



ADDENDUM #001 – GRADING, CONCRETE, AND STEEL

SOUTH FULTON BRANCH LIBRARY

October 21, 2014

This Addendum #1 dated June 2, 2014 issued by Evergreen Construction is hereby made part of the Instructions to Bidders for the South Fulton Branch Library. The changes and/or clarifications included in this Addendum shall be considered as part of the Bidding Documents and shall supersede, amend, add to, or subtract from those conditions included in the original Bid Documents, including the Project Bid Package, Drawings, Specifications, etc. This addendum must be acknowledged within the Subcontractor's Proposal.

Failure to acknowledge this Addendum may subject Bidder to disqualification.

1. Incorporate the Scope of Work: Grading & Utilities revised October 21, 2014 into the Contract Documents.
2. Incorporate the Scope of Work: Cast-in-Place Concrete revised October 21, 2014 into the Contract Documents.
3. Incorporate the Scope of Work: Structural & Miscellaneous Steel revised October 21, 2014 into the Contract Documents.
4. Incorporate the following specification sections into the Contract Documents:
 - 01 4510 – Special Inspection Observation and Testing
 - 03 1500 – Concrete Anchoring
 - 03 3000 - Cast-in-Place Concrete
 - 03 6000 – Non-Shrink Grout
 - 04 2000 – Unit Masonry
 - 05 1200 – Structural Steel Framing
 - 05 2100 – Steel Joist Framing
 - 05 3100 – Steel Decking
 - 05 4000 – Cold-Formed Metal Framing
 - 05 5000 – Metal Fabrications
5. Incorporate the following revised drawings into the Contract Documents for the Bid Package 3.01 Building Addition Concrete
 - S-0.0 Cover Sheet
 - S-0.1 General Notes 1
 - S-0.2 General Notes 2
 - S-1.0 Foundation Plan
 - S-3.0 Sections
 - S-5.0 Typical Details 1
6. Incorporate the following revised drawings into the Contract Documents for the Bid Package 5.01 Structural Steel

S-0.0 Cover Sheet
S-0.1 General Notes 1
S-0.2 General Notes 2
S-1.1 Floor Framing Plan
S-1.2 Low Roof Framing Plan
S-1.3 High Roof Framing Plan
S-2.0 Moment Frame Elevations 1
S-2.1 Moment Frame Elevations 2
S-3.1 Sections
S-4.0 Details
S-5.1 Typical Details 2
S-5.2 Typical Details 3

END OF ADDENDUM



SCOPE OF WORK: GRADING & UTILITIES

BID PACKAGE: 02.06

1. All work will be done on the premises of the South Fulton Branch Library Renovation and Addition. Subcontractors are advised that there is to be absolutely no contact, be it verbal, physical, written or otherwise, with the guests, students, staff, parents or others who frequent the library, except as specifically directed by the Evergreen Construction Project Superintendent.
2. Each Subcontractor agrees to abide by the requirements of the Drug Free Workplace Act.
3. All work has been broken into Work Categories for the purpose of receiving and comparing bids received from each Subcontractor interested in performing the work. Work described in each Scope of Work must be included in the Bid amount.
4. Subcontract form shall be Evergreen's Construction Management contract as included in this bid package. A copy of which can also be obtained online at:

http://www.evergreencorp.com/forms/construction_management_subcontract_form.pdf

or by requesting a copy from Hunter Letts at hletts@evergreencorp.com. No modifications to this Contract form will be made.
5. Furnish all labor, materials, tools, taxes, equipment, insurance and services necessary to install and complete the work as authorized by the Construction Manager, all complete and in accordance with the Contract Documents, without exception, unless otherwise herein provided, subject to the approval of the Architect, Owner and Construction Manager.
6. All work shall be performed in accordance with both State and Local code requirements to the best of current practices and to a quality of work acceptable to the Owner, Architect and Construction Manager. In the event that any discrepancies and/or errors are found in the drawings or specifications, this Subcontractor shall be required to notify the Construction Manager before proceeding with the work, and shall be deemed to have estimated the highest quality way of doing the work.
7. Each Subcontractor is to have a qualified supervisor on site at all times while their work is being performed.
8. Each Subcontractor shall provide all shop drawings, submittals, and samples as required by the Contract Documents.
9. Each Subcontractor is to secure all inspections and certificates as required for his work by governing authorities.
10. Each Subcontractor shall pay all local, state and federal taxes.
11. Each Subcontractor to secure and pay for applicable permits and fees.
12. Continuous clean up is required. Each Subcontractor is responsible for trash pick-up, recycling, and disposal of all debris associated with his work to the Construction Manager's provided dumpsters. During the course of Construction a composite cleanup crew may be

requested by the Construction Manager to perform project cleanup. Participation will be required based on the number of employees each Subcontractor has on the project. If a Subcontractor fails to participate in this composite crew, without prior approval of the Project Superintendent, Construction Manager will provide adequate manpower for this effort and deduct the cost from Subcontractor's contract amount.

13. Removal and disposal of subcontractor's pallets (Note: Pallets are not to be deposited in Construction Manager's dumpsters).
14. Temporary lighting will be provided under the Electrical Scope of Work.
15. Temporary power will be provided by the Owner.
16. Temporary water will be provided by the Owner.
17. Temporary toilets will be provided by the Construction Manager.
18. Telephone service will not be provided at the project site during construction.
19. All cutting and patching associated with the each Subcontractor's work is required to be included in each Subcontractor's scope of work.
20. The Owner will employ and pay for an Independent Testing Agency to perform all tests in accordance with the Contract Documents. However, any re-testing resulting from failed tests will be each Subcontractor's responsibility and any and all costs associated with this re-testing will be paid for by each Subcontractor.
21. Each Subcontractor is to include all hoisting of all materials, equipment and personnel required for their work (lifts, scaffolding, cranes, etc.).
22. Subcontractors are to include temporary bracing, shoring, or underpinning or protection required for installation of their work.
23. Subcontractors are to include re-handling of on-site materials, which interfere with the work of other Subcontractors.
24. Subcontractors are to include temporary storage of materials and equipment. Construction Manager will designate space for each Subcontractor, if available.
25. Parking is not available on-site. Subcontractors shall be responsible for finding off-site parking and finding other means of transportation to the site for journeymen, mechanics, workers, etc. Any costs for offsite parking shall be the responsibility of each Subcontractor.
26. Each Subcontractor shall be responsible for excavation, backfill, compaction, and restoration of grades associated with their scope of work. Coordination with all other trades is required. Any subcontractor who performs excavation shall perform all utility locates and "potholing".
27. Each Subcontractor shall coordinate its work with the other Mechanical, Electrical, and Plumbing Subcontractors working on the Project to ensure complete and operational systems.
28. Each Subcontractor shall take all reasonable precautions to protect stored materials and

- their work from loss or damage prior to acceptance by Owner.
29. Protection of in-place work adjacent to Construction Manager's activities.
 30. Subcontractor shall provide its Safety Program to Construction Manager in accordance with Article 15 & Exhibit C of this Subcontract.
 31. It is agreed and understood that this Subcontractor's onsite Foreman/Supervisor shall participate in a project specific safety course scheduled by Contractor. The cost of attendance (approximately \$300 per attendee) will be the responsibility of this Subcontractor. Further, it is agreed that this Subcontractor's Foreman will attend Contractor's Weekly Safety meetings.
 32. Subcontractor shall submit a delivery schedule for all items to ensure they have proper scheduling and receiving. As ship dates approach, contact Evergreen's Superintendent at the jobsite to confirm ship dates, times, etc. A minimum of a 48 hour notice is required for all deliveries. It is the Subcontractor's responsibility to ensure the shipping company has the proper directions to the jobsite.
 33. All keys for the Project associated with Subcontractor's Work shall be tagged and mounted in the Key Cabinet. Key Cabinet shall be maintained by the Construction Manager in the Construction Manager's on-site office. Contractor will not accept these keys presented in-bulk, untagged, and unorganized. It shall be the Subcontractor's responsibility to coordinate delivery of these keys to the Construction Manager for inclusion into the Key Cabinet.
 34. Subcontractor shall be responsible for providing all submittals, including but not limited to, shop drawings, product data, color charts, samples, etc.
 35. It is agreed and understood that this project will be a LEED certified project and that all requirements specified for this scope of work shall be met and required paperwork, submittals and materials will be provided as needed to help achieve the specified LEED certification.
 36. It is agreed and understood that the current project schedule is January 2015 – December 2015 and that Subcontractor will take all necessary actions to ensure that their work is completed within this time frame in accordance with the Construction Manager's schedule to ensure that the entire project is completed on or before the noted time frames.

