTV security cameras at locations as directed by the owner or architect.
 3. Unit of Measurement: Per device (1 location) (EA)

4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

LL. Unit Price No 38 34: Wireless Clocks

1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
2. Description: Include the quantity indicated and installation of wireless wall clocks at locations as directed by the owner or architect.
3. Unit of Measurement: Per device (1 location) (EA)
4. Include the following in the unit price:
 - a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
5. Quantity Allowance: Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."

MM. Unit Price No 39: Temporary/Permanent Power

1. Description: ~~Base bid shall include a Lump Sum Allowance of \$20,000.00 for temporary and permanent power and water fees to be used at the discretion of the CmaR.~~
2. Unit of Measurement: Lump Sum (LS)
3. Lump Sum Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~

NN. Unit Price No 40: Temporary/Permanent Water

1. Description: ~~Base bid shall include a Lump Sum Allowance of \$50,000.00 for temporary and permanent power and water fees to be used at the discretion of the CmaR.~~
2. Unit of Measurement: Lump Sum (LS)
3. Lump Sum Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~

OO. Unit Price No 41: Duke Energy Permanent Power Fees

1. Description: ~~Base bid shall include a Lump Sum Allowance of \$50,000.00 for Duke Energy permanent power fees to be used at the discretion of the CmaR.~~
2. Unit of Measurement: Lump Sum (LS)
3. Lump Sum Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~

PP. Unit Price No 42: Dumpster Cost

1. Description: ~~Base bid shall include a Lump Sum Allowance of \$75,000.00 for temporary dumpster fees to be used at the discretion of the CmaR.~~
2. Unit of Measurement: Lump Sum (LS)
3. Lump Sum Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~

QQ. Unit Price No 43: Liquid Asphalt Escalation

1. Description: ~~Base bid shall include a Lump Sum Allowance of \$TBD for escalation of liquid asphalt to be used at the discretion of the CMAA.~~
2. Unit of Measurement: Lump Sum (LS)
3. Lump Sum Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- RR. Unit Price No 44: ~~Topping Out Ceremony~~
1. Description: ~~Base bid shall include a Lump Sum Allowance of \$2,000.00 \$5,000.00 for a topping out ceremony to be used at the discretion of the Owner.~~
2. Unit of Measurement: Lump Sum (LS)
3. Lump Sum Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- SS. Unit Price No 45: ~~Plumbing Disconnect for Existing Modular Classroom Units~~
1. Description: ~~Include all disconnects for plumbing services for the modular classroom units in the quantity indicated.~~
2. Unit of Measurement: Per device (1 location) (EA)
3. Include the following in the unit price:
- a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- TT. Unit Price No 46: ~~Mechanical Disconnect for Existing Modular Classroom Units~~
1. Description: ~~Include all disconnects for mechanical services for the modular classroom units in the quantity indicated.~~
2. Unit of Measurement: Per device (1 location) (EA)
3. Include the following in the unit price:
- a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- UU. Unit Price No 47: ~~Electrical Disconnect for Existing Modular Classroom Units~~
1. Description: ~~Include all disconnects for electrical services for the modular classroom units in the quantity indicated.~~
2. Unit of Measurement: Per device (1 location) (EA)
3. Include the following in the unit price:
- a. All materials, equipment, transport to site and labor for complete installation.
 - b. Overhead and profit.
 - c. Include all other related costs in the contract sum.
4. Quantity Allowance: ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~
- VV. Unit Price No. 48: ~~Additional Aggregate Piers~~
1. Description: ~~Include the quantity indicated for the placement and installation of additional aggregate pier(s) at the discretion of the CMAA.~~

- 2. **Unit of Measurement:** ~~Per aggregate pier (EA)~~
- 3. **Include the following in the unit price:**
 - a. ~~All materials, equipment, transport to site and labor for complete installation.~~
 - b. ~~Overhead and profit.~~
 - c. ~~Include all other related costs in the contract sum.~~
- 4. **Quantity Allowance:** ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~

WW. Unit Price No 49: Groundbreaking Ceremony

- 1. **Description:** ~~Base bid shall include a Lump Sum Allowance of \$5,000.00 for a groundbreaking ceremony to be used at the discretion of the Owner.~~
- 2. **Unit of Measurement:** ~~Lump Sum (LS)~~
- 3. **Lump Sum Allowance:** ~~Coordinate unit price with allowance adjustment requirements of Section 012100 "Allowances."~~

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

- A. Preferred Alternate: A system or product identified by Owner as offering a long-term value to Owner, based on maintenance, durability, warranties, compatibility with existing equipment or other characteristics that would justify a higher initial cost. Indicate the differential in costs between the base bid product that meets the specification and the preferred alternate.

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. Execute accepted alternates under the same conditions as other work of the Contract.
- C. 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: Bus Canopy.
 - 1. Base Bid: Provide prefabricated bus canopy as shown on Drawings.
 - 2. Alternate: Provide steel-framed metal canopy as shown on Drawings.
- B. Alternate No. 2: Resilient Flooring.
 - 1. Base Bid: Provide VCT as shown on the Drawings and specified in Section 096519 "Resilient Tile Flooring."
 - 2. Alternate: Provide linoleum tile as shown on Drawings and as specified in Section 096543 "Linoleum Flooring."
- C. Alternate No. 3: Fall Protection.
 - 1. Base Bid: No fall protection.
 - 2. Alternate: Provide a full personal fall arrest system including permanent, non-penetrating standing seam metal roof anchors on both East and West slopes of roof in a pattern to fully cover all locations of the roof.

D. Alternate No. 4: Mobile Classrooms.

- 1. Base Bid: Demolish two mobile classrooms. Include full demolition and removal from site for two mobile classrooms, including all disconnects required.**
- 2. Alternate: Relocate two mobile classrooms. Provide all disconnects and transportation required to relocate two mobile classrooms to WCPSS at their Rock Quarry Road facility. Address is 1551 Rock Quarry Road, Raleigh, NC 27610.**

3.2 SCHEDULE OF OWNER-PREFERRED ALTERNATES**A. Alternate No. P1: Intrusion Detection/Burglar Alarm Panels & Associated Hardware.**

1. Alternate: Furnish and install Gemini by Napco Security Technologies, (no substitutions).

B. Alternate No. P2: Theatrical Lighting Dimmers and Controls.

1. Alternate: Furnish and install ETC Visual Environment Technologies, (no substitutions).

C. Alternate No. P3: Convection Oven at Food Preparation.

1. Alternate: Furnish and install Blodgett Convection Oven, (no substitutions).

D. Alternate No. P4: Food Processor at Food Preparation.

1. Alternate: Furnish and install Colorpoint Serving Lines, (no substitutions).

E. Alternate No. P5: Door Hardware.

1. Alternate: Furnish and install the following:
 - a. Cylinders and Locks: Best, (no substitutions).
 - b. Door Closers: Stanley or LCN, (no substitutions).
 - c. Panic Devices: Precision or Von Duprin, (no substitutions).

F. Alternate No. P6: Web-Based Controls.

1. Alternate: Furnish and install Honeywell, Johnson Control, Schneider Electric or Brady Trane, (no substitutions).

G. Alternate No. P7: Access Control.

1. Alternate: Furnish and install S2 Netbox, (no substitutions).

H. Alternate No. P8: Fire Alarm.

1. Alternate: Furnish and install Siemens, SimplexGrinnell, or Mircom, (no substitutions).

END OF SECTION 012300

SECTION 033000 - CAST-IN-PLACE CONCRETE FOR BUILDINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Walls and Pedestals including site retaining walls.
 - 3. Slabs-on-grade.
 - 4. Suspended floor slabs.
 - 5. Interior metal pan stairs and landings.
- B. Related Sections:
 - 1. Division 1 Section "Special Inspection Services" for administrative and procedural requirements for special inspection services.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 SUBMITTALS

- A. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- B. Steel Reinforcement Shop Drawings: Prepare shop drawings in accordance with ACI 315. Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Include special reinforcement required for openings through concrete structures and dimensioned opening locations. Include applicable dimensions, sections, elevations, and details required to complete installation and coordination of the details, and typical details. Plan shall be drawn at a scale of no less than 1/8" per foot.
- C. Welding certificates.
- D. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.

E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

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

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 318, "Building Code Requirements for Reinforced Concrete."
4. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Metal or fiberglass panels.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Site Retaining Walls: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that will provide continuous and true concrete surfaces within tolerances indicated; non-reactive with concrete and suitable for producing required finishes.
 - 1. Metal or fiberglass panels.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
 - 4. Metal form ties are prohibited at site retaining walls.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: Polyethylene sheet, ASTM E 1745, Class A, except with a maximum perm rating of 0.1 and not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete and concrete with a water-cementitious materials ratio below 0.50.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
 1. Exposure Class: ACI 318 F1.
 2. Minimum Compressive Strength: 3500 psi at 28 days.
 3. Maximum w/cm: 0.50.
 4. Slump Limit: 4 inches, plus or minus 1 inch.
 5. Air Content:
 - a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch nominal maximum aggregate size.
 6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- B. Walls and Pedestals (interior walls and pedestals and exterior site walls): Proportion normal-weight concrete mixture as follows:
 1. Exposure Class: ACI 318 F2.

