PERSIGO WASTE WATER TREATMENT PLANT
Flow Equalization Basin Rebuild
Project Specific Specifications

2145 River Road
Grand Junction, Colorado 81505

April 7, 2021
WJE No. 2019.3776

Prepared for:
City of Grand Junction
Public Works
333 West Avenue, Bldg C
Grand Junction, Colorado 81501

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SECTION 00 01 10

TABLE OF CONTENTS

END OF SECTION

INSTALLER'S WARRANTY FOR CONCRETE AND CONCRETE REBUILD

Installer: _____

Address: _____

Owner: _____

Owner Address: _____

Project Address: _____

Building Name: _____

Area of Work: _____

Substantial Completion Date: _____

Warranty Period: ___ years

Expiration Date: _____

AND WHEREAS Concrete Installer has contracted, either directly with Owner or indirectly as subcontractor, to warrant said Work against faulty or defective materials and workmanship for designated Warranty Period,

NOW THEREFORE Concrete Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period it will, at its own cost and expense, make or cause to be made such repairs to or replacement of said Work as are necessary to correct faulty and defective Work and warrants against the following.

1. Components of the concrete that does not comply with requirements; that do not maintain general durability; or that deteriorate in a manner not clearly specified as an inherent quality of the material for the application indicated, regardless of whether the Work was previously accepted by Owner.

2. Delamination of the cementitious material from the substrate concrete or delamination within the material itself.

3. Surface defects, including but not limited to: blisters; curling; delamination; dusting; popouts; scaling (including mortar flaking); spalling.

4. Cracking. Including, but not limited to, those due to inadequate thickness or improperly cut or placed control joints.

5. Damage by exposure to foreseeable weather.

Warranty is made subject to the following terms and conditions:

1. Specifically excluded from Warranty are damages to Work and other parts of the building, and to building contents, caused by:
   a. lightning;
   b. fire;
   c. activity adjacent to Work by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner's Representative.

2. When Work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Concrete Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Concrete Installer is responsible for damage to Work covered by Warranty but is not liable for consequential damages to building, pedestrians or vehicles using the Work.
4. During Warranty Period, if Owner allows alteration of Work by anyone other than Concrete Installer, including cutting, patching, and maintenance, Warranty shall become null and void on date of said alterations, but only to extent said alterations affect Work covered by Warranty. If Owner engages Concrete Installer to perform said alterations, Warranty shall not become null and void unless Concrete Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate Work, thereby reasonably justifying limitation or termination of Warranty.
5. Owner will promptly notify Concrete Installer of observed, known, defects, or deterioration and will afford reasonable opportunity for Concrete Installer to inspect Work and to examine evidence of such defects, or deterioration. Concrete Installer shall inspect defect, or deterioration within 72 hours of notification.
6. If permanent repair or replacement of warranted condition cannot be made immediately, due to weather conditions, availability of appropriate labor or materials, building occupancy, etc., Concrete Installer must make, or cause to be made, immediate temporary repairs to prevent any further damage, deterioration, or unsafe conditions. Permanent repair or replacement of warranted condition shall be scheduled as soon thereafter as practical, and with Owner's consent and approval.
7. If Owner notifies Concrete Installer of warranted condition that requires immediate attention to prevent potential injury or damage, and Concrete Installer cannot or does not promptly inspect and repair same, either permanently or temporarily, then Owner may make, or cause to be made, such temporary repairs as may be essential and Concrete Installer will reimburse Owner for cost of such repairs. Such action will not relieve Concrete Installer of its obligation to perform any necessary permanent repairs, and Warranty shall remain in full force and effect for remaining portion of its original term.
9. Concrete Installer shall provide equipment, labor, and material required to remedy warranted conditions, including repair or replacement of damage to other work resulting therefrom, and removal and replacement of other work required to access warranted condition. Additional required work will be at Concrete Installer’s sole expense for full term of Warranty. Warranty includes removal and replacement of concrete and sealants.
10. Warranty is recognized to be only Warranty of Concrete Installer on said Work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of Concrete failure. Specifically, Warranty shall not operate to relieve Concrete Installer of responsibility for performance of original Work according to requirements of Contract Documents, regardless of whether Contract was directly with Owner or with Owner’s General Contractor.

IN WITNESS THEREOF, and intending to be legally bound hereby, Concrete Installer has caused this document to be executed by undersigned, duly-authorized officer.