Specific Specifications

N/A

Summary of Work

1. Payment and Performance Bonds
2. Payment and Performance Bonds and a signed Subcontract shall be delivered to the Construction Manager within one week of issuance of Subcontract
3. Permits related to this scope of work. Permit fees are by others.
4. NDPES NOI fees are by others.
5. Subcontractor shall maintain current and valid Utility Contractor's License with the State of Georgia
6. Subcontractor's full-time onsite superintendent shall maintain current and valid NPDES

- Level 1 training and certification as may be required to perform this scope of work
7. Shop drawings and submittals as specified
 8. Continuous Cleanup
 9. Layout Engineering for this scope of work including locating property corners, staking of building corners for the building addition and parking deck, and staking of curb & gutter for curb & gutter installation
 10. As-Builts for this scope of work.
 11. Certified As-Builts and hydrology study
 12. Utility locates required for underground work
 13. Multiple mobilizations as required
 14. Temporary Barricades/Signage/Traffic Control as required for this scope of work
 15. Erosion Control. Complete erosion control system as indicated in the Contract Documents. Subcontractor shall maintain erosion control for the duration of the project, regardless of whether subcontractor is working on the jobsite or not.
 16. Construction entrance and maintenance regardless of whether Subcontractor is working on the jobsite or not
 17. Removal of erosion control upon completion of the project is by others.
 18. Temporary grassing
 19. PAM (polyacrylamide) applications as required by the Contract Documents
 20. Erosion control matting
 21. Tree protection fencing Construction and maintenance of a vehicle wash down area (gravel / water) is included.
 22. Permanent grassing is not included. However, Subcontractor will utilize the specified permanent grassing mix for the grassing of all slopes.
 23. Final cleaning of underground detention system upon stabilization of the site
 24. Site demolition. Complete site demolition as required including demolition of asphalt paving, curb & gutter, existing utilities, sawcutting and haul off of debris.
 25. Demolition as required for installation of new utilities or for the tie-in of utilities.
 26. Removal and offsite disposal of demolition debris to meet the project's LEED requirements
 27. Clearing, Grubbing, grinding and haul off of debris that cannot be utilized on site.
 28. Strip and stockpile topsoil. Excess topsoil that cannot be utilized onsite shall be hauled off.
 29. Complete site and building excavation in accordance with the Contract Documents including haul off of excess material as required and haul in of suitable fill as required.
 30. Layback for building foundation wall
 31. Backfill of building foundation wall
 32. Backfill curbs, islands, etc.
 33. Complete storm sewer system including underground detention facility
 34. Gravel encasement at underground detention facility
 35. 12" pvc from trench drain to storm structure A3
 36. Downspout collection system piping. Final connection shall be made by Plumber or this Subcontractor, whoever completes this work last.
 37. Trench drain including concrete trench
 38. Complete sanitary sewer system to within 5' of building. Final connection shall be made by Plumber or this Subcontractor, whoever completes this work last.
 39. Complete fire water system to 1' above finish floor elevation within the building addition and parking deck stair tower.
 40. Connection to existing fire line, fire hydrants, check valves, PIVs with tamper switches, FDCs, etc.
 41. Subcontractor shall coordinate with the local governing authority for the water service and provide all work that is required (or not provided by the local governing authority) to provide a fully functional domestic and fire water system.

42. Demolition of existing abandoned sanitary sewer piping beneath the proposed parking deck
43. Demolition and removal of the existing abandoned fire line
44. Relocating or adjusting all items as indicated on the contract documents and as necessary to perform this scope of work. This shall include, but is not limited to: sanitary sewer lines, storm structures, irrigation control valves, water meter, etc.
45. Footing spoils shall be stockpiled around the building for haul off by this Subcontractor.
46. Cut & patch
47. NPDES monitoring is by others.
48. Pipe bedding, compaction, etc. as specified
49. Concrete maintenance edge at catch basins
50. Temporary relocation of existing irrigation system required to complete this work. Permanent relocation will be performed by the Landscaping & Irrigation subcontractor (after the grading work is completed).
51. Irrigation sleeves – install two each irrigation sleeves across each driveway
52. Gravel paving is by others.
53. Asphalt paving is by others.
54. Curb & gutter is by others.
55. The building addition is only partially on grade. See structural drawings for extents of Building Addition Slab on Grade vs. Building Addition elevated structure.
56. Building Addition Slab on Grade consists of 6” of GAB and 4” of concrete.
57. Parking deck slab on grade consists of 6” of GAB and 6” of concrete.
58. River rock swale is by others.
59. Subcontractor shall be responsible to wet or dry the soils, as necessary, to achieve a moisture content that will allow for proper compaction, including discing, harrowing, or pulverizing. The means and methods employed shall be governed by the specifications, space limitations of the construction site and time limitations of the Project Schedule.
60. Subcontractor shall remove any “rip rock” as required at no additional cost. Excavation, removal, and replacement of trench rock, mass rock, and unsuitable soils shall be performed at the unit rates listed in this agreement and in accordance with the procedures outlined in the contract documents.
61. Install geo-textile fabric beneath the elevated building addition.

Unit Prices – Please provide the following unit prices:

- A. Unsuitable soils – remove and haul off site
- B. Unsuitable soils – remove and waste onsite
- C. Suitable fill – haul in, place, and compact
- D. Suitable fill - from onsite, place, and compact
- E. Mass rock – waste onsite
- F. Mass rock – haul offsite
- G. Trench rock – waste onsite
- H. Trench rock – haul offsite
- I. Install geotextile fabric
- J. #57 stone – haul in, place, and compact to replace unsuitable soils or rock
- K. #4 stone – haul in, place, and compact to replace unsuitable soils or rock
- L. #GAB – haul in, place, and compact to replace unsuitable soils or rock
- M. Surge stone – haul in, place, and compact to replace unsuitable soils or rock



SCOPE OF WORK: CAST-IN-PLACE CONCRETE

BID PACKAGE: 03.01

1. All work will be done on the premises of the South Fulton Branch Library Renovation and Addition. Subcontractors are advised that there is to be absolutely no contact, be it verbal, physical, written or otherwise, with the guests, students, staff, parents or others who frequent the library, except as specifically directed by the Evergreen Construction Project Superintendent.
2. Each Subcontractor agrees to abide by the requirements of the Drug Free Workplace Act.
3. All work has been broken into Work Categories for the purpose of receiving and comparing bids received from each Subcontractor interested in performing the work. Work described in each Scope of Work must be included in the Bid amount.
4. Subcontract form shall be Evergreen's Construction Management contract as included in this bid package. A copy of which can also be obtained online at:

http://www.evergreencorp.com/forms/construction_management_subcontract_form.pdf

or by requesting a copy from Hunter Letts at hletts@evergreencorp.com. No modifications to this Contract form will be made.
5. Furnish all labor, materials, tools, taxes, equipment, insurance and services necessary to install and complete the work as authorized by the Construction Manager, all complete and in accordance with the Contract Documents, without exception, unless otherwise herein provided, subject to the approval of the Architect, Owner and Construction Manager.
6. All work shall be performed in accordance with both State and Local code requirements to the best of current practices and to a quality of work acceptable to the Owner, Architect and Construction Manager. In the event that any discrepancies and/or errors are found in the drawings or specifications, this Subcontractor shall be required to notify the Construction Manager before proceeding with the work, and shall be deemed to have estimated the highest quality way of doing the work.
7. Each Subcontractor is to have a qualified supervisor on site at all times while their work is being performed.
8. Each Subcontractor shall provide all shop drawings, submittals, and samples as required by the Contract Documents.
9. Each Subcontractor is to secure all inspections and certificates as required for his work by governing authorities.
10. Each Subcontractor shall pay all local, state and federal taxes.
11. Each Subcontractor to secure and pay for applicable permits and fees.
12. Continuous clean up is required. Each Subcontractor is responsible for trash pick-up, recycling, and disposal of all debris associated with his work to the Construction Manager's provided dumpsters. During the course of Construction a composite cleanup crew may be

requested by the Construction Manager to perform project cleanup. Participation will be required based on the number of employees each Subcontractor has on the project. If a Subcontractor fails to participate in this composite crew, without prior approval of the Project Superintendent, Construction Manager will provide adequate manpower for this effort and deduct the cost from Subcontractor's contract amount.