2. Minimum Compressive Strength: 4500 psi at 28 days.
 3. Maximum w/cm: 0.45.
 4. Slump Limit: 8 inches for concrete with verified slump of 3 inches, plus or minus 1 inch, before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 5. Air Content:
 - a. Exposure Class F2: 5.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch nominal maximum aggregate size.
 6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Exposure Class: ACI 318 F0.
 2. Minimum Compressive Strength: 3500 psi at 28 days.
 3. Maximum w/cm: 0.50.
 4. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 5. Slump Limit: 8 inches for concrete with verified slump of 3 inches, plus or minus 1 inch, before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 6. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 7. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- D. Suspended Slabs: Proportion structural lightweight concrete mixture as follows:
1. Exposure Class: ACI 318 F0.
 2. Minimum Compressive Strength: 4000 psi at 28 days.
 3. Maximum w/cm: 0.50
 4. Calculated Equilibrium Unit Weight: 113 lb/cu. ft, plus or minus 3 lb/cu. ft. as determined by ASTM C567/C567M.
 5. Slump Limit: 8 inches for concrete with verified slump of 3 inches, plus or minus 1 inch, before adding high-range water-reducing admixture or plasticizing admixture at Project site.
 6. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 7. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- E. Interior Metal Pan Stairs and Landings:
1. Exposure Class: ACI 318 F0.
 2. Minimum Compressive Strength: 3000 psi at 28 days.
 3. Maximum Size Aggregate: 1/2 inch.
 4. Slump Limit: 4 inches, plus or minus 1 inch.
 5. Air Content: 0 percent, plus or minus 0.5 percent at point of delivery.
 6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

2.13 FABRICATING REINFORCEMENT

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

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished exposed surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished non-exposed surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 48 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide by 1/4 of the slab thickness joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 WATERSTOPS

- A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- F. Hot-Weather Placement: Comply with ACI 305.1 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view including both faces of site retaining walls.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
- D. Rubbed Finish: At both faces and top surface of all site retaining walls for extent of wall exposed above grade, rub all wall surfaces with carborundum stone as required to remove form lines, fins, blemishes and create uniform wall finish. Rubbing shall occur immediately after form removal. Do not apply any mortar to wall surface, only utilizing paste formed from rubbing operation.
 - 1. Apply to faces and top surface of site walls that will be exposed above grade.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

- a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.

- b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
- 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
- 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
- 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 SPECIAL INSPECTIONS

- A. Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.
- B. Verification and inspection of concrete construction shall be in accordance with Section 1704.4 of 2018 North Carolina Building Code and as follows:
 1. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - a. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

- 1) When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - b. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - c. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - d. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 - e. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - f. Compression Test Specimens: ASTM C 31/C 31M.
 - 1) Cast and laboratory cure five 4x8 standard cylinder specimens for each composite sample.
 - g. Compressive-Strength Tests: ASTM C 39/C 39M; test one laboratory-cured specimen at 7 days and one set of three laboratory-cured specimens at 28 days. Maintain one specimen in reserve for later testing, if required.
 - 1) A compressive-strength test shall be the average compressive strength from a set of three specimens obtained from same composite sample and tested at age indicated.
 - 2) Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 - h. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.
 - i. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 - 1) Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 - j. Additional Tests: Additional tests and Inspections shall be made of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met.
2. Inspections: Perform inspections of the work to verify compliance with the requirements of the contract documents, including the following:
 - a. Steel reinforcement placement.
 - b. Steel reinforcement welding.
 - c. Headed bolts and studs.
 - d. Use of required design mixture.
 - e. Concrete placement and consolidation, including conveying and depositing.
 - f. Curing procedures and maintenance of curing temperature.
 - g. Concrete batch plant and review procedures for maintaining proper mix proportions and proper mix techniques.
 - h. Concrete delivery tickets at time of delivery to assure conformance to ACI 318.

- C. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements at the Contractor's expense.

END OF SECTION 033000

SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated service doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
 - 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
 - 1. Design Wind Load: As indicated on Drawings.
 - 2. Testing: According to ASTM E330/E330M.
 - 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

2.3 INSULATED, MOTORIZED DOOR ASSEMBLY

- A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
 - 1. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
 - a. Cookson; a CornellCookson LLC company (Basis-of-Design).
 - 1) Product: Thermiser Insulated Door EDS20.
 - b. C.H.I. Overhead Doors, Inc.
 - c. Cornell; a CornellCookson LLC company.
 - d. McKeon.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Insulated Door Curtain R-Value: 4.5 deg F x h x sq. ft./Btu.
- D. Insulated Door Assembly U-Factor: 0.90 Btu/deg F x h x sq. ft.
- E. Door Curtain Material: Galvanized steel.
- F. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.
 - 1. Insulated-Slat Interior Facing: Metal.
- G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from hot-dip galvanized steel and finished to match door.
- H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.
- I. Hood: Galvanized steel.
 - 1. Shape: As indicated on Drawings.
 - 2. Mounting: Face of wall.
- J. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: Wall.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. or lower.
4. Motor Exposure: Interior.
5. Motor Electrical Characteristics:
 - a. Horsepower: 1/2 hp.
 - b. Voltage: 115 V ac, single phase, 60 Hz.
6. Emergency Manual Operation: Push-up type.
7. Obstruction-Detection Device: Automatic electric sensor edge on bottom bar.
 - a. Sensor Edge Bulb Color: Black.
8. Control Station(s): Interior mounted.

K. Curtain Accessories: Equip door with weatherseals and push/pull handles.

L. Door Finish:

1. Powder-Coated Finish: Color as selected by Architect from manufacturer's standard range of not less than 5 colors.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 MATERIALS, GENERAL

- 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.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
 2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
 3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum aluminum thickness of 0.032 inch.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb

mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.
2. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.

2.7 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Cylinder from the outside and keyed to building keying system.

2.8 CURTAIN ACCESSORIES

- A. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene.

- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-

prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
 2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.
- B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.
- C. Door Operator Location(s): Operator location indicated for each door.
1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
- D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.
1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.
1. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Provide a wireless sensing edge connection to motor operator eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close." Provide key-accessed cover when located in student-occupied areas.
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
- H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.
- I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.11 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Power-Operated Doors: Install according to UL 325.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 083323

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes mechanical door hardware.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Installation Templates: Distribute for doors, frames, and other Work specified to be factory prepared. Check Shop Drawings of other Work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
2. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
3. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.3 ACTION SUBMITTALS

- A. Samples for Verification: For each type of exposed product, in each finish specified.

1. Sample Size: Full units or minimum 2-by-4-inch. Samples for sheet and 4 inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into Work, within limitations of keying requirements.

- B. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant (AHC). Coordinate door hardware schedule with doors, frames, and related Work to ensure proper size, thickness, hand, function, and finish of door hardware.

- C. Keying Schedule: Prepared by or under the supervision of WCPSS Lockshop detailing Owner's final keying instructions for locks from keying meeting where owner and manufacturer's representative are to be present. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.

- B. Product Certificates: For electrified door hardware.

1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Data: For each type of door hardware to include in maintenance manuals, including the following:
 - 1. Maintenance instructions and warranty information for each item of hardware.
 - 2. Catalog pages for each product.
 - 3. Contact information for supplier of hardware and local representatives of each product manufacturer.
 - 4. Parts list for each product.
- B. Schedules: Final door hardware schedule, keying schedule, and wiring diagrams.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Maintenance Tools and Instructions: Furnish complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products, with minimum of five years' experience in installation of commercial hardware similar to that required for this Project, is an employer of workers trained and approved by product manufacturers, and employs an Architectural Hardware Consultant (AHC) who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Hardware Consultant (AHC) and an Electrified Hardware Consultant (EHC).

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware to prevent damage during transit and storage. Deliver products in original unopened packaging with legible manufacturer's identification.
 - 1. Store hardware in a secured and dry environment to protect against loss, theft and damage.
- B. Deliver complete shipment of door hardware as detailed in Door Hardware Schedule and per approved Shop Drawings.

- C. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
 - 1. Compare delivered hardware to approved Hardware Schedule. Report shortage of products or damaged products to Architect and supplier within 24 hours of delivery. Shortages not reported are Contractor's responsibility and will not be an additional cost to Owner.
- D. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion, except as follows:
 - a. Electromagnetic Locks: Five years from date of Substantial Completion.
 - b. Exit Devices: Two years from date of Substantial Completion.
 - c. Manual Closers: 10 years from date of Substantial Completion.
 - d. Locks and Latches: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products. Where named manufacturers' products are not indicated, provide products complying with BHMA designations referenced.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 Door Hardware Schedule Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 Door Hardware Schedule Article.
 - 2. References to BHMA Designations: Where products are not specified by name, provide products complying with BHMA designations and requirements for description, quality, and function.
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer unless indicated otherwise. Supplier to maintain a permanent office within 120 miles of Wake County's Rock Quarry Roads Service Center.

- D. Butt Hinges: BHMA A156.1.
 - 1. Manufacturers: Hager, Stanley, McKinney.
- E. Geared Continuous Hinges: BHMA A156.26, Grade 1.
 - 1. Manufacturers: Pemko, Stanley, ABH.
- F. Locks and Latches: Mortise Locks: Grade 1.
 - 1. Manufacturers: Best, Schlage, Sargent.
- G. Exit Devices: BHMA A 156.3, Grade 1.
 - 1. Manufacturers: Precision, Von Duprin, Sargent.
- H. Door Closers: BHMA A 156.4, Grade 1
 - 1. Manufacturers: LCN, Stanley, Norton.
- I. Flushbolts: BHMA A 156.16:
 - 1. Manufacturer: Rockwood, ABH, Burns, Trimco.
- J. Push Plates, Pull Bars and Grips: BHMA A 156.6
 - 1. Manufacturer: Rockwood, ABH, Burns, Trimco.
- K. Door Protection (Kick plates, mop plates and armor plate): BHMA A156.6.
 - 1. Manufacturer: Rockwood, ABH, Burns, Trimco.
- L. Overhead Stops and Holders: Where scheduled.
 - 1. Manufacturer: Rixson, Sargent, ABH
- M. Auxiliary Hardware
 - 1. Silencers: BHMA A 156.16.
 - a. Basis of Design: Rockwood, ABH, Burns, Trimco
 - 2. Wall Stops (bumpers):
 - a. Basis of Design: Rockwood, ABH, Burns, Trimco

2.2 CYLINDERS, KEYING AND KEY CONTROL

- A. Cylinders and Cores: Best.
 - 1. Keyed to Owner's existing patented system. Owner to approve all keying decisions and proposed key schedule during a keying conference. Hardware Supplier to install final cores.
 - 2. Hardware supplier to provide bittings, Best KS600IMP CD code import and KS600NDB facility data base upgrade.
 - 3. Provide three keys per core combination.
 - 4. Exterior locksets, locksets on mechanical and electrical rooms and exit devices shall be provided with construction key cores.
 - 5. No keys are to be stamped with bittings.
- B. Key Cabinet:
 - 1. Manufacturer: Lund, Tel-kee P.O. Moor Company.
 - 2. Hardware Supplier shall supply, set up, compile Hook to Key Schedule, hang keys, and install key cabinet.
- C. Fire Department Access (Knox Box): Recessed, aluminum, satin finish.
 - 1. Provide one of the following:

- a. Knox Series 4400RDL Dual Key Box.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing Work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
 - 3. All hardware and cylinders/cores shall be installed by the hardware supplier. Final adjustments of all hardware shall be performed prior to building turn over. Installation shall be performed by the hardware supplier using personnel that are experienced in the installation of hardware for schools. Personnel shall have a minimum of 5 years of documented experience doing this type of work.