By: _____ Corporate Seal:
(Signature of Concrete Installer)

_____
(Name)

_____
(Date)

Notary Public Seal:

Subscribed and sworn before me this _____day of _____, _____

My commission expires _____

INSTALLER'S WARRANTY FOR JOINT SEALANT

Sealant Installer: _____

Sealant Installer Address: _____

Owner: _____

Owner Address: _____

Project Address: _____

Building Name: _____

Area of Work: _____

Substantial Completion Date: _____

Warranty Period: _____years

Expiration Date: _____

AND WHEREAS Sealant Installer has contracted, either directly with Owner or indirectly as subcontractor, to warrant said Work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

NOW THEREFORE Sealant Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period it will, at its own cost and expense, make or cause to be made such repairs to or replacement of said Work as are necessary to correct faulty and defective Work and as are necessary to maintain said Work in watertight condition, and warrants against the following.

1. Components of sealant system that do not comply with requirements; that do not remain watertight; that fail in adhesion, cohesion, or general durability; or that deteriorate in a manner not clearly specified by submitted sealant manufacturer's data as an inherent quality of the material for the application indicated, regardless of whether the Work was previously accepted by Owner.
2. Damage by exposure to foreseeable weather; and damage by intrusion of foreseeable wind-borne moisture.

Warranty is made subject to the following terms and conditions:

1. Specifically excluded from Warranty are damages to Work and other parts of the building, and to building contents, caused by:
    a. lightning;
    b. fire;
    c. failure of sealant substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    d. activity adjacent to sealant Work by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner's Representative.
    e. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
    f. Excessive joint movement caused by structural settlement or errors attributable to design or construction, resulting in stresses in sealant exceeding sealant manufacturer's written specifications for sealant elongation or compression.

2. When Work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Sealant Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Sealant Installer is responsible for damage to Work covered by Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of Work.
4. During Warranty Period, if Owner allows alteration of Work by anyone other than Sealant Installer, including cutting, patching, and maintenance, Warranty shall become null and void on date of said alterations, but only to extent said alterations affect Work covered by Warranty. If Owner engages Sealant Installer to perform said alterations, Warranty shall not become null and void unless Sealant Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate Work, thereby reasonably justifying limitation or termination of Warranty.
5. Owner will promptly notify Sealant Installer of observed, known, or suspected leaks, defects, or deterioration and will afford reasonable opportunity for Sealant Installer to inspect Work and to examine evidence of such leaks, defects, or deterioration. Sealant Installer shall inspect leak, defect, or deterioration within 24 hours of notification.
6. If permanent repair or replacement of warranted condition cannot be made immediately, due to weather conditions, availability of appropriate labor or materials, building occupancy, etc., Sealant Installer must make, or cause to be made, immediate temporary repairs to prevent any further damage, deterioration, or unsafe conditions. Permanent repair or replacement of warranted condition shall be scheduled as soon thereafter as practical, and with Owner's consent and approval.
7. If Owner notifies Sealant Installer of warranted condition that requires immediate attention to prevent potential injury or damage, and Sealant Installer cannot or does not promptly inspect and repair same, either permanently or temporarily, then Owner may make, or cause to be made, such temporary repairs as may be essential and Sealant Installer will reimburse Owner for cost of such repairs. Such action will not relieve Sealant Installer of its obligation to perform any necessary permanent repairs, and Warranty shall remain in full force and effect for remaining portion of its original term.
9. Sealant Installer shall provide equipment, labor, and material required to remedy warranted conditions, including repair or replacement of damage to other work resulting therefrom, and removal and replacement of other work required to access warranted condition. Additional required work will be at Sealant Installer’s sole expense for full term of Warranty. Warranty includes removal and replacement of sealant-backer material and sealant.
10. Warranty is recognized to be only Warranty of Sealant Installer on said Work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of sealant failure. Specifically, Warranty shall not operate to relieve Sealant Installer of responsibility for performance of original Work according to requirements of Contract Documents, regardless of whether Contract was directly with Owner or with Owner’s General Contractor.

IN WITNESS THEREOF, and intending to be legally bound hereby, Sealant Installer has caused this document to be executed by undersigned, duly-authorized officer.

By: _____ Corporate Seal:
(Signature of Sealant Installer)

_____
(Name)

_____
(Date)

Notary Public Seal:

Subscribed and sworn before me this _____day of _____, _____

My commission expires _____

SECTION 01 00 00

GENERAL

PART 1 GENERAL

1.1 PROJECT SPECIFIC REQUIREMENTS

A. The Standard Specifications for Road and Bridge Construction, as well as the Standard Specifications for Construction of Underground Utilities Water Lines, Sanitary Sewers, Storm Drains, Underdrains and Irrigation Systems do not apply to this project. Any references to those documents in the contract shall be replaced by the requirements of the project specific documents.