13. Removal and disposal of subcontractor's pallets (Note: Pallets are not to be deposited in Construction Manager's dumpsters).
14. Temporary lighting will be provided under the Electrical Scope of Work.
15. Temporary power will be provided by the Owner.
16. Temporary water will be provided by the Owner.
17. Temporary toilets will be provided by the Construction Manager.
18. Telephone service will not be provided at the project site during construction.
19. All cutting and patching associated with the each Subcontractor's work is required to be included in each Subcontractor's scope of work.
20. The Owner will employ and pay for an Independent Testing Agency to perform all tests in accordance with the Contract Documents. However, any re-testing resulting from failed tests will be each Subcontractor's responsibility and any and all costs associated with this re-testing will be paid for by each Subcontractor.
21. Each Subcontractor is to include all hoisting of all materials, equipment and personnel required for their work (lifts, scaffolding, cranes, etc.).
22. Subcontractors are to include temporary bracing, shoring, or underpinning or protection required for installation of their work.
23. Subcontractors are to include re-handling of on-site materials, which interfere with the work of other Subcontractors.
24. Subcontractors are to include temporary storage of materials and equipment. Construction Manager will designate space for each Subcontractor, if available.
25. Parking is not available on-site. Subcontractors shall be responsible for finding off-site parking and finding other means of transportation to the site for journeymen, mechanics, workers, etc. Any costs for offsite parking shall be the responsibility of each Subcontractor.
26. Each Subcontractor shall be responsible for excavation, backfill, compaction, and restoration of grades associated with their scope of work. Coordination with all other trades is required. Any subcontractor who performs excavation shall perform all utility locates and "potholing".
27. Each Subcontractor shall coordinate its work with the other Mechanical, Electrical, and Plumbing Subcontractors working on the Project to ensure complete and operational systems.

28. Each Subcontractor shall take all reasonable precautions to protect stored materials and their work from loss or damage prior to acceptance by Owner.
29. Protection of in-place work adjacent to Construction Manager's activities.
30. Subcontractor shall provide its Safety Program to Construction Manager in accordance with Article 15 & Exhibit C of this Subcontract.
31. It is agreed and understood that this Subcontractor's onsite Foreman/Supervisor shall participate in a project specific safety course scheduled by Contractor. The cost of attendance (approximately \$300 per attendee) will be the responsibility of this Subcontractor. Further, it is agreed that this Subcontractor's Foreman will attend Contractor's Weekly Safety meetings.
32. Subcontractor shall submit a delivery schedule for all items to ensure they have proper scheduling and receiving. As ship dates approach, contact Evergreen's Superintendent at the jobsite to confirm ship dates, times, etc. A minimum of a 48 hour notice is required for all deliveries. It is the Subcontractor's responsibility to ensure the shipping company has the proper directions to the jobsite.
33. All keys for the Project associated with Subcontractor's Work shall be tagged and mounted in the Key Cabinet. Key Cabinet shall be maintained by the Construction Manager in the Construction Manager's on-site office. Contractor will not accept these keys presented in-bulk, untagged, and unorganized. It shall be the Subcontractor's responsibility to coordinate delivery of these keys to the Construction Manager for inclusion into the Key Cabinet.
34. Subcontractor shall be responsible for providing all submittals, including but not limited to, shop drawings, product data, color charts, samples, etc.
35. It is agreed and understood that this project will be a LEED certified project and that all requirements specified for this scope of work shall be met and required paperwork, submittals and materials will be provided as needed to help achieve the specified LEED certification.
36. It is agreed and understood that the current project schedule is January 2015 – December 2015 and that Subcontractor will take all necessary actions to ensure that their work is completed within this time frame in accordance with the Construction Manager's schedule to ensure that the entire project is completed on or before the noted time frames.

Specific Specifications

N/A

Summary of Work

1. Payment and performance bonds
2. Payment and Performance Bonds and a signed Subcontract shall be delivered to the Construction Manager within one week of issuance of Subcontract
3. Concrete mix designs shall be delivered within one week from the receipt of a Subcontract agreement.
4. Reinforcing steel shop drawings for foundations and foundation walls shall be received within three weeks from the receipt of a Subcontract agreement.

5. All other submittals shall be received within two weeks from the receipt of a Subcontract agreement.
6. Multiple mobilizations
7. Subcontractor shall include all hoisting
8. Continuous cleanup as needed to maintain an orderly and safe jobsite
9. Acceptance and unloading of all material deliveries including but not limited to reinforcing steel
10. This subcontractor shall be responsible for all layout
11. Furnish and install all concrete for the building addition including but not limited to
 - a. Continuous footings and spread footings
 - b. Foundation walls
 - c. Slab on grade
 - d. Concrete piers
 - e. Concrete slab over metal deck
 - f. Concrete stairs
12. Saw cutting and layout of control joints and expansion joints (including pej or pjf)
13. Curing of slab on grades in accordance with the project specifications; dependent upon floor coverings it will receive
14. Filling of control joints and construction joints with joint filler
15. Layout and installation of anchor bolts and embeds (anchor bolts and embeds to be provided by others)
16. Pointing and patching of all concrete work
17. Grouting of base plates
18. Excavation, fine grading, and backfilling of all foundations
19. Formwork as required
20. Reinforcing steel, welded wire fabric, and diamond plate dowels
21. Rebar, drilling, doweling, and epoxy for installation of masonry dowels into slab on grade
22. Graded aggregate base below slab on grade
23. Fine grading of slab on grade from +/-0.1'
24. Vapor barrier (10 mil or greater reinforced vapor barrier equal to Stego wrap
 - a. Sealing around penetrations through the vapor barrier
25. Furnish and install rebar caps for all reinforcing / impalement conditions
26. This subcontractor will be responsible for dewatering and muck out of own excavations
27. This subcontractor will be responsible for protecting rebar and placed concrete from freezing conditions
28. All Equipment is to be supplied by this Subcontractor including light towers, vibrators, and concrete blankets if needed.
29. Concrete conveyance (pumps, conveyors, georgia buggies, etc.)
30. Concrete accessories (waterstop, etc).
31. Patching of tie-holes in foundation wall to receive waterproofing
32. Patching of tie-holes and rubbing of exposed concrete foundation wall
33. Gravel paving below elevated building addition
34. Site trench drain is by others.
35. Weep holes and drainage filter in foundation walls
36. Threaded rods into existing foundations including drilling and epoxy material
37. Backfill of the building foundation wall is by others
38. Column block-outs and pour-backs
39. Subcontractor shall stockpile foundation spoils in one location (adjacent to the parking lot) for loading and haul off by others.
40. Subcontractor is responsible for all traffic control and safety measure during concrete operations and deliveries (e.g. flag men, cones, barriers).

41. Concrete mix supplier will provide a qualified quality control representative on site for any concrete pours over 50 cubic yards.
42. Parking deck concrete is not included.
43. Concrete sidewalks are not included.
44. Concrete curb & gutter is not included.
45. Subcontractor shall install and maintain an OSHA compliant guardrail along the top of the concrete foundation wall. Guardrail shall be installed during backfill. Guardrail shall be reinstalled upon completion of the slab on grade and may be removed when the steel erection is complete.