3.2 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed Work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.3 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 - 2. All permanent cores will be installed for final adjustment of all locking and latching hardware.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, schedule Installer's Architectural Hardware Consultant to examine and readjust each item of door hardware, including operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.4 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation. Clean operating items as necessary to restore proper function and finish.
- B. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.5 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

3.6 HARDWARE SCHEDULE**Set: 1.0**

1 Continuous Hinge	FM100 CTP	628	MR
2 Cylinder	BEST AS REQUIRED	626	BE
1 Exit Device	.ALK .QEL 98.NLOP	.630	VD
1 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
1 Surface Closer	4040XP .SCUSH	.689	LC
1 Threshold	171A		PE
1 Set Weatherstrip	BY DOOR MANUFACTURER		00
1 ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1 ElectroLynx Harness	QC-C000P x LAR		MK
1 Door Position Switch	DPS-M-BK		SU
1 Wiring Diagram	AS REQUIRED		
1 Power Supply	PS900 SERIES		VD
1 Electric Power Transfer	CEPT	630	SU

OPERATION: DOOR TO BE CONTROLLED BY BUILDING'S ACCESS CONTROL SYSTEM.**Set: 2.0**

1 Continuous Hinge	FM100 CTP	628	MR
1 Exit Device	.QEL .RX 98.NL	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO

1	Surface Closer	4040XP .SCUSH	.689	LC
1	Threshold	171A		PE
1	Set Weatherstrip	BY DOOR MANUFACTURER		00
1	ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1	ElectroLynx Harness	QC-C000P x LAR		MK
1	Door Position Switch	DPS-M-BK		SU
1	Wiring Diagram	AS REQUIRED		
1	Card Reader	FURNISHED IN OTHER SECTION		OT
1	Power Supply	PS900 SERIES		VD
1	Electric Power Transfer	CEPT	630	SU

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL SIGNALS LATCH RETRACTION AND ALLOWS INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 2.1

1	Continuous Hinge	FM100 CTP	628	MR
1	Exit Device	.QEL .RX 98.NL	.630	VD
1	Cylinder	BEST AS REQUIRED	626	BE
1	Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
1	Door Operator	4642	.689	LC
1	Threshold	171A		PE
1	Set Weatherstrip	BY DOOR MANUFACTURER		00
1	ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1	ElectroLynx Harness	QC-C000P x LAR		MK
2	Actuator Switch	8310 SERIES		LC
1	Door Position Switch	DPS-M-BK		SU
1	Wiring Diagram	AS REQUIRED		
1	Card Reader	FURNISHED IN OTHER SECTION		OT
1	Power Supply	PS900 SERIES		VD
1	Electric Power Transfer	CEPT	630	SU

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL ENERGIZES ACTUATOR SWITCH, SIGNALS LATCH RETRACTION, CYCLES DOOR OPERATOR, AND ALLOWS INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 3.0

2	Continuous Hinge	FM100 CTP	628	MR
1	Mullion	KR4954	.689	VD
1	Exit Device	.QEL .RX 98.NL	.630	VD
1	Exit Device	.QEL .RX 98.EO	.630	VD
1	Cylinder	BEST AS REQUIRED	626	BE

1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
2 Surface Closer	4040XP .SCUSH	.689	LC
1 Threshold	171A		PE
1 Mullion Gasketing	5110BL		PE
1 Set Weatherstrip	BY DOOR MANUFACTURER		00
2 ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
2 ElectroLynx Harness	QC-C000P x LAR		MK
2 Door Position Switch	DPS-M-BK		SU
1 Wiring Diagram	AS REQUIRED		
1 Card Reader	FURNISHED IN OTHER SECTION		OT
1 Power Supply	PS900 SERIES		VD
2 Electric Power Transfer	CEPT	630	SU

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL SIGNALS LATCH RETRACTION AND ALLOWS INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 4.0

2 Continuous Hinge	FM100 CTP	628	MR
1 Mullion	KR4954	.689	VD
1 Exit Device	.QEL .RX 98.NL	.630	VD
1 Exit Device	.QEL .RX 98.EO	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
1 Surface Closer	4040XP .SCUSH	.689	LC
1 Door Operator	4642	.689	LC
1 Threshold	171A		PE
1 Mullion Gasketing	5110BL		PE
1 Set Weatherstrip	BY DOOR MANUFACTURER		00
2 ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
2 ElectroLynx Harness	QC-C000P x LAR		MK
2 Actuator Switch	8310 SERIES		LC
2 Door Position Switch	DPS-M-BK		SU
1 Wiring Diagram	AS REQUIRED		
1 Door Release Push Button	PB4 SERIES		SU
1 Card Reader	FURNISHED IN OTHER SECTION		OT
1 Power Supply	PS900 SERIES		VD
2 Electric Power Transfer	CEPT	630	SU
1 Hardware	SEE NOTE BELOW		OT

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL OR INPUT FROM DOOR RELEASE PUSH BUTTON ENERGIZES ACTUATOR SWITCH, SIGNALS LATCH RETRACTION, CYCLES DOOR OPERATOR, AND ALLOWS INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 5.0

1 Continuous Hinge	FM100	628	MR
1 Exit Device	98.NLOP	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
1 Surface Closer	4040XP .SCUSH	.689	LC
1 Threshold	171A		PE
1 Set Weatherstrip	BY DOOR MANUFACTURER		00
1 Door Position Switch	DPS-M-BK		SU

Set: 6.0

2 Continuous Hinge	FM100	628	MR
1 Mullion	KR4954	.689	VD
1 Exit Device	98.NLOP	.630	VD
1 Exit Device	98.EO	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
2 Surface Closer	4040XP .SCUSH	.689	LC
1 Threshold	171A		PE
1 Mullion Gasketing	5110BL		PE
1 Set Weatherstrip	BY DOOR MANUFACTURER		00
2 Door Position Switch	DPS-M-BK		SU

Set: 7.0

1 Continuous Hinge	FM3500 CTP	630	MR
1 Exit Device	.QEL .RX 98.NL	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
1 Surface Closer	4040XP .SCUSH	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Threshold	2005AT		PE
1 Set Weatherstrip	303AS		PE
1 Rain Guard	346C		PE
1 Door Bottom Sweep	3452CNB		PE
1 ElectroLynx Harness	QC-C1500P (@ JAMB)		MK

1	ElectroLynx Harness	QC-C000P x LAR		MK
1	Door Position Switch	DPS-M-BK		SU
1	Wiring Diagram	AS REQUIRED		
1	Door Release Push Button	PB4 SERIES		SU
1	Card Reader	FURNISHED IN OTHER SECTION		OT
1	Power Supply	PS900 SERIES		VD
1	Electric Power Transfer	CEPT	630	SU
1	Hardware	SEE NOTE BELOW		OT

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL OR INPUT FROM DOOR RELEASE PUSH BUTTON SIGNALS LATCH RETRACTION AND ALLOWS INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 8.0

2	Continuous Hinge	FM300	630	MR
2	Flush Bolt	555/557	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	L9080 .L .03A	.630	SC
1	Cylinder	BEST AS REQUIRED	626	BE
1	Overhead Stop	10 SERIES	630	RF
1	Surface Closer	4040XP .CUSH	.689	LC
2	Kick Plate	K1050 8" high CSK	US32D	RO
1	Threshold	2005AT		PE
1	Rain Guard	346C		PE
1	Set Weatherstrip	BY FRAME MANUFACTURER		OT
2	Door Bottom Sweep	3452CNB		PE
1	Set Astragal	18041CNB		PE
2	Door Position Switch	DPS-M-BK		SU

Set: 9.0

2	Continuous Hinge	FM300	630	MR
1	Exit Device	9847.EO	.630	VD
1	Exit Device	9847.LNL .996L-NL .03	.630	VD
1	Cylinder	BEST AS REQUIRED	626	BE
2	Surface Closer	4040XP .CUSH	.689	LC
1	Threshold	2005AT		PE
1	Rain Guard	346C		PE
1	Set Weatherstrip	BY DOOR MANUFACTURER		00
2	Door Bottom Sweep	3452CNB		PE
2	Door Position Switch	DPS-M-BK		SU

Set: 10.0

1 Continuous Hinge	FM300	630	MR
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .CUSH	.689	LC
1 Threshold	2005AT		PE
1 Rain Guard	346C		PE
1 Set Weatherstrip	BY DOOR MANUFACTURER	00	
1 Door Bottom Sweep	3452CNB		PE
1 Door Position Switch	DPS-M-BK		SU

Set: 11.0

2 Continuous Hinge	FM300	630	MR
1 Set Combo Flush Bolts	2845/2945	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Coordinator	2600 x FILLER BAR x CLOSER MTG BRKTS AS REQ'D	Black	RO
2 Surface Closer	4040XP .CUSH	.689	LC
1 Threshold	2005AT		PE
1 Rain Guard	346C		PE
1 Set Weatherstrip	BY DOOR MANUFACTURER	00	
2 Door Bottom Sweep	3452CNB		PE
2 Door Position Switch	DPS-M-BK		SU

Set: 12.0

2 Continuous Hinge	FM100 CTP	628	MR
1 Mullion	KR4954	.689	VD
1 Exit Device	.QEL .RX 98.NL	.630	VD
1 Exit Device	.QEL .RX 98.EO	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
1 Surface Closer	4040XP .SCUSH	.689	LC
1 Door Operator	4642	.689	LC
1 Mullion Gasketing	5110BL		PE
1 Set Door Seals	BY DOOR MANUFACTURER	OT	
2 ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
2 ElectroLynx Harness	QC-C000P x LAR		MK

2	Actuator Switch	8310 SERIES		LC
2	Door Position Switch	DPS-M-BK		SU
1	Wiring Diagram	AS REQUIRED		
1	Card Reader	FURNISHED IN OTHER SECTION		OT
1	Power Supply	PS900 SERIES		VD
2	Electric Power Transfer	CEPT	630	SU
1	Hardware	SEE NOTE BELOW		OT

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. PRESENTATION OF AUTHORIZED CREDENTIAL ENERGIZES ACTUATOR SWITCH, SIGNALS LATCH RETRACTION, CYCLES DOOR OPERATOR, AND ALLOWS INGRESS. EGRESS BY EXIT DEVICE PUSH BAR AT ALL TIMES.