B. Standard Details for Construction of Streets, Trails, Storm Drains and Utilities do not apply to this project. Any references to those documents in the contract shall be replaced by the requirements of the project specific documents.

C. Project specific requirements shall take precedence over general conditions or standard documents.

D. Warranty period for specific Work items are not intended to supplement the general Contractor's Warranty and Guarantee.

1.2 DEFINITIONS

A. The definitions here shall supplement, or replace, those found in the City of Grand Junction General Contract Conditions.
   1. As-Built Documents: See Project Record Documents.
   2. Owner: See City.
   3. Project Record Documents: Contract documents marked by the Contractor to identify changes that were made during construction.
   4. Request for Information (also known as RFI): A question or inquiry about the Work submitted by the Contractor for clarification by the Owner or Engineer.

1.3 REFERENCES

A. References to industry standards shall refer to the latest edition or version of each as of the date of the first specification publish date, unless otherwise noted.

1.4 ADMINISTRATIVE

A. Requests for Information (RFI): Contractor shall submit RFIs to the Engineer for any condition which is believed to be at variance with the Contract Documents, or for situations where it is unclear what the Contract Documents are implementing. RFIs shall be submitted in writing to the Engineer and shall include a location, date requested, date required and indicate which repair item or item(s) are impacted by the request. Allow a minimum of 3 working days for review by Engineer.

B. Maintain at least one copy of each referenced standard, this Project Manual (Specifications), Drawings and/or Figures at the job site. In addition, maintain copies of all site visit reports (SVR) and Sketches (SKs) issued by the Engineer during Construction.

C. Provide a project superintendent at the Site a minimum of eight hours per day during the progress of the Work. The superintendent shall be literate and fluent in English.

D. Photograph existing conditions that are important to the construction or that deviate substantially from the Contract Documents; significant conditions that will be concealed by the Work; finish surfaces that might be misconstrued as damage caused by removal or other Work operations; and immediate follow-up when on-site events result in construction damage or loss. Photographs shall be of sufficient quality as to depict the condition being photographed. Provide photographs to Owner or Engineer upon request, either during project or after completion.

1.5 TEMPORARY FACILITIES AND CONTROLS

A. Contractor to furnish and pay for all temporary facilities and controls listed below which are not explicitly designated as responsibility of Owner.

B. Comply with Owner's limitations and restrictions for Site use and accessibility.
   1. Comply with all security procedures.

C. Project has special requirements for coordinating Work because of the following conditions:
   1. Owner will occupy premises outside of Work area during construction period.
      a. Cooperate with Owner to minimize conflicts and facilitate Owner usage.
      b. Perform Work to avoid interference with Owner's day-to-day operations. Notify Owner's Representative at least 72 hours in advance of activities that will affect Owner's operations.
      c. Maintain vehicular, pedestrian, and emergency and normal access to portions of facility that are in use. Keep entrances and exits clear of stored materials and construction equipment.
      d. Short interruptions in access may be permitted if approved in advance in writing by the Owner's Representative.
      e. Schedule deliveries to minimize interruptions.
      f. Do not disturb Site outside of Work area.
      g. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted and then only after arranging to provide temporary utility services according to requirements indicated.
      h. Notify Owner not less than 7 days in advance of proposed utility interruptions.
      i. Do not proceed with utility interruptions without Owner's written permission.

D. Staging:
   1. Staging areas must be coordinated with Owner prior to mobilization.
   2. Confine materials and equipment to the staging and work areas. Contractor assumes full responsibility for the protection and safekeeping of items stored on site.
   3. Do not unreasonably encumber Site with materials or equipment.
   4. Do not load Project structure with weight that will endanger Project structure.

E. Parking: Construction personnel shall park on-site in areas designated by the Owner's Representative.

F. Water Service: Use of Owner's existing water service will be permitted.
   1. Provide connections and extensions of service as required for construction operations.
   2. Provide additional water as necessary.

G. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel at location designated by Owner's Representative.
   1. Provide disposable supplies, including toilet tissue, paper towels, and paper cups. Maintain adequate supply. Provide covered waste containers for disposal of used material.
   2. Service toilets at least twice weekly.
   3. Provide wash facilities supplied with potable water at convenient locations for personnel who handle materials that require clean up. Supply cleaning compounds appropriate for each type of material handled. Dispose of drainage properly.
      a. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
   4. Comply with public authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

H. Electric Power Service: Use of Owner's existing electric 120V electric outlets will be permitted. Any power requirements above existing 120V outlets will need to be provided.
   1. As necessary, provide additional electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Do not overload