SCOPE OF WORK: STRUCTURAL & MISCELLANEOUS STEEL

BID PACKAGE: 05.01

1. All work will be done on the premises of the South Fulton Branch Library Renovation and Addition. Subcontractors are advised that there is to be absolutely no contact, be it verbal, physical, written or otherwise, with the guests, students, staff, parents or others who frequent the library, except as specifically directed by the Evergreen Construction Project Superintendent.
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Summary of Work

1. Payment and performance bonds
2. Payment and Performance Bonds and a signed Subcontract shall be delivered to the Construction Manager within one week of issuance of Subcontract
3. Shop drawings shall include sealed calculations by a registered engineer in the state of Georgia, where required by the Contract Documents.
4. Engineering is included for stairs and rails, guardrails, and steel connections.
5. Shop drawings and submittals shall be provided within the following durations:

- a. Anchor bolt drawings – 14 days
 - b. Structural steel shop drawings – 28 days
 - c. Joist and deck drawings – 35 days
 - d. Stair and rail drawings – 28 days
 - e. Miscellaneous steel drawings – 42 days
 - f. The issuance of RFIs to the structural engineer during the detailing process will not relieve this supplier from its obligation to meet these durations.
6. Structural steel shall be fabricate and delivered within 28 days from the receipt of approved submittals.
 7. Subcontractor shall maintain AISC certification for fabrication.
 8. Subcontractor shall notify Construction Manager when steel fabricator is ready for testing agency to visit the fabricator's shop for inspections.
 9. Fabricate and erect complete structural and miscellaneous steel package in accordance with the contract documents including but not limited to the following:
 - a. Structural steel
 - b. Joists and bridging
 - c. Deck
 - d. Deck accessories
 - e. Gauge angle at decking (if specified or required)
 - f. Columns
 - g. Beams
 - h. Anchor bolts (installed by others)
 - i. Angles
 - j. Plates
 - k. Embeds
 - l. Bolts and expansion bolts required for erection
 - m. Studs
 - n. Stairs
 - o. Rails
 - p. Wall mounted pipe rails
 - q. Lintels
 - r. Brick support angles (galvanized)
 - s. Elevator sump pit grate and frame
 - t. Elevator hoist beam
 - u. Roof opening frames (as required by roof openings indicated on the architectural, structural, mechanical, electrical, or plumbing documents). All frames shall be included wherein the installation of the roof opening frames is required to be performed from below the roof deck.
 - v. Elevator pit ladder
 - w. Roof access ladder
 - x. Site stair rails
 - y. Furnish ¼" thick steel base plate and anchor bolt templates to be used for each column.
 10. Galvanizing of steel is included where specified
 11. All hoisting required for this scope of work is included.
 12. Temporary guying during erection is included, as required.
 13. Safety is of the utmost importance. Erector will have an OSHA Competent Person on site during all erection. This Competent Person shall have current OSHA training in CFR 29 Subpart "R".
 14. Furnish and install safety cables. Subcontractor shall install and maintain these rails during their work activities. Once the steel installation is complete, maintenance of safety cables becomes the responsibility of the Construction Manager.

15. Installation of wall mounted pipe rails is included.
16. Installation of site stair rails including core drilling and pour rock or grout
17. Installation of loose lintel angles is by others.
18. Removal of temporary support steel after erection is complete.
19. Grouting of baseplates is by others.
20. Field measuring for miscellaneous steel is included.
21. Subcontractor shall cut deck at all roof opening frames. Construction Manager shall cover and protect any open holes in the decking.
22. Touch-up of primer or galvanizer at welds is included.

SECTION 01 4510
SPECIAL INSPECTION AND TESTING

PART 1 GENERAL

1.1 SUMMARY

- A. This section covers requirements for Special Inspection and Testing required in accordance with Chapter 17 of the 2009 International Building Code and is in addition to and supplements requirements included in Statement of Special Inspections (Plan) shown on Drawings.

1.2 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. International Code Council (ICC):
 - a. 2009 International Building Code (IBC).
 - b. Evaluation Service (ICC-ES) Reports and Legacy Reports.
 2. American Society of Civil Engineers (ASCE): 7 -05, Minimum Design Loads for Buildings and Other Structures.

1.3 STATEMENT OF SPECIAL INSPECTIONS (PLAN) REQUIREMENTS

- A. Designated Systems for Inspection:
1. Seismic-force-resisting systems designated under IBC Section 1705 and subject to Special Inspection under Section 1707: See Drawings for basic lateral load resisting systems for each structure and other designated seismic systems.
 2. Wind-force-resisting systems designated under IBC Section 1705: See Drawings for basic lateral load resisting systems for each structure and other designated wind-resisting components.
 3. Architectural, Mechanical, and Electrical Components subject to Special Inspection and testing under IBC Section 1707 for Seismic Resistance:- None required.
- B. Statement of Special Inspections (Plan):
1. As included in Drawings and in support of the building permit application, the Project specific plan was prepared by the registered design professional in responsible charge. The following identifies elements of the inspection testing program to be followed in construction of the Work:

- a. Special Inspection and testing required by IBC Section 1704 and Section 1708, and other applicable sections and referenced standards therein.
 - b. Type and frequency of Special Inspection required.
 - c. Type and frequency of testing required.
 - d. Required frequency and distribution of testing and Special Inspection reports to be distributed by Special Inspector to Engineer, Contractor, building official, and Owner.
 - e. Geotechnical Observation to be performed: Required frequency and distribution of Geotechnical Observation reports by registered design professional to Contractor, building official, and Owner.
- C. Special Inspection and associated testing of shop fabrication and field construction will be performed by an approved accredited independent agency. Owner will secure and pay for the services of the agency to perform Special Inspection and associated testing.
- D. Owner's plan for code required Special Inspection with associated testing and Professional Observation, as provided in Statement of Special Inspections (Plan) on Drawings and further provided in this section, is for the sole benefit of Owner and does not:
1. Relieve Contractor of responsibility for providing adequate quality control measures.
 2. Relieve Contractor of responsibility for damage to or loss of material before acceptance.
 3. Constitute or imply acceptance.
 4. Affect continuing rights of Owner after acceptance of completed Work.
- E. The presence or absence of code required Special Inspector does not relieve Contractor from Contract requirements.
- F. Contractor is responsible for additional costs associated with Special Inspection and Testing when Work is not ready at time identified by Contractor, and Special Inspectors and Professional Observer are on Site but not able to provide contracted services.
- G. Contractor is responsible for associated costs for additional Special Inspection and Testing by Special Inspectors required because of rejection of materials of in place Work that cannot be made compliant to Contract Document without additional Site visits or testing.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 GENERAL

- A. Provide access to shop or Site for Special Inspection and Testing
- B. Notify Engineer in advance of required Special Inspection no later than 48 hours prior to date of Special Inspection
- C. When required by Registered Design Professional, provide access for mechanical and electrical component inspections for those items requiring certification.
- D. Materials and systems, inclusive, shall be inspected during placement where Continuous Special Inspection is required.
- E. Materials and systems shall be inspected during or at completion of their placement where Periodic Special Inspection is allowed.
 - 1. Periodic Special Inspection shall be performed so that Work inspected after, but not during, its placement can be corrected prior to other related Work proceeding and covering inspected Work.
 - 2. Periodic Special Inspection does not allow sampling of a portion of the Work. All Work shall be inspected.

End of Section

SECTION 03 1500
CONCRETE ANCHORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements pertaining to post-installed anchors for materials and equipment. This section pertains to all other sections of these specifications that require post-installed anchors, unless specified otherwise.

1.2 RELATED SECTIONS: Specified Elsewhere May Include But Is Not Limited To:

- A. Section 01 33 00 Submittals
- B. Section 03 30 00 Cast-In-Place Concrete
- C. Section 05 50 00 Metal Fabrications

1.3 REFERENCES

- A. ACI 318 – Building Code Requirements for Structural Concrete
- B. ACI 355.2 – Standard for Evaluating the Performance of Post-Installed Mechanical Anchors in Concrete
- C. ASTM A36 – Standard Specification for Carbon Structural Steel
- D. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- E. ASTM A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
- F. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- G. ASTM A615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- H. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- I. ASTM B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- J. ASTM C881 – Standard Specification Epoxy-Resin-Based Bonding Systems for Concrete
- K. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

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- L. ASTM E1512 – Standard Test Methods for Testing Bond Performance of Bonded Anchors
- M. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
- N. Federal Specifications A-A-1922A, A-A01923A and A-A-55614 for Expansion and Shield-Type Anchors
- O. ICC-ES AC01 – Acceptance Criteria for Expansion Anchors in Masonry Elements
- P. ICC-ES AC58 – Acceptance Criteria for Adhesive Anchors in Masonry Elements
- Q. ICC-ES AC60 – Acceptance Criteria for Anchors in Unreinforced Masonry Elements
- R. ICC-ES AC70 – Acceptance Criteria for Fasteners Power-Driven into Concrete, Steel and Masonry Elements
- S. ICC-ES AC106 – Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Concrete or Masonry Elements
- T. ICC-ES AC193 – Acceptance Criteria for Mechanical Anchors in Concrete Elements
- U. ICC-ES AC308 – Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

1.4 QUALITY ASSURANCE

- A. Post-Installed anchors and related materials shall be listed by one or more of the following agencies, as applicable:
 - 1. ICC Evaluation Service
 - 2. Underwriters Laboratories (UL) and/or Factory Mutual (FM)

1.5 SUBMITTALS

- A. Product Data: Submit data for proprietary materials, manufacturer's specifications (including finishes and/or materials), Material Safety Data Sheets (MSDS) and installation procedures.
- B. Test Reports: ICC-ES listings and performance data that includes recommended loading for each application.
- C. Only manufacturers with an ICC-ES listing will be considered for substitution requests. The contractor shall submit for Engineer-of-Record's review, calculations that are prepared & sealed by a registered Professional Engineer demonstrating that the substituted product is capable of achieving the pertinent equivalent performance values of the specified product using the appropriate design procedure and/or standard(s) as required by the Building Code. In addition, the calculations shall specify the diameter and embedment depth of the substituted product. Any increase in material costs for such submittal shall be the responsibility of the contractor.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
- B. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage or deterioration.