Set: 13.0

2	Continuous Hinge	FM100	628	MR
1	Mullion	KR4954	.689	VD
1	Exit Device	98.NLOP	.630	VD
1	Exit Device	98.EO	.630	VD
1	Cylinder	BEST AS REQUIRED	626	BE
1	Mullion Cylinder	BEST AS REQUIRED	626	BE
2	Door Pull	RM3310-12 Mtg-Type 12HD	US32D	RO
2	Surface Closer	4040XP .SCUSH	.689	LC
1	Mullion Gasketing	5110BL		PE
1	Set Door Seals	BY DOOR MANUFACTURER		OT

Set: 14.0

2	Continuous Hinge	FM100	628	MR
1	Mullion	KR4954	.689	VD
2	Exit Device	98.L .996L .03	.630	VD
2	Cylinder	BEST AS REQUIRED	626	BE
1	Mullion Cylinder	BEST AS REQUIRED	626	BE
2	Surface Closer	4040XP .EDA	.689	LC
2	Door Stop	409/441CU	US26D	RO
1	Mullion Gasketing	5110BL		PE
1	Set Door Seals	BY DOOR MANUFACTURER		OT

Set: 15.0

2	Continuous Hinge	FM100	628	MR
1	Mullion	KR4954	.689	VD
2	Exit Device	98.L .996L .03	.630	VD
1	Cylinder	BEST AS REQUIRED	626	BE

1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Surface Closer	4040XP .EDA	.689	LC
2 Kick Plate	K1050 8" high CSK	US32D	RO
2 Electromagnetic Holder	990 SERIES	689	RF
1 Mullion Gasketing	5110BL		PE
1 Set Door Seals	BY DOOR MANUFACTURER		OT

Set: 16.0

1 Continuous Hinge	FM300	630	MR
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .REGARM	.689	LC
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals	BY DOOR MANUFACTURER		OT

Set: 17.0

Hinge	TA2714	US26D	MK
1 Exit Device	98.LNL .996L-NL .03	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .CUSH	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Set Door Seals/Silencers	S88BL/608 AS REQUIRED		PE

Set: 18.0

Hinge	TA2714	US26D	MK
1 Exit Device	98.L .-2 .996L .06	.630	VD
2 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .EDA	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88BL/608 AS REQUIRED		PE

Set: 19.0

Hinge	TA2714	US26D	MK
1 Exit Device	98.L .-2 .996L .06	.630	VD
2 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .CUSH	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Set Door Seals/Silencers	S88BL/608 AS REQUIRED		PE

Set: 20.0

Hinge	T4A3786	US26D	MK
1 Mullion	KR9954	.689	VD
2 Exit Device	98.LBE.F .996L-BE .03	.630	VD
1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Surface Closer	4040XP .REGARM	.689	LC
2 Kick Plate	K1050 8" high CSK	US32D	RO
2 Electromagnetic Holder	990 SERIES	689	RF
1 Mullion Gasketing	5110BL		PE
1 Set Door Seals	S88BL		PE
1 Hardware	SEE NOTE BELOW		OT

NOTE: DOORS TO BE TIED INTO BUILDING'S FIRE ALARM SYSTEM.

Set: 21.0

Hinge	T4A3786	US26D	MK
1 Mullion	KR9954	.689	VD
2 Exit Device	98.L.F .996L .03	.630	VD
2 Cylinder	BEST AS REQUIRED	626	BE
1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Surface Closer	4040XP .EDA	.689	LC
2 Kick Plate	K1050 8" high CSK	US32D	RO
2 Electromagnetic Holder	990 SERIES	689	RF
1 Mullion Gasketing	5110BL		PE
1 Set Door Seals	S88BL		PE
1 Hardware	SEE NOTE BELOW		OT

NOTE: DOORS TO BE TIED INTO BUILDING'S FIRE ALARM SYSTEM.

Set: 22.0

Hinge	T4A3786	US26D	MK
1 Mullion	KR4954	.689	VD
2 Exit Device	98.L .996L .03	.630	VD
2 Cylinder	BEST AS REQUIRED	626	BE
1 Mullion Cylinder	BEST AS REQUIRED	626	BE
2 Surface Closer	4040XP .CUSH	.689	LC
2 Kick Plate	K1050 8" high CSK	US32D	RO
1 Mullion Gasketing	5110BL		PE
1 Set Door Seals/Silencers	S88BL/608 AS REQUIRED		PE

Set: 23.0

Hinge	TA2714	US26D	MK
1 Exit Device	9847.EO	.630	VD
1 Exit Device	9847.LNL .996L-NL .03	.630	VD
1 Cylinder	BEST AS REQUIRED	626	BE
2 Surface Closer	4040XP .CUSH	.689	LC
2 Kick Plate	K1050 8" high CSK	US32D	RO
1 Set Door Seals	S773D		PE
2 Door Bottom	411ARL		PE
1 Set Astragal	18041CNB		PE

Set: 24.0

1 Continuous Hinge	FM100	628	MR
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .REGARM	689	LC
1 Electric Strike	1006-LBM	630	HS
1 SMART Pac Bridge Rectifier	2005M3		HS
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals	BY DOOR MANUFACTURER		OT
1 ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1 Wiring Diagram	AS REQUIRED		
1 Door Release Push Button	PB4 SERIES		SU
1 Power Supply	PS900 SERIES		VD

OPERATION: INPUT FROM DOOR RELEASE PUSH BUTTON RELEASES ELECTRIC STRIKE AND
ALLOWS INGRESS. EGRESS BY INSIDE LEVER AT ALL TIMES.

Set: 25.0

1 Continuous Hinge	FM100	628	MR
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .SCUSH	.689	LC
1 Electric Strike	1006-LBM	630	HS
1 SMART Pac Bridge Rectifier	2005M3		HS
1 Set Door Seals	BY DOOR MANUFACTURER		OT
1 ElectroLynx Harness	QC-C1500P (@ JAMB)		MK
1 Wiring Diagram	AS REQUIRED		
1 Door Release Push Button	PB4 SERIES		SU

1 Power Supply PS900 SERIES VD**OPERATION: INPUT FROM DOOR RELEASE PUSH BUTTON RELEASES ELECTRIC STRIKE AND
ALLOWS INGRESS. EGRESS BY INSIDE LEVER AT ALL TIMES.****Set: 26.0**

1 Continuous Hinge	FM100	628	MR
1 Classroom Security Lock	L9071 .L .03A	.630	SC
2 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals	BY DOOR MANUFACTURER		OT

Set: 27.0

Hinge	TA2714	US26D	MK
1 Passage Latch	L9010 .03A	.630	SC
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 27.1

Hinge	TA2714	US26D	MK
1 Passage Latch	L9010 .03A	.630	SC
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1 Coat Hook	796	US26D	RO

Set: 28.0

Hinge	TA2714	US26D	MK
1 Passage Latch	L9010 .03A	.630	SC
1 Overhead Stop	10 SERIES	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 29.0

Hinge	TA2714	US26D	MK
1 Privacy Lock	L9040 .03A .L283-722 .09-509x.L583-363	.630	SC
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 29.1

Hinge	TA2714	US26D	MK
1 Privacy Lock	L9040 .03A .L283-722 .09-509x.L583-363	.630	SC

1 Overhead Stop	10 SERIES	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 30.0

Hinge	TA2714	US26D	MK
1 Privacy Lock	L9040 .03A .L283-722 .09-509x.L583-363	.630	SC
1 Surface Closer	4040XP .REGARM	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1 Coat Hook	796	US26D	RO

Set: 30.1

Hinge	TA2714	US26D	MK
1 Privacy Lock	L9040 .03A .L283-722 .09-509x.L583-363	.630	SC
1 Surface Closer	4040XP .CUSH	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1 Coat Hook	796	US26D	RO

Set: 31.0

Hinge	TA2714	US26D	MK
1 Office Lock	L9050 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1 Coat Hook	796	US26D	RO

Set: 32.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 32.1

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1 Coat Hook	796	US26D	RO

Set: 33.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals	S773D		PE
1 Door Bottom	411ARL		PE

NOTE: STC DOOR - DOOR SEALS AND DOOR BOTTOM TO BE PROVIDED BY DOOR MANUFACTURER TO MEET STC RATING.

Set: 34.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Overhead Stop	10 SERIES	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 35.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .REGARM	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 35.1

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .REGARM	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1 Coat Hook	796	US26D	RO

Set: 36.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Overhead Stop	10 SERIES	630	RF
1 Surface Closer	4040XP .REGARM	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 37.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .EDA	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 38.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .EDA	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Electromagnetic Holder	990 SERIES	689	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 39.0

Hinge	TA2714	US26D	MK
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .CUSH	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 40.0

Hinge	TA2714	US26D	MK
2 Flush Bolt	555/557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Classroom Lock	L9070 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Overhead Stop	10 SERIES	630	RF
1 Wall Stop	409	US26D	RO
2 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 41.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 42.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Overhead Stop	10 SERIES	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 43.0

Hinge	TA2714	US26D	MK
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Surface Closer	4040XP .REGARM	.689	LC

1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 44.0

Hinge	TA2714	US26D	MK
2 Flush Bolt	555/557	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
2 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 45.0

Hinge	TA2714	US26D	MK
1 Set Combo Flush Bolts	2845/2945	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Storeroom Lock	L9080 .L .03A	.630	SC
1 Cylinder	BEST AS REQUIRED	626	BE
1 Coordinator	2600 x FILLER BAR x CLOSER MTG BRKTS AS REQ'D	Black	RO
2 Surface Closer	4040XP .EDA	.689	LC
2 Kick Plate	K1050 8" high CSK	US32D	RO
2 Door Stop	409/441CU	US26D	RO
2 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 46.0

Hinge	TA2714	US26D	MK
1 Classroom Security Lock	L9071 .L .03A	.630	SC
2 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE
1 Hardware	SEE NOTE BELOW		OT

NOTE: DOOR 1108 - DOOR SEALS AND DOOR BOTTOM TO BE PROVIDED BY DOOR MANUFACTURER TO MEET STC RATING.

Set: 47.0

Hinge	TA2714	US26D	MK
1 Classroom Security Lock	L9071 .L .03A	.630	SC
2 Cylinder	BEST AS REQUIRED	626	BE
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals	S773D		PE
1 Door Bottom	411ARL		PE

Set: 48.0

Hinge	TA2714	US26D	MK
1 Classroom Security Lock	L9071 .L .03A	.630	SC
2 Cylinder	BEST AS REQUIRED	626	BE
1 Overhead Stop	10 SERIES	630	RF
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 49.0

Hinge	TA2714	US26D	MK
1 Classroom Security Lock	L9071 .L .03A	.630	SC
2 Cylinder	BEST AS REQUIRED	626	BE
1 Overhead Stop	10 SERIES	630	RF
1 Set Door Seals	S773D		PE
1 Door Bottom	411ARL		PE
1 Hardware	SEE NOTE BELOW		OT

NOTE: STC DOOR - DOOR SEALS AND DOOR BOTTOM TO BE PROVIDED BY DOOR MANUFACTURER TO MEET STC RATING.

Set: 50.0

Hinge	TA2714	US26D	MK
1 Push Plate	70F	US32D	RO
1 Pull Plate	111x70C	US32D	RO
1 Surface Closer	4040XP .REGARM	.689	LC
1 Kick Plate	K1050 8" high CSK	US32D	RO
1 Door Stop	409/441CU	US26D	RO
1 Set Door Seals/Silencers	S88D/608 AS REQUIRED		PE

Set: 51.0

1 Cylinder	BEST AS REQUIRED	626	BE
1 Hardware	SEE NOTE BELOW		OT

NOTE: OVERHEAD DOOR - BALANCE OF HARDWARE SUPPLIED BY DOOR MANUFACTURER.

END OF SECTION 087100

SECTION 122113 - HORIZONTAL LOUVER BLINDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Horizontal louver blinds with aluminum slats.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details for horizontal louver blinds.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long.
- D. Window-Treatment Schedule: For horizontal louver blinds. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of horizontal louver blind, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For horizontal louver blinds to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining horizontal louver blinds and finishes.
 - 2. Precautions about cleaning materials and methods that could be detrimental to finishes and performance.
 - 3. Operating hardware.

1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide horizontal louver blinds with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Flame-Resistance Ratings: Passes NFPA 701.
- B. Source Limitations: Obtain horizontal louver blinds through one source from a single manufacturer.
- C. Product Standard: Provide horizontal louver blinds complying with WCSC A 100.1.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver horizontal louver blinds in factory packages, marked with manufacturer and product name, fire-test-response characteristics, lead-free designation, and location of installation.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install horizontal louver blinds until construction and wet and dirty finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where horizontal louver blinds are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 HORIZONTAL LOUVER BLINDS, ALUMINUM SLATS (HLB)

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. SWF Contract (Basis-of-Design).
 - a. **Product: Classics 1" Mini Aluminum Cordless Blinds.**
 2. CACO Inc.
 3. Hunter Douglas Contract.
 4. ~~WT Shade; a division of InPro.~~
- B. Slats: Aluminum; alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners.
1. Width: 1 inch.
 2. Thickness: No less than 0.008 inch.
 3. Finish: As selected by Architect from manufacturer's full range of colors.
 - a. Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
 - b. Reflective Coating: Manufacturer's special coating enhancing the reflection of solar energy on the outside-facing slat surface.
- C. Headrail: Formed steel or extruded aluminum; long edges returned or rolled; fully enclosing operating mechanisms on three sides and end plugs.
1. Finish Color: Match color, texture, pattern, and gloss of louver slats.
- D. Bottom Rail: Formed-steel or extruded-aluminum tube, sealed with plastic or metal capped ends top contoured to match crowned shape of louver slat and bottom contoured for minimizing light gaps; with enclosed and protected ladders and tapes to prevent their contact with sill.
- E. Ladders: Evenly spaced to prevent long-term slat sag.
1. For Blinds with Nominal Slat Width 1 Inch or Less: Braided cord.

- F. Lift Operation: Manual **and cordless**, ~~cord lock; locks pull cord to stop blind at any position in ascending or descending travel.~~
- G. Tilt Control: Enclosed worm-gear mechanism, slip clutch or detachable wand preventing over-rotation, and linkage rod.
 - 1. Tilt Operation: Manual with clear plastic wand.
 - 2. Length of Tilt Control: Manufacturer's standard of length required to make operation convenient from floor level.
 - 3. Tilt: Full.
- H. Valance: Manufacturer's standard.
- I. Mounting Brackets: With spacers and shims required for blind placement and alignment indicated.
 - 1. Type: End.
 - 2. Intermediate Support: Provide intermediate support brackets to produce support spacing recommended by blind manufacturer for weight and size of blind.
- J. Hold-Down Brackets and Hooks or Pins: Manufacturer's standard.

2.2 HORIZONTAL LOUVER BLIND FABRICATION

- A. Product Safety Standard: Fabricate horizontal louver blinds to comply with WCMA A 100.1 including requirements for corded, flexible, looped devices; lead content of components; and warning labels.
- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lift-and-Tilt Mechanisms: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows:
 - 1. Between (Inside) Jamb Installation: Width equal to 1/4 inch per side or 1/2 inch total, plus or minus 1/8 inch, less than jamb-to-jamb dimension of opening in which each blind is installed. Length equal to 1/4 inch, plus or minus 1/8 inch, less than head-to-sill dimension of opening in which each blind is installed.
- D. Installation Brackets: Designed for easy removal and reinstallation of blind, for supporting headrail, valance, and operating hardware, and for hardware position and blind mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to blind hardware and adjoining construction; type designed for securing to supporting substrate; and supporting blinds and accessories under conditions of normal use.
- F. Color-Coated Finish: For components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Component Color: Provide rails, cords, ladders, and exposed-to-view metal and plastic matching or coordinating with slat color, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install horizontal louver blinds level and plumb, aligned and centered on openings, and aligned with adjacent units according to manufacturer's written instructions.
 - 1. Locate so exterior slat edges are not closer than 1 inch from interior faces of glass and not closer than 1/2 inch from interior faces of glazing frames through full operating ranges of blinds.
 - 2. Install mounting and intermediate brackets to prevent deflection of headrails.
 - 3. Install with clearances that prevent interference with adjacent blinds, adjacent construction, and operating hardware of glazed openings, other window treatments, and similar building components and furnishings.

3.3 ADJUSTING

- A. Adjust horizontal louver blinds to operate smoothly, easily, safely, and free of binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean horizontal louver blind surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer and that ensures that horizontal louver blinds are without damage or deterioration at time of Final Acceptance.
- C. Replace damaged horizontal louver blinds that cannot be repaired in a manner approved by Architect before time of Substantial Completion.

END OF SECTION 122113

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually-operated roller shades with single rollers.
 - 2. Motor-operated roller shades with single rollers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 - 1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified
 - 1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
- D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of shadeband material, signed by product manufacturer.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roller shades to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.
- B. Fire-Test-Response Characteristics: Provide products passing flame-resistance testing according to NFPA 701 by a testing agency acceptable to authorities having jurisdiction.
- C. Electronic Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Roller Shades: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 1. SWF Contract (Basis-of-Design).
 2. Draper Inc.
 3. Lutron Shading Solutions by VIMCO
 4. ~~MeechoShade Systems, Inc.~~
 5. ~~Hunter Douglas Contract~~
- B. Motorized Shade Operators: Subject to compliance with requirements, provide basis of design indicated or comparable product by one of the following:
 1. Lutron Electronics Company; Sivoia QED (Basis of Design)
 2. Elero USA Inc.
 3. SIMU US, Inc.
 4. SOMFY Systems.
 5. Shade operators may also be provided by approved manufacturer of roller shade.

2.2 MANUALLY-OPERATED, SINGLE-ROLLER SHADES (RS-1 AND RS-3)

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 1. Basis of Design: SWF Contract; ~~Pro-Series~~ **Precision+** Manual Solar Shade.
 2. ~~Bead Chains: Nickel-plated metal.~~
 - a. ~~Loop Length: Full length of roller shade.~~
 - b. ~~Limit Stops: Provide upper and lower ball stops.~~
 - c. ~~Chain Retainer Type: Chain tensioner, jamb mounted.~~
 3. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades. **Provide a system that does not require chains, cords, cranks or any other external methods to operate roller shades.**

- a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Roller Drive-End Location: As standard with manufacturer to suit installation.
 2. Direction of Shadeband Roll: Regular, from back of roller.
 3. Shadeband-to-Roller Attachment: Removable spline fitting integral channel in tube.
- C. Mounting Hardware: Heavy duty brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
 1. Source: Roller shade manufacturer.
 2. Shadeband Material: PVC-free, TPO fabric.
 - a. RS-1: Light-filtering fabric.
 - b. RS-3: Light-blocking fabric.
 3. Shadeband Bottom (Hem) Bar: Manufacturer's standard for operating mechanism indicated.
 - a. Color and Finish of Exposed Bottom Bar: As selected by Architect from manufacturer's full range.
- F. Installation Accessories:
 1. Exposed Headboxes and Bottom Boxes: Rectangular, extruded-aluminum enclosure including front fasciae, top and back covers, endcaps, and removable closures.
 - a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than height indicated on Drawings.
 2. Channels or Angles: Manufacturer's standard design for operating mechanism indicated and shadeband take-up and support.
- G. Installation Accessories Color and Finish: As selected from manufacturer's full range

2.3 MOTOR-OPERATED, SINGLE-ROLLER SHADES (RS-2)

- A. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
 1. Basis of Design: SWF Contract; RTS Motorized Solar Shades.
 2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.
 - a. Electrical Characteristics: Single phase, 110 V, 60 Hz.
 3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

-
- a. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
 - b. Color: As selected by Architect from manufacturer's full range.
 - 4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
 - 5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
 - 6. Operating Features:
 - a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
 - B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 - 1. Roller Drive-End Location: As standard with manufacturer to suit installation.
 - 2. Direction of Shadeband Roll: Regular, from back of roller.
 - 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
 - C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.
 - D. Shadebands: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - E. Shadebands:
 - 1. Shadeband Material: Light-filtering fabric.
 - a. Source: Roller shade manufacturer.
 - b. Type: PVC-free, TPO fabric.
 - c. Material Openness Factor: 3 percent.
 - d. Material Color: As selected by Architect from manufacturer's full range.
 - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - a. Type: Enclosed in sealed pocket of shadeband material.
 - F. Installation Accessories:
 - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 - a. Shape: L-shaped.
 - b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches.
 - 2. Endcap Covers: To cover exposed endcaps.
 - 3. Installation Accessories Color and Finish: As selected by Architect from manufacturer's full range.