PART 2 PRODUCTS

2.1 CRITERIA

A. CAST-IN-PLACE ANCHORS

- 1. See Section 055000 Metal Fabrications.

B. EXPANSION ANCHORS

- 1. Cracked Concrete Wedge Anchors: Anchors used to transmit load [i.) Between structural elements and ii.) From life safety-related attachments] shall be designed in accordance with ACI 318 Appendix D, which requires post-installed mechanical anchors to be qualified according to ACI 355.2. Such anchors shall be an imperial sized, threaded stud with an integral cone expander and three-segment expansion clip. The stud shall be manufactured from carbon steel and the expansion clip shall have 2 undercutting embossments per segment and be manufactured from 316 stainless steel. Carbon steel anchors shall have an electroplated zinc finish in accordance with ASTM B633, Class SC1, Type I. Anchors shall have an evaluation report issued by ICC-ES and have been tested and qualified for performance in cracked and uncracked concrete in accordance with ACI 355.2 and ICC-ES AC193 for all mandatory tests and including the following:
 - a Seismic tension & shear in cracked concrete.

Unless otherwise noted, cracked concrete wedge anchors shall be "Strong-Bolt" Wedge Anchors by Simpson Strong-Tie (ICC-ES ESR-1771).

- 2. Wedge Anchors: Anchors shall meet the physical requirements of Federal Specification A-A-1923A, Type 4. Anchors shall be non-bottom bearing type with a single piece steel expansion clip providing 360-degree contact with the base material and shall not require oversized holes for installation. Carbon steel anchors shall have an electroplated zinc finish or shall be mechanically galvanized in accordance with ASTM B695, Class 55, Type 1, as appropriate. Stainless steel anchors shall be type 303, 304 or 316. Anchors shall have an evaluation report issued by ICC-ES and have been tested in accordance with ICC-ES AC01 for all mandatory tests and including the following:
 - a Seismic tension & shear
 - b Combination of tension and shear loads
 - c Critical and minimum edge distance

Unless otherwise noted, wedge anchors shall be "Wedge-All" Wedge Anchors by Simpson Strong-Tie (ICC-ES ESR-1396).

3. Sleeve Anchors: Anchors shall meet the physical requirements of Federal Specification A-A-1922A. Anchors shall be non-bottom bearing type with a single piece steel expansion sleeve providing 360-degree contact with the base material and shall not require oversized holes for installation. Carbon steel anchors shall have an electroplated zinc finish. Stainless steel anchors shall be type 304. Anchors shall have been tested in accordance with ICC-ES AC01 for the following:
 - a Static Loads
 - b Critical and minimum edge distance and spacing

Unless otherwise noted, sleeve anchors shall be "Sleeve-All" Sleeve Anchors by Simpson Strong-Tie.

4. Flush-Mount, Internally Threaded Shell Anchor: Anchors shall meet the physical requirements of Federal Specification A-A-55614, Type I. Anchors shall be bottom-bearing type with a slotted single piece steel shell and a tapered expander plug providing 360-degree contact with the base material. Carbon steel anchors shall have an electroplated zinc finish. Stainless steel anchors shall be type 303 or 316. Anchors shall have been tested in accordance with ICC-ES AC01 for all mandatory tests and including the following:
 - a Seismic tension and shear
 - b Combination of tension and shear loads
 - c Critical and minimum edge distance and spacing.

Unless otherwise noted, flush-mount, internally threaded shell anchors shall be "Drop-In" Anchors by Simpson Strong-Tie.

C. ADHESIVE ANCHORS

1. An adhesive anchors shall consist of i.) an insert, and ii.) an adhesive formula. Inserts shall meet the requirements of ASTM A307, A36, A193 Grade B7, or F1554 for threaded rods or ASTM A615 or A706 for rebar. For exterior exposure the threaded insert shall be stainless steel or zinc coated carbon steel. The zinc coating shall be either hot-dipped in accordance with ASTM A153 Class C or D; mechanically deposited in accordance with ASTM B695, Class 65, Type I; or demonstrated through tests to be equivalent to the coatings previously described. The adhesive formula shall be one of the following:
2. Cracked Concrete Epoxy Adhesives: Anchors used to transmit load [i. Between structural elements and/or ii.) From life safety-related attachments] shall be designed in accordance with ACI 318 Appendix D as amended by the specific design provisions of ICC-ES AC308. Adhesives shall be a cartridge type, two-component, high solids epoxy based system dispensed and mixed through a

static mixing nozzle supplied by the manufacturer. The adhesive shall meet the minimum requirements of ASTM C-881 Type I and IV, Grade 3, Class C. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation. Epoxy adhesives shall have an evaluation report issued by ICC-ES and have been tested and qualified for use in cracked and uncracked concrete in accordance with ICC-ES AC308 for all mandatory tests and including the following:

- a Seismic tension and shear in cracked concrete
 - b Static and cyclic cracks
 - c Horizontal and overhead installations
 - d Long term creep at elevated temperatures
 - e Damp holes
 - f Freeze-thaw conditions
 - g Critical and minimum edge distance and spacing.
3. Epoxy Adhesives: Adhesives shall be a cartridge type, two-component, solid epoxy based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. The adhesive shall meet the minimum requirements of ASTM C-881 Type I, II, IV and V, Grade 3, Class B and C. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation. Epoxy adhesives shall have an evaluation report issued by ICC-ES and shall have been tested in accordance with ICC-ES AC58 for all mandatory tests and including the following:
- a Seismic tension and shear
 - b Long term creep at elevated temperatures
 - c Static loading at elevated temperatures
 - d Damp and water-filled holes
 - e Freeze-thaw conditions
 - f Critical and minimum edge distance and spacing.
4. Acrylic Adhesives: Adhesive shall be a cartridge type, two-component, acrylic based system dispensed and mixed through a static mixing nozzle supplied by the manufacturer. The adhesive shall meet the minimum physical requirements of ASTM C-881 Type I and IV, Grade 3, Class A, B and C. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation. Acrylic adhesives shall have an evaluation report issued by ICC-ES and have been tested in accordance with ICC-ES AC58 for all mandatory tests and including the following:

- a Seismic tension and shear
 - b Long term creep at elevated temperatures
 - c Static loading at elevated temperatures
 - d Damp and water-filled holes
 - e Freeze-thaw conditions
 - f Critical and minimum edge distance and spacing
5. Encapsulated Adhesives: Capsule shall be a two-component, vinylester based adhesive capsule-within-a-capsule system supplied in manufacturer's standard packaging. The capsule is placed in the hole and the resin and initiator components are combined when the rod or rebar is driven to the bottom of the hole through the capsule. No spinning or insert end preparation shall be required for proper installation. Acceptable installation and performance temperature ranges shall be verified with manufacturer's literature prior to installation.
6. Adhesive Limitations:
- i. Installation Temperature: When the base material temperature drops below 40-degrees F (5-degrees C), only Acrylic or Encapsulated Adhesives shall be used for adhesive installations. See manufacturer's instructions for additional minimum temperature requirements.
 - ii. Hollow Substrates: The adhesive manufacturer's screen tubes shall be used for adhesive installations into hollow substrate material. Encapsulated Adhesives shall not be used in hollow substrate applications.
 - iii. Moisture: Encapsulated Adhesives shall not be used when moisture is present in or around hole.
 - iv. Oversized Holes: Refer to manufacturer's information if drilled hole size is larger than what is recommended.
 - v. Core-drilled holes: Refer to manufacturer's information if holes are drilled with a core-drill bit.

D. CONCRETE AND MASONRY SCREW ANCHORS

1. Cracked Concrete Screw Anchors: Anchors used to transmit load [i.) Between structural elements and ii) From life safety-related attachments] shall be designed in accordance with ACI 318 Appendix D as amended by the specific design provisions of ICC-ES AC193. Anchors shall be manufactured from carbon steel which is subsequently heat-treated. Anchors shall be zinc-plated in accordance with ASTM B633, Class SC1, Type I. Anchors shall have an evaluation report issued by ICC-ES and have been tested in accordance with ICC-ES AC193 for all mandatory and including the following:
 - i. Seismic tension and shear;

- ii. Reliability of screw anchors against brittle failure.
2. Masonry Screw Anchors: Anchors shall have 360-degree contact with the base material and shall not require oversized or undersized holes for installation. Anchors shall be manufactured from carbon steel which is subsequently heat-treated. Anchors shall be zinc-plated in accordance with ASTM B633 or mechanically galvanized in accordance with ASTM B695. Anchors shall have an evaluation report issued by ICC-ES and have been tested in accordance with ICC-ES AC106 for the following:
 - a Seismic tension and shear
 - b Static tension and shear loading
 - c Critical and Minimum edge distance and spacing
3. High strength, heat-treated anchors are recommended for permanent dry, interior non-corrosive applications or temporary outdoor applications.

E. POWDER ACTUATED FASTENERS

1. Fasteners shall be drive pin and threaded stud types, as applicable for each condition. Fasteners shall be manufactured from AISI 1060 to 1065 steel austempered to a Rockwell "C" Hardness of 51-56, and have a mechanically galvanized finish. Fasteners shall have a minimum bending yield strength of 90,000 psi. Fasteners shall have an evaluation report issued by ICC-ES and have been tested in accordance with ICC-ES AC70.

F. ANCHOR SIZES

1. The anchor size (nominal diameter and embedment depth) shall be as indicated on the drawings. If not indicated on the drawings, sizes shall be provided as required to maintain not less than the appropriate Code safety factors over manufacturer's performance load tables. If the actual concrete compressive strength is not known, the compressive strength shall be determined through testing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Where manufacturer recommends use of special tools for installation of anchors, such tools shall be used, unless otherwise permitted specifically by DC Water.
- B. Where holes are drilled in concrete or masonry, holes shall be accurately and squarely drilled, and the holes shall be cleaned in accordance with the manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

- C. Special Inspection, periodic or continuous, of post-installed anchors shall be provided as required by ICC-ES evaluation reports and/or as specified by DC Water. This

service shall be performed by personnel independent of the Manufacturer or Contractor so as to prevent a conflict of interest.

- D. DC Water may require pullout or shear tests, in addition to Special Inspection, to determine the adequacy of anchors. A field testing program shall be established by the independent test laboratory and/or Engineer of Record and performed in accordance with appropriate ASTM test standards. Field tests shall be non-destructive whenever possible.

PART 4 MEASURE AND PAYMENT

4.1 MEASURE

- A. Measurement of concrete anchors shall not be made.

4.2 PAYMENT

- A. The cost thereof shall be included in the lump sum of the project.

End of Section

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.
- D. Joint Placement Plans: Placement plans showing locations of Construction and Contraction/Control joints.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Material test reports, by Owner contracted vendor.
- C. Floor surface flatness and levelness measurements.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production.
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- D. 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.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Concrete Testing Service: Owner will engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

CONSULTANT FIRM INITIALS - PROJECT NUMBER

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.
- 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.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. 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.

2.3 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 II, white. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded.
 - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.4 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. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 FIBER REINFORCEMENT

- A. Synthetic Micro-Fiber: Monofilament or fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

CONSULTANT FIRM INITIALS - PROJECT NUMBER

2.6 WATERSTOPS

- A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
- B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch (10 by 19 mm).

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick.

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. (305 g/sq. m) when dry.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

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.

2.10 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.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use 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.

CONSULTANT FIRM INITIALS - PROJECT NUMBER

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- B. Foundation Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days (curbs 5000 psi at 28 days)
 2. Minimum Cementitious Materials Content: 520 lb/cu. yd.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: Do not allow air content
 5. Steel-Fiber Reinforcement: For use in slabs outside of building perimeter. Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd.
 6. Synthetic Fiber: For use in slabs outside of building perimeter. Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.
- D. Elevated slab on metal deck: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 3. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- E. Concrete Toppings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 3000 psi at 28 days.
 2. Minimum Cementitious Materials Content: 470 lb/cu. yd.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 6. Air Content: Do not allow air content of troweled finished toppings to exceed 3 percent.
 7. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd.
 8. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

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2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), 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. Chamfer exterior corners and edges of permanently exposed concrete, $\frac{3}{4}$ ".

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.

3.3 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 (150 mm) and seal with manufacturer's recommended tape.

3.4 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.

3.5 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.

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- 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. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide 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.
- E. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 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. 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. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

3.7 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.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

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- D. 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.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, 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 (6 mm) in one direction.
1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings and 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 restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- 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 indicated or 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 and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated or 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.

3.9 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 301 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 (1 kg/sq. m 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. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

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1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
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 (300 mm), 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.
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.

3.10 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.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- B. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. Yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. 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.
 3. 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.
 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete;

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- 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.
5. 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.
 6. 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.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. 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.
 11. 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.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device maybe permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

End of Section

SECTION 03 6000
NON-SHRINK GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish all labor and material required to perform the grouting required for the Work.

1.2 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. U. S. Grout Corporation.
 - 2. Master Builders.
 - 3. USM Corporation.
 - 4. W. R. Meadows.
 - 5. Sonneborn-Contech.
 - 6. Or approved manufacturer.
- B. Applicable Codes, Standards and Specifications:
 - 1. ASTM C109 – Compressive Strength of Hydraulic Cement Mortars.
 - 2. ASTM C191 – Time of Setting Hydraulic Cement by Vicat Needle
 - 3. ASTM C827 – Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
 - 4. USACE CRD C621 – Non-Shrink Grout.

1.3 SUBMITTALS

- A. Submit copies of recent independent laboratory test reports showing compliance with requirements described herein. Certification or affidavits will not be acceptable.
- B. Submit grout manufacturer's literature describing product and instructions for use.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Grout shall be delivered in moisture proof bags with the manufacturer's name, product name and general instructions for placement printed on the bag.

B. Product shall be stored on pallets and protected from damage.

PART 2 PRODUCTS

2.1 MATERIALS

A. All grout shall be non-metallic, non-shrink, non-gas forming, preblended and ready-for-use requiring only the addition of water.

1. Grout shall contain no metals nor rust or corrosion promoting agents, or gypsums.
2. The addition of set control agents or water reducers will not be allowed.
3. Grout shall conform to the following properties:

Property	Test Methods	Requirements
Shrinkage below	ASTM C827	0
Placement Volume		
Drying Shrinkage	CRD C621	0
Expansion	CRD C621	0.10% max.
Compressive Strength*		
24 hours	ASTM C190	3000 psi min.
7 days		6000 psi min.
Initial Set Time	ASTM C191	Min. 45 minutes
Pull-Out Strength	#5 bar grouted 6" deep in a 7/8" dia. hole in saturated surface dried concrete	10,000 lbs
*Flowable mix		

C. Water shall be clean and free from injurious chemicals and deleterious materials.

PART 3 EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Preparation:

1. All contact surfaces shall be prepared in accordance with manufacturer's recommendations.

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2. Grout contact surfaces shall be cleaned of all oil, grease, scale and other foreign matter.
3. Unsound concrete shall be removed leaving surface level but rough.
4. Concrete contact area shall be saturated with water 12-24 hours prior to grouting. Before placing grout, remove all excess or freestanding water.

B. Mixing:

1. Grout shall be mixed in strict accordance with the manufacturer's written instructions. Amount of water used should be a minimum quantity to provide the desired grout consistency.
2. Mix only that quantity of grout that can be placed within 30 minutes after mixing.