2.4 ROLLER-SHADE FABRICATION

- A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
- B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
- C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
 - 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
 - 2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.
- B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 122413

SECTION 316100 - AGGREGATE PIERS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. Coordinate the sequence of construction and utilize BIM to coordinate underground constructions in proximity to the aggregate piers to avoid undermining of the aggregate piers.

1.2 DESCRIPTION OF WORK

- A. Work shall consist of designing, furnishing, installing, monitoring, and testing of the aggregate pier foundations to the lines and grades designated on the project foundation plan and as specified herein. The number of piers, diameters and depth of piers shall be determined by the aggregate pier designer/installer. The aggregate piers shall be columns of compacted aggregate constructed in a columnar-type configuration to produce an intermediate foundation system for support of foundation loads to achieve the degree of improvement (allowable bearing capacity and maximum allowable total and differential settlements) as indicated in paragraph "PERFORMANCE CRITERIA." The piers can be constructed with a down-hole vibrator or a down-hole tamper. It shall be the aggregate pier contractor's responsibility to determine and implement the systems and criteria to ensure specified performance is achieved.
- B. For soils and groundwater conditions in which the predrilled hole remains open and stable, the aggregate can be placed by a loader into the open hole and compacted in lifts using either a down-hole vibrator or down-hole tamper. In unstable conditions, the hole stability must be maintained either with a bottom feed down-hole vibrator, casing if the tamper method is used, or other suitable method.
- C. Design shall rely on subsurface information presented in the project geotechnical report.
- D. The Rammed Aggregate Pier design and installation shall adhere to all methods and standards described in this Specification.
- E. Contractor is responsible at time of bidding for performing sufficient design and calculations to verify that the proposed Rammed Aggregate Piers (RAPS) can achieve all of the requirements as listed in this specification section and on the structural construction drawings. If Rammed Aggregate Piers (RAPS) are not able to achieve these requirements, Contractor must prepare bid based on rigid inclusions (unreinforced bored and grouted columns) or other appropriate foundation improvement system as required to meet the project requirements.

1.3 REFERENCES

- A. Definitions
 - 1. Aggregate Piers: Aggregate Piers are columns of compacted aggregate used to reinforce the ground to increase bearing capacity and reduce settlement of a structure. The aggregate piers shall be constructed with a down-hole vibrator or down-hole tamper.

2. Down-Hole Vibrators: Down-Hole Vibrators are specially-designed, high-energy depth vibrators. The horizontal vibrations are created by a motor and eccentric weight located near the tip of the vibrator. Extension tubes are bolted to the vibrator to allow it to be lowered to the necessary treatment depth.
3. Bottom Feed Vibrators: Bottom Feed Vibrators are down-hole vibrators which are equipped with a tremie pipe through which the aggregate is fed to the tip of the vibrator. This equipment is most often used in soil conditions which are too soft or cohesionless to remain open when pre-drilled.
4. Down-Hole Tampers: Down-Hole Tampers are proprietary high-energy impact apparatus. The vertical tamping energy is provided by a hammer which is connected to a round, beveled tamper. The apparatus is lowered into a pre-drilled hole to the required treatment depth.
5. Aggregate Pier Designer: Licensed Professional Engineer in the State of North Carolina acting as the "Delegated Design Engineer" for the aggregate piers on this project.

B. American Society for Testing and Materials (ASTM) Standards

1. ASTM D 1143, Standard Test Method for Deep Foundations Under Static Axial Compressive Load.
2. ASTM D 1194, Standard Test Method for Bearing Capacity of Soil for Static Load and Spread Footings (Modified for Size).
3. ASTM D7383-08 – Axial Compressive Force Pulse (Rapid) testing of Deep Foundations (Static Testing)
4. ASTM D 3689, Individual Piles Under Static Axial Tensile Load.
5. ASTM D 1241, Material for Soil-Aggregate Subbase, Base, and Surface Courses.
6. ASTM C 33, Standard Specification for Concrete Aggregates.
7. ASTM STP 399, Dynamic Cone for Shallow In-Situ Penetration Testing ASTM STP (Special Technical Publication) 399.
8. ASTM D422 - Gradation of Soils
9. ASTM C31 Standard Practice for Making and Curing Cement Test Specimens in the field
10. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

C. Other Reference Standards

1. "Control of Settlement and Uplift of Structures Using Short Aggregate Piers," by Evert C. Lawton (Assoc. Prof., Dept. of Civil Eng., Univ. of Utah) Nathaniel S. Fox (President, Geopier Foundation Co., Inc.), and Richard L. Handy (Distinguished Prof. Emeritus, Iowa State Univ., Dept. of Civil Eng.), reprinted from IN-SITU DEEP SOIL IMPROVEMENT, Proceedings of sessions sponsored by the Geotechnical Engineering Division/ASCE in conjunction with the ASCE National Convention held October 9-13, 1994, Atlanta, Georgia.
2. "Settlement of Structures Supported on Marginal or Inadequate Soils Stiffened with Short Aggregate Piers," by Evert C. Lawton and Nathaniel S. Fox. Geotechnical Special Publication No. 40: Vertical and Horizontal Deformations of Foundations and Embankments, ASCE, 2, 962-974.
3. "The Design of Vibro Replacement," by Heinz J. Priebe and Keller Grundbau GmbH, reprinted from GROUND ENGINEERING, December 1995.
4. "VibroPier Design Methodology," by Hayward Baker, Inc., 2007.

1.4 MEASUREMENT AND PAYMENT

- A. General: All costs in connection with design, mobilization and demobilization costs, one modulus tests, furnishing all materials, equipment, and performing all labor for the construction of the aggregate piers and inspection to achieve the degree of improvement (allowable bearing capacity for maximum allowable settlements) as indicated in paragraph "PERFORMANCE CRITERIA" to support the column and wall footings illustrated on the contract drawings and as required per the specifications shall be paid for as lump sum. Contractor shall be responsible for the excavation and disposal of all spoil materials from excavations of aggregate piers. All measurements shall be made in the presence of the Owner's Testing Agency.
- B. Additional Modulus Tests: Additional Modulus Tests, if requested by the Owner's Testing Agency, will be measured for payment on the basis of tests satisfactorily completed in accordance with paragraph "MODULUS TEST." Payment will be made for satisfactorily completed modulus tests, which shall constitute full payment for installation of test and reaction piers, for furnishing, delivering, handling, and/or installation, as applicable, all labor, materials, equipment, and instrumentation, as well as survey and Geotechnical Engineer services necessary to meet contract requirements applicable to conducting, monitoring and recording data for the modulus test. No payment will be made for modulus tests which were unsatisfactorily performed, as determined by the Owner's Testing Agency.
- C. Additional Uplift Tests: Additional Uplift Tests, if requested by the Owner's Testing Agency, will be measured for payment on the basis of tests satisfactorily completed in accordance with paragraph "UPLIFT TEST." Payment will be made for satisfactorily completed uplift tests, which shall constitute full payment for installation of test and reaction piers, for furnishing, delivering, handling, and/or installation, as applicable, all labor, materials, equipment, and instrumentation, as well as survey and Geotechnical Engineer services necessary to meet contract requirements applicable to conducting, monitoring and recording data for the uplift test. No payment will be made for load tests which were unsatisfactory performed, as determined by the Owner's Testing Agency.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Submit aggregate pier design report at least four (4) weeks prior to commencement of rammed aggregate piers.
- B. PREINSTALLATION MEETING

1.6 ACTION SUBMITTALS

- A. Product Data:
 - 1. Equipment: Provide type and size of compaction equipment and predrill auger equipment and diameter used. Include work procedures and control criteria.
 - 2. Modulus Test: Modulus test detail and setup and location to confirm that the installation procedure produces the pier modulus used in the design.
- B. Shop Drawings:

1. Aggregate Pier Design Report: Submit a complete report describing the size and location of Aggregate Piers to the Architect and Structural Engineer of Record for review. The report shall include the following:
 - a. Engineering Calculations – The aggregate pier design shall be completed by a Professional Engineer licensed in the State of North Carolina and shall sign and seal all plans. The design shall consider the bearing capacity and total and differential settlement of all footings supported by aggregate piers, and shall be in accordance with acceptable engineering practice and these specifications. Total and differential settlement shall be considered. Aggregate piers shall be designed in accordance with the reference design standards in paragraph "REFERENCES" and "APPLICABLE DESIGN STANDARDS." The aggregate pier design shall meet the criteria illustrated in paragraph "PERFORMANCE CRITERIA." Detailed calculations, including anticipated loads, design assumptions and relevant subsurface information, shall be provided. Drawings shall be prepared for construction use and shall include site plans showing Aggregate Pier locations and depths, and footing details showing Aggregate Pier layout beneath footings and uplift anchor connection details when applicable.
 - b. Minimum Modulus at Maximum design stress shall be as specified in the final design documents provided by the Aggregate Pier Designer.
2. Modulus Test: Submit a plan detailing the modulus test set-up and procedure. Submit jack, pump, and pressure gauge calibration data. The Contractor shall submit a complete report on the modulus test, within 7 days of completion of each test, including but not limited to, reaction and test pier locations, a description of the installation records for both test piers and reaction piers, complete test data, analysis of test data, and other observations made during testing plus any other items required in ASTM D 1143, or ASTM D 3689 as applicable.