C. Grouting:

1. All work shall be done in strict accordance with the manufacturer's recommendations, including special procedures for hot and cold weather grouting.
2. Bring the manufacturer's representative to the job site for consultation regarding detailed use of the grout when directed by DCWater.
3. The grout shall be placed using the most practical method, completely filling the space to be grouted and shall be thoroughly compacted and free of air pockets.
4. Do not remove forms until after the grout has taken an initial set and will not slump. After removal, cut off excess grout and finish to a smooth surface.
5. Prevent rapid loss of water from the grout during first 48 hours with the use of an approved membrane-curing compound, or with the wetted burlap method.

PART 4 MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

- A. Grout will not be measured separately for payment.

4.2 PAYMENT

- A. The cost thereof shall be included as part of the lump sum of the project.

End of Section

SECTION 04 2000
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units (CMU's).
2. Decorative concrete masonry units.
3. Steel reinforcing bars.
4. Masonry cell insulation.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
2. Section 076200 "Sheet Metal Flashing and Trim" for furnishing manufactured reglets installed in masonry joints.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.3 ACTION SUBMITTALS

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

B. LEED Submittals:

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

C. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

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1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of product indicated. For masonry units include material test reports substantiating compliance with requirements.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 - 1. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

- A. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- B. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
 - 1. Build sample panels for each type of exposed unit masonry construction] [typical exterior wall in sizes approximately 60 inches (1500 mm) long by 48 inches (1200 mm) high by full thickness.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS**2.1 MASONRY UNITS, GENERAL**

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested,

or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

- B. Shapes: Provide shapes indicated and for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- C. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa).
 - 2. Density Classification: Medium weight unless otherwise indicated.
- D. Decorative CMUs: ASTM C 90.
 - 1. Products: Subject to compliance with requirements.
 - 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi (13.1 MPa).
 - 3. Density Classification: Normal weight.
 - 4. Pattern and Texture:
 - a. Standard pattern, split-face finish. Match Architect's samples.

2.3 MASONRY LINTELS

- A. General: Provide one of the following:
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout.

2.4 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Masonry Cement: ASTM C 91.
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
 - b. Cemex S.A.B. de C.V.; Brikset Type N.
 - c. Essroc, Italcementi Group; Brixment or Velvet.
 - d. Holcim (US) Inc.; Mortamix Masonry Cement.
 - e. Lafarge North America Inc.; Lafarge Masonry Cement.

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- f. Lehigh Cement Company; Lehigh Masonry Cement.
 - g. National Cement Company, Inc.; Coosa Masonry Cement.
 - h. Or approved manufacturer.
- F. Aggregate for Mortar: ASTM C 144.
- 1. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
- G. Aggregate for Grout: ASTM C 404.
- H. Epoxy Pointing Mortar: ASTM C 395, epoxy-resin-based material formulated for use as pointing mortar for structural-clay tile facing units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
- 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
 - d. Or approved manufacturer.
- J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent by same manufacturer.
- 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACM Chemistries; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
 - d. Or approved manufacturer.
- K. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
- 1. Interior Walls: Hot-dip galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: 0.187-inch (4.76-mm) diameter.
 - 4. Wire Size for Cross Rods: 0.187-inch (4.76-mm) diameter.
 - 5. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.

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7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches (100 mm) wide, plus 2 side rods at each wythe of masonry 4 inches (100 mm) wide or less.
 2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face.
 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm). Size ties to extend at least halfway through facing wythe but with at least 5/8-inch (16-mm) cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. 316 Stainless Steel, Plate and Bent-Bar Anchors: ASTM A 480 and ASTM A 666
 2. 316 Stainless Steel, Sheet Metal Anchors and Ties: ASTM A 480 and ASTM A 240.
 3. 316 Stainless Steel, Wire Ties and Anchors: ASTM A 580.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
1. Wire: Fabricate from 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.
- E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

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1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.060-inch- (1.52-mm-) thick, steel sheet, galvanized after fabrication
 2. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.060-inch- (1.52-mm-) thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch (25 mm) of masonry face.
- F. Partition Top anchors: 0.105-inch- (2.66-mm-) thick metal plate with 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- H. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch- (1.90-mm-) thick steel sheet, galvanized after fabrication.
 3. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire.
 4. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors:
- I. Anchor Bolts: Headedsteel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.7 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with 076200 "Sheet Metal Flashing and Trim" and as follows:
1. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed.
 2. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
 3. Metal Expansion-Joint Strips: Fabricate from copper to shapes indicated.

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- B. Flexible Flashing: Use one of the following unless otherwise indicated:
1. Copper-Laminated Flashing: 7-oz./sq. ft. (2-kg/sq. m) copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; Copper Fabric Flashing.
 - 2) Dayton Superior Corporation, Dur-O-Wal Division; Copper Fabric Thru-Wall Flashing.
 - 3) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 4) Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - 5) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 6) York Manufacturing, Inc.; Multi-Flash 500.
 - 7) Or approved manufacturer.
 2. Elastomeric Thermoplastic Flashing: Composite flashing product consisting of a polyester-reinforced ethylene interpolymer alloy.
 - a. Products: Subject to compliance with requirements provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) DuPont; Thru-Wall Flashing.
 - 2) Hohmann & Barnard, Inc.; Flex-Flash.
 - 3) Hyload, Inc.; Hyload Cloaked Flashing System.
 - 4) Mortar Net USA, Ltd.; Total Flash.
 - 5) Or approved manufacturer.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from urethane .
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use one of the following unless otherwise indicated:
 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected from manufacturer's standard.

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- a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Advanced Building Products Inc.; Mortar Maze weep vent.
 - 2) Blok-Lok Limited; Cell-Vent.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
 - 4) Heckmann Building Products Inc.; No. 85 Cell Vent.
 - 5) Hohmann & Barnard, Inc.; Quadro-Vent.
 - 6) Wire-Bond; Cell Vent.
 - 7) Or approved manufacturer.
 2. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.
 - a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
 - 2) Or approved manufacturer.
 3. Vinyl Weep Hole/Vent: T-shaped units made from flexible PVC, consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in color selected by Architect.
 - a. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hohmann & Barnard, Inc.; #343 Louvered Weep Hole.
 - 2) Williams Products, Inc.; Williams-Goodco Brick Vent.
 - 3) Wire-Bond; Louvered Weepholes.
 - 4) Or approved manufacturer.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Advanced Building Products Inc.; Mortar Break.
 - b. Archovations, Inc.; CavClear Masonry Mat.
 - c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
 - d. Mortar Net USA, Ltd.; Mortar Net.
 - e. Or approved manufacturer.
 2. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches (250 mm) high, with dovetail shaped notches 7 inches (175 mm) deep.
 - b. Strips, not less than 1-1/2 inches (38 mm) thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
 - c. Sheets or strips full depth of cavity and installed to full height of cavity.

2.9 MASONRY-CELL INSULATION

- A. Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).
- B. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Concrete Block Insulating Systems; Korfil.
 - b. Shelter Enterprises Inc.; Omni Core.
 - c. Or approved manufacturer.

2.10 CAVITY-WALL INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C 1289, Type I (aluminum-foil-faced), Class 2 (glass-fiber-reinforced).
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.11 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.
 - d. Or approved manufacturer.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime or masonry cement mortar.

4. For reinforced masonry, use portland cement-lime or masonry cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry below grade or in contact with earth, use Type S.
 2. For reinforced masonry, use Type S.
 3. For mortar parge coats, use Type S.
 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 5. For interior non-load-bearing partitions, use Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.
- E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
1. Application: Use epoxy pointing mortar for exposed mortar joints with the following units:
 - a. Pre-faced CMUs.
 - b. Glazed structural-clay facing tile.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2 inch (12 mm) maximum.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
 - 2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
 - 3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. (0.25 sq. m) of wall area spaced not to exceed 24 inches (610 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 36 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.
 - 2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.

- b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- C. Parge cavity face of backup wythe in a single coat approximately 3/8 inch (10 mm) thick. Trowel face of parge coat smooth.
- D. Coat cavity face of backup wythe to comply with Section 071113 "Bituminous Dampproofing."
- E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).
- 1. Space reinforcement not more than 16 inches (406 mm) o.c.
 - 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
- 1. Provide an open space not less than 1/2 inch (13 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.

2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
1. Fasten anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 2. Embed connector sections and continuous wire in masonry joints. Provide not less than 2 inches (50 mm) of air space between back of masonry veneer and face of sheathing.
 3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 4. Space anchors as indicated, but not more than 16 inches (406 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally with not less than 1 anchor for each 3.5 sq. ft. (0.33 sq. m) 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 36 inches (914 mm), around perimeter.

3.9 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
 3. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 4. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
- B. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep/vent products or open head joints to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

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- C. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

3.10 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches (1520 mm) 12.67 ft. (3.86 m).

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

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- F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.12 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch (19 mm).
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - 2. Protect surfaces from contact with cleaner.
 - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.14 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

End of Section

SECTION 05 1200
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes structural steel and grout.

1.2 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 - 1. Select and complete connections using schematic details indicated and AISC 360.
 - 2. Use LRFD; data are given at factored-load level.
- B. Moment Connections: Type FR, fully restrained.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels, Angles, M, S-Shapes: ASTM A 572/A 572M, Grade 50 (345).
- D. Plate and Bar: ASTM A 36/A 36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
- G. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
- B. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- C. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- D. Threaded Rods: ASTM A 36/A 36M.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.3 PRIMER

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

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- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

End of Section

SECTION 05 2100
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. Joist accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Manufacturer certificates.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

2.3 PRIMERS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.4 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated.
- C. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
 - 1. Finish: Plain.
- D. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories.
- B. Apply one coat of shop primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.

End of Section

SECTION 05 3100
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Composite floor deck.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

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- C. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.; Vulcraft Group.
11. Roof Deck, Inc.
12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
13. Verco Manufacturing Co.
14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
15. Or approved manufacturer.

- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 40 (275) minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.
 - a. Color: Manufacturer's standard Gray.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.

2.3 COMPOSITE FLOOR DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.; Metal Dek Group.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.

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10. Nucor Corp.; Vulcraft Group.
 11. Roof Deck, Inc.
 12. Verco Manufacturing Co.
 13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
 14. Or approved manufacturer.
- B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 40 (275) minimum, with top surface phosphatized and unpainted and underside surface shop primed with manufacturers' standard gray baked-on, rust-inhibitive primer.
 2. Profile Depth: As indicated.
 3. Design Uncoated-Steel Thickness: As indicated.

2.4 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 (4.8-mm) minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), not less than 0.0359-inch (0.91-mm) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
- G. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

CONSULTANT FIRM INITIALS - PROJECT NUMBER

- B. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- C. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- D. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- E. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- F. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- G. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.
- H. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld or mechanically fasten flanges to top of deck. Space welds or mechanical fasteners not more than 12 inches (305 mm) apart with at least one weld or fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.
- I. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- J. Pour Stops and Girder Fillers: Weld steel-sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
- K. Floor-Deck Closures: Weld steel-sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.2 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.

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- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.3 PROTECTION

- A. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

End of Section

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Load-bearing wall framing.
 - 2. Exterior non-load-bearing wall framing.

1.2 ACTION SUBMITTALS

- A. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product test reports.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- B. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AllSteel & Gypsum Products, Inc.
 - 2. California Expanded Metal Products Company.
 - 3. ClarkWestern Building Systems, Inc.
 - 4. Consolidated Fabricators Corp.; Building Products Division.
 - 5. Craco Mfg., Inc.
 - 6. Custom Stud Inc.
 - 7. Design Shapes in Steel.

8. Dietrich Metal Framing; a Worthington Industries company.
9. Formetal Co. Inc. (The).
10. MarinoWARE.
11. MBA Building Supplies, Inc.
12. Nuconsteel; a Nucor Company.
13. Olmar Supply, Inc.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. State Building Products, Inc.
18. Steel Construction Systems.
19. Steel Network, Inc. (The).
20. Steel Structural Systems.
21. Steeler, Inc.
22. Super Stud Building Products, Inc.
23. Telling Industries, LLC.
24. United Metal Products, Inc.
25. United Steel Manufacturing.
26. Or approved manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).
- C. Steel Sheet for Vertical Deflection and Drift Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60 (Z180).

2.4 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0966 inch (2.45 mm).

2. Flange Width: 2-1/2 inches (63 mm) or as required by structural performance.
 3. Section Properties: As required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and matching minimum base-metal thickness of steel studs.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0966 inch (2.45 mm).
 2. Flange Width: 2-1/2 inches (63 mm) or as required by structural performance.
 3. Section Properties: As required by structural performance.

2.5 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0966 inch (2.45 mm).
 2. Flange Width: 2-1/2 inches (63 mm) as required by structural performance.
 3. Section Properties: As required by structural performance.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AllSteel & Gypsum Products, Inc.
 - b. ClarkWestern Building Systems, Inc.
 - c. Dietrich Metal Framing; a Worthington Industries company.
 - d. MarinoWARE.
 - e. SCAFCO Corporation.
 - f. Steel Network, Inc. (The).
 - g. Steeler, Inc.
 - h. Or approved manufacturer.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.

- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
- F. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying

with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.

- C. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:
 - 1. Anchor Spacing: As required by structural performance and as shown on Shop Drawings.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches (406 mm) maximum or as required by structural performance.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically 48 inches (1220 mm) maximum or as indicated on Shop Drawings. Fasten at each stud intersection.
 - 1. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches (406 mm) maximum or as required by structural performance.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
 - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
 - 3. Connect vertical deflection clips to bypassing infill studs and anchor to building structure.
 - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination

of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

a. Install solid blocking at centers indicated on Shop Drawings.

2. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

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

End of Section

SECTION 05 5000
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous steel framing and supports.
 - 2. Shelf angles.
 - 3. Metal ladders.
 - 4. Miscellaneous steel trim.
 - 5. Pipe Downspout guards.
 - 6. Abrasive metal thresholds.
 - 7. Loose bearing and leveling plates.
 - 8. Metal Bollards

- B. Products furnished, but not installed, under this Section:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

- B. Structural Performance of Aluminum Ladders: Aluminum ladders, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.3 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
 - 2. Grout.

- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.2 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

2.3 NONFERROUS METALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- B. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.4 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
- B. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

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- D. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.5 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.

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- E. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 24 inches (600 mm) o.c.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches (600 mm) o.c.
- D. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.8 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.9 METAL LADDERS

- A. General:
 - 1. Comply with ANSI A14.3 unless otherwise indicated.
 - 2. For elevator pit ladders, comply with ASME A17.1.
- B. Aluminum Ladders:

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACL Industries, Inc.
 - b. Alco-Lite Industrial Products.
 - c. Halliday Products.
 - d. O'Keeffe's Inc.
 - e. Precision Ladders, LLC.
 - f. Royalite Manufacturing, Inc.
 - g. Thompson Fabricating, LLC.
 - h. Or approved manufacturer.
2. Space siderails 18 inches (457 mm)] apart unless otherwise indicated.
3. Siderails: Continuous extruded-aluminum channels or tubes, not less than 2-1/2 inches (64 mm) deep, 3/4 inch (19 mm) wide, and 1/8 inch (3.2 mm) thick.
4. Rungs: Extruded-aluminum tubes, not less than 3/4 inch (19 mm) deep and not less than 1/8 inch (3.2 mm) thick, with ribbed tread surfaces.

2.10 PIPE DOWNSPOUT GUARDS

- A. Fabricate pipe downspout guards from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch (50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchor bolts
- B. Prime pipe downspout guards with zinc-rich primer.

2.11 ABRASIVE METAL THRESHOLDS

- A. Extruded Units: Aluminum with abrasive filler in an epoxy-resin binder.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ACL Industries, Inc.
 - b. American Safety Tread Co., Inc.
 - c. Amstep Products.
 - d. Armstrong Products, Inc.
 - e. Balco Inc.
 - f. Granite State Casting Co.
 - g. Wooster Products Inc.
 - h. Or approved manufacturer.
 2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
 3. Provide solid-abrasive-type units without ribs.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

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- C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c.
- D. Apply clear lacquer to concealed surfaces of extruded units.

2.12 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.13 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Galvanize loose steel lintels located in exterior walls.

2.14 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.16 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Or SSPC-SP 3, "Power Tool Cleaning." Requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

2.17 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- (6.4-mm-) thick steel plate.
- B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.
- C. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve.
- D. Prime bollards with zinc-rich primer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
- C. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 INSTALLING METAL BOLLARDS

- A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
- B. Anchor bollards to existing construction with anchor bolts. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.
- C. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- D. Fill bollards solidly with concrete, mounding top surface to shed water.

End of Section