1.7 INFORMATIONAL SUBMITTALS

- A. A list of at least five previously completed projects of similar scope and purpose. The list shall include a description of the project, relative size, and contact person with phone number.
- B. Resumes of the management, supervisory, and key personnel.
- C. A ground improvement QA plan, as detailed in section 3.04 of these specifications.
- D. Work procedures and control criteria.
- E. Certificates:
 1. Surveys: A certified copy of the survey. Lines and levels shall be established and column and wall foundations and aggregate pier locations staked and maintained.
 2. Site Inspection Report: A certified copy of the Site Inspection Report shall be submitted prior to beginning installation of the aggregate piers.
 3. Certification of Qualifications for Aggregate Pier Designer, Aggregate Pier Installer, and Geotechnical Engineer.
- F. Site Inspection Report: A certified copy of the Site Inspection Report shall be submitted prior to beginning installation of the aggregate piers.

G. Field Reports:

1. Daily Aggregate Pier Progress Reports: Furnish a complete and accurate record of aggregate pier installation, including the type and size of compaction equipment and predrill auger diameter used, and, for each aggregate pier, the identification number and depth of the pier tip. Note Any change in the subsurface conditions observed during the work.
2. Final Aggregate Pier Progress Reports: Upon completion of aggregate piers, a final shop drawing including all daily progress reports shall be provided. A report documenting the observations and results of all test. This report will certify that the bearing pressure has been achieved within settlement tolerances.

H. Test Reports:

1. Aggregates: Submit gradation curves, one liquid limit test, one plasticity index test, and physical property tests results. Submit letters of certification and material delivery tickets from the aggregate supplier.
2. Modulus Tests and Uplift Tests: Submit reports no later than 7 days after completion of the modulus and uplift tests.

1.8 SURVEYS

- A. Lines and levels must be established and column and wall foundations and aggregate pier locations staked and maintained. A certified copy of the survey shall be submitted. Provide ground elevations in sufficient detail to estimate drilling depth elevations to within 2 inches.

1.9 SEQUENCE OF WORK

- A. The sequence of aggregate pier construction shall be coordinated with other construction operations in order to minimize interferences.

1.10 SUPERVISION, INSPECTION, AND RECORDS

- A. Contractor Supervision: The contractor shall provide for the continuous supervision of all phases of aggregate pier construction. Each aggregate pier excavation shall be checked by the Contractor for its depth, workmanship, and for all tolerance requirements before aggregate is placed.
- B. Geotechnical Inspection: An independent licensed Professional Engineer with expertise in Geotechnical Engineering and the construction of aggregate piers, hereinbefore and hereafter referred to as the Geotechnical Engineer, shall be paid for by the Contractor and shall be provided for the aggregate pier inspection and to oversee the recording and monitoring of all aggregate pier construction including the installation and monitoring of the modulus and uplift tests. The Geotechnical Engineer shall monitor the installation of modulus test aggregate piers to document procedures and criteria used for constructing the modulus test piers. Each aggregate pier excavation shall be checked by the Geotechnical Engineer to ensure that it meets the requirements provided in the design prior to placing aggregate. The Geotechnical Engineer shall have at least 5 years of experience in aggregate pier construction and inspected similar

projects in similar scope utilizing the methods being performed for the subject project (Down Hole Vibrator or Down Hole Tamper methods).

- C. Records: An accurate record shall be kept by the contractor for each aggregate pier as installed. The record shall indicate the pier location, length, average lift thickness, and final elevations of the base and top of pier, bearing strata description, water conditions, dates of excavations and aggregate placement, recording of compaction energy information, quantity of aggregate placed into piers, and other pertinent information. Detailed records for each column and wall footing, to include location, number of aggregate piers, and spacing shall also be provided. The record shall also indicate the type of size of the densification equipment used. The Aggregate Pier Installer shall immediately report any unusual conditions encountered during installation. Any corrective measures shall also be recorded. A complete tabulation of all records pertaining to approved aggregate piers shall be submitted. Records shall be signed by the inspector (Geotechnical Engineer) and the Contractor's superintendent.

1.11 QUALIFICATIONS

A. Qualifications:

1. Aggregate Pier Installer: Qualifications of the Aggregate Pier Installer shall show that he/she has been engaged in successful installation of aggregate piers for at least 5 years and completed a minimum of 10 similar projects in similar scope utilizing the methods being performed for the subject project (Down Hole Vibrator or Down Hole Tamper methods). A list of projects, including name and description of the project, relative size, and contact person with phone number shall be provided.
2. Aggregate Pier Designer: Qualifications of the Aggregate Pier Designer shall show that he/she has been engaged in successful design of aggregate piers for at least 5 years and completed a minimum of 10 similar projects in similar scope utilizing the methods being performed for the subject project (Down Hole Vibrator or Down Hole Tamper methods). A list of projects, including name and description of the project, relative size, and contact person with phone number shall be provided.
3. Geotechnical Engineer: Geotechnical Engineer performing the Geotechnical Inspection shall show that he/she has been engaged in successful inspection of aggregate piers for at least 5 years and inspected similar projects in similar scope utilizing the methods being performed for the subject project (Down Hole Vibrator or Down Hole Tamper methods).

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Down-Hole Vibrator: Should the aggregate pier contractor use a down-hole vibrator, the vibrator shall be capable of providing at least 80 HP of rated energy and a centrifugal force of 15 tons. An appropriate metering device should be provided at such a location that inspection of amperage increase may be verified during the operation of the equipment. The metering device may be an ammeter directly indicating the performance of the vibrator tip. Complete equipment specifications should be submitted prior to commencement of the fieldwork.

- B. Down Hole Tamper: Displacement Rammed Aggregate Pier systems shall be constructed by advancing a specially designed mandrel with a minimum 15-ton static force augmented by dynamic vertical ramming energy to the full design depth. The hollow-shaft mandrel, filled with aggregate, is incrementally raised, permitting the aggregate to be released into the shaft, and then lowered by vertically advancing and/or ramming to densify the aggregate and force it laterally into the adjacent soil. The cycle of raising and lowering the mandrel is repeated to the top of pier elevation. The cycle distance shall be determined by the Rammed Aggregate Pier designer.

2.2 BACKFILL MATERIALS

- A. If materials from more than one source are going to be utilized, provide aggregate submittals from each source as noted in "SUBMITTALS". The source of the material shall be selected 90 days prior to the time the material will be required in the work.
- B. If a change in material is observed, work shall stop immediately and the problem corrected. If the aggregate source or gradation has changed, a modulus test shall be completed at no additional cost to the Owner.
- C. Down-Hole Vibrator Method: The backfill aggregate should consist of hard, angular to sub-angular durable rock fragments, with the majority of particles in the range of 1/8th inch to 1- 1/2 inches such as ASTM C 33 size No. 57, or shall be other graded aggregate selected by the aggregate pier installer, approved by the aggregate pier Designer, and successfully used in the modulus test.
- D. Down-Hole Tamper Method: Aggregates used for piers constructed above the water table shall be Type I, Grade B in accordance with ASTM D 1241, or shall be other graded aggregate selected by the aggregate pier installer, approved by the aggregate pier Designer, and successfully used in the modulus test. It shall be compacted to a densification and strength which provides resistance to the dynamic penetration test (ASTM STP 399) of a minimum average of 15 blows per 1.75 inch vertical movement. The number of dynamic penetration tests performed during a workday by the Geotechnical Engineer shall depend on the consistency of achieving this minimum penetration resistance. A minimum of one aggregate pier shall be tested per column footing and one test per every 5 aggregate piers shall be completed per wall footing. Observation of questionable aggregate moisture content or questionable aggregate gradation appearance may determine the need for additional dynamic penetration testing to verify that proper densification is being achieved. Test results shall be included in the Daily Aggregate Pier Progress Reports.
 - 1. For aggregates used for piers constructed below the water table, the gradation shall be the same as Type I Grade B, except that particles passing the number 40 sieve shall be eliminated. Alternately, No. 57 stone or other stone selected by the Aggregate Pier Installer, approved by the aggregate pier Designer, and used successfully in the modulus test may be used. Dynamic penetration resistance is inappropriate for this material.
 - 2. When Type I Grade B material is used, potable water or other suitable source shall be used to increase the aggregate moisture content when required.

PART 3 - EXECUTION

3.1 SPECIAL INSPECTIONS

- A. Special Inspections will be performed by the Special Inspector or the Special Inspection Agency.

3.2 SITE INSPECTION

- A. If an adjacent building is within 15 feet of the aggregate pier work area, a relevant building examination/site inspection report shall be performed prior to initiating work to document preexisting cracks/damage. The building must also be monitored for movement during any work within 15 ft. of the structure. The work shall be stopped and the aggregate pier Designer and Engineer notified if any building settlement or cracks are observed.

3.3 AGGREGATE PIER CONSTRUCTION

- A. Stable Ground Conditions: The following general procedures shall be followed when the pre-drilled hole remains open during construction.
 - 1. Pre-drilling to the design depth will be performed with an auger diameter equal to the finished column diameter.
 - 2. Down-Hole Vibrator Method: The quantity of aggregate initially added shall be such that the vibrator tip is able to penetrate to within 12 inches of the design depth. The vibrator will be raised and lowered repeatedly, such that on each re-penetration, the tip of the vibrator advances to within 12 inches of the previous penetration depth.
 - 3. Down-Hole Tamper Method: Augered Rammed Aggregate Pier or Rigid Inclusion Pier elements –
 - a. Augered Rammed Aggregate Pier system shall be pre-augered using mechanical drilling or excavation equipment.
 - b. If cave-ins exceeding 10 percent of the lift volume occur during excavation such that the sidewalls of the hole are deemed to be unstable, steel casing shall be used to stabilize the shaft or a displacement Rammed Aggregate Pier system may be used.
 - c. Aggregate shall be placed in the augered shaft in lift thicknesses as determined by the Rammed Aggregate Pier Designer.
 - d. A specially-designed beveled tamper and high-energy impact densification apparatus shall be employed to densify lifts of aggregate during installation. The apparatus shall apply direct downward impact energy to each lift of aggregate. Compaction equipment that induces horizontal vibratory energy (such as Vibroflot equipment) is not permitted.
 - e. For Rigid Inclusion Pier elements using Cement Treated Aggregate (CTA) the same procedures (1 through 4 apply). The CTA materials that are mixed or delivered on site shall mixed dry and shall all be used within 8 hours of mixing. The aggregate shall be removed and replaced with fresh aggregate if cave-ins occur during the aggregate placement such that the volume of caved-in soil is greater than 10 percent of the aggregate being compacted.

- B. Unstable Ground Conditions: The following general procedures will be followed when a pre-drilled hole will not remain open before or during pier construction.
1. Down-Hole Vibrator Method: If the hole will remain temporarily stable, the hole may be filled with aggregate to a level above the instability as long as the vibrator is still able to penetrate to within 1 foot of the pre-drilled depth. If the hole will not remain temporarily stable, a Bottom Feed Down-Hole vibrator may be used.
 2. Down-Hole Tamper Method:
 - a. Displacement Rammed Aggregate Pier systems shall be constructed by advancing a specially designed mandrel with a minimum 15-ton static force augmented by dynamic vertical ramming energy to the full design depth. The hollow-shaft mandrel, filled with aggregate, is incrementally raised, permitting the aggregate to be released into the shaft, and then lowered by vertically advancing and/or ramming to densify the aggregate and force it laterally into the adjacent soil. The cycle of raising and lowering the mandrel is repeated to the top of pier elevation. The cycle distance shall be determined by the Rammed Aggregate Pier designer.
 - b. Special high-energy impact densification apparatus shall be employed to vertically densify the Rammed Aggregate Pier elements during installation of each constructed lift of aggregate.
 - c. Densification shall be performed using a mandrel/tamper. The mandrel/tamper foot is required to adequately increase the lateral earth pressure in the matrix soil during installation. Compaction equipment that induces horizontal vibratory energy (such as Vibroflot equipment) is not permitted.
 - d. Downward crowd pressure shall be applied to the mandrel during installation.
 - e. For Rammed Aggregate pier elements using #57 stone and neat cement or sand cement grout mixtures a minimum of 3 cylinders shall be taken daily in accordance with ASTM C31 to perform compressive strength testing of the stone/cement mixture to show it is in accordance with the project strength requirements.
 - f. For GeoConcrete Columns (GCC) using structural concrete, 3 cylinders of the concrete shall be taken daily per ASTM C31 to confirm the 28-day concrete strength of the concrete.
 - g. GCC elements shall be installed using the displacement pier method as described above however the compacted pier shall be restricted to the lower 5 feet of the pier and concrete shall be extruded under pressure to assure a uniform diameter of pier is built above the lower bulb.
 - h. If the structural design requirements are not controlling the Rigid Inclusion design and as approved by the Rigid Inclusion design engineer, compressive strength testing of Rigid Inclusion Piers may be limited to initial testing of the design mix to confirm that the design strength is met.
- C. Obstructions:
1. Obstructions encountered during excavation or drilling that will prevent installation of the aggregate piers to design depth or cause the aggregate pier to stray from its specified location during installation shall be removed. Removal of obstructions shall be performed at no additional cost to the Owner.
 2. Obstructions include, but are not limited to, boulders, timbers, concrete, bricks, utility lines, etc., that prevent installing the aggregate piers to the required depth or cause the aggregate pier to drift from the required locations. Dense natural rock or weathered rock shall not be deemed obstructions, and piers may be terminated short of design lengths on

such materials if approved by the Owner's Testing Representative and Geotechnical Engineer. The aggregate pier designer shall verify that the short piers are acceptable.

3.4 PERFORMANCE CRITERIA

- A. Construct aggregate piers to a sufficient depth with granular backfill material beneath all column foundations and load-bearing wall foundations to meet the following settlement and allowable soil bearing capacity criteria upon completion. Modulus tests shall be performed to verify the parameter values selected for the pier aggregate.
1. An allowable soil bearing capacity of 5000 PSF at column footings and 4000 PSF at wall footings with a maximum total settlement of 1.0 inch and a maximum differential settlement of 0.5 inches between adjacent column footings.
 2. Aggregate piers below all mat footings at braced frames shall provide an equivalent composite sliding friction coefficient of 0.50.

3.5 MODULUS TESTS

- A. One Aggregate Pier Modulus Test, to verify the aggregate pier design, shall be performed at the location of the worst soil conditions and maximum anticipated column loading for the project. This location shall be proposed by the Aggregate Pier Designer and approved by the Geotechnical Engineer. Aggregate Piers that are tested to provide a safe design, and that meet the tolerances describe in this specification, may be used in the finished work. Aggregate Piers shall be tested to 150 percent of the maximum design stress as shown in the aggregate pier design report submittal. Modulus Test Procedures shall utilize appropriate portions of ASTM D 1143/D 1143M, ASTM D 1194 and ASTM D 3689, as outline below. The modulus schedule shall be as follows:

Increment	Approximate Load (percent design)	Min. Duration (minutes)	Max. Duration (minutes)
Seat	< 9	0	N/A
1	17	15	60
2	33	15	60
3	50	15	60
4	67	15	60
5	83	15	60
6	100	15	60
7	117	15	60
8	133	15	60
9	150	15	60
10	100	N/A	N/A

11	66	N/A	N/A
12	33	N/A	N/A
13	0	N/A	N/A

- B. Each load increment shall be held for the minimum duration shown. For each load increment the deflection of the top plate shall be measured. The top plate shall be located on top of the Aggregate Pier or on top of concrete cast on top of the Aggregate Pier. If the rate of the Aggregate Pier deflection exceeds 0.01 inches per hour, the load shall be held in 15 minute increments until the rate of the Aggregate Pier deflection is less than 0.01 inches per hour (0.0025 inches per 15 minutes), or the maximum duration is reached. Test Aggregate Pier deflections shall be measured using a minimum of two dial gauges graduated to 0.001 inches. Dial gauges shall be anchored to the loading jack base, with gauge plungers set on reference beams anchored at least two diameters from the Aggregate Pier. For compression tests, deflection of uplift reactions shall be monitored using tightened strings of wire and graduated scales. The test jack, pump and pressure gauges shall have been calibrated within no longer than six months from the date of the test. If there are any questions regarding jack, pump and gauge accuracy, a confirmation calibration shall be performed after the modulus test. The results of the modulus test shall be reported on a deflection versus stress graph. The Aggregate Pier modulus shall be calculated as the maximum design stress divided by the deflection of the top plate at the maximum design stress. The deflection of the top plate shall not exceed the upper zone settlement as shown in the design calculations for any pier location.

3.6 BOTTOM STABILIZATION VERIFICATION TESTS

- A. Applicable for Down-Hole Tamper Method Only. Bottom stabilization testing (BSTs) or Crowd stabilization testing (CSTs) shall be performed by the Control Technician during the installation of the modulus test pier. Additional testing as required by the Pier Designer shall be performed on selected production Pier elements to compare results with the modulus or load test pier.

3.7 PLAN LOCATION AND ELEVATION TOLERANCES

- A. The center of each pier shall be within three inches of the locations indicated on the plans submitted by the Aggregate Pier Designer. The final measurement for the top of aggregate piers shall be the lowest point on the aggregate in the last compacted lift. Piers installed outside of the above tolerances and deemed not acceptable shall be rebuilt at no additional expense to the Owner.

3.8 REJECTION OF AGGREGATE PIERS

- A. Aggregate piers improperly located or installed beyond the maximum allowable tolerances shall be abandoned and replaced with new piers, unless the Owner's Testing Agency approves other remedial measures. All material and labor required to replace rejected aggregate piers shall be provided at no additional cost to the Owner.

3.9 SPOIL MATERIALS

- A. Dispose of soil materials, including spoils generated by Aggregate Pier installation.

3.10 EXCAVATION OF PIER TOPS AND UTILITIES

- A. Excavations conducted after aggregate pier installation shall be performed such that the horizontal distance between the edge of any aggregate pier and the nearest edge of the excavation is such that the pier is not affected. If installed aggregate piers are located within the zone of influence of excavation, the Contractor and Aggregate Pier designer shall develop solutions to excavation or construction methods that will avoid detrimental impact to the installed aggregate piers. Damage to any aggregate piers shall be repaired or replaced at no additional cost to the Owner.

3.11 BOTTOMS OF FOOTINGS

- A. Prior to placement of structural concrete, aggregate pier tops shall be excavated in manner that will prevent the soil matrix surrounding the aggregate piers from softening and ensure that a direct connection between the aggregate pier and concrete footing will be achieved. The following excavation procedures shall be followed:
 - 1. Over excavation below the bottom of footing elevation shall be limited to 3 inches. This includes limiting the teeth from excavators from over excavation beyond 3 inches below the footing elevation.
 - 2. Aggregate pier tops and footing bearing soils shall be compacted with a motorized standard, hand operated impact compactor ("Whacker Packer," "Jumping Jack," or equal). Tampers of the "sled" variety shall not be employed. Compaction shall be performed over the entire footing bottom to compact any loose surface soil and loose surface pier aggregate.
 - 3. Footing concrete shall be placed immediately following approval of the completed footing excavation work. If the bearing soils are expansive or sensitive, it is imperative that the footing concrete be placed on the same day that the excavation takes place.
 - 4. If footing concrete cannot be placed on the same day that excavation takes place, a minimum 3-inch thick mud mat shall be placed immediately following approval of the footing excavation. The top of the mud mat elevation shall be at the bearing elevation of the foundation above it.
- B. The following criteria shall apply and shall be verified by the Owner's Testing Representative in a written report.
 - 1. The footing excavation has been kept free of water since completion of excavation work. This will ensure that the unconfined matrix soil surrounding the aggregate piers has not been softened. Softening of the matrix soil may negatively impact the load bearing capability of the reinforced subgrade.
 - 2. That at each footing location, all aggregate piers installed have been fully exposed within the limits of the footing excavation.
 - 3. That the following specified procedures required immediately prior to construction of the footings have been followed:
 - a. Inspection of each aggregate pier top after exposure by the footing excavation.

- b. Recompaction, as required, of aggregate pier tops by mechanical impact compaction equipment.
 - c. Recompaction of aggregate pier tops that have or may have been disturbed by footing excavation or other actions, to the satisfaction of the Owner's Testing Representative.
- 4. Assurance that no excavation has been made within a distance that will affect any completed pier, without being approved in writing by the aggregate pier Designer.

3.12 FOOTING SUBGRADE INSPECTION

- A. The footing bearing surface shall be free of all water and compacted prior to placement of any reinforcement. Compaction can be by any heavy tamping type compaction equipment designed for compaction in small spaces. Reinforcement and concrete placement shall be placed in a timely manner so that no degradation of the bearing surface occurs.

END OF SECTION 316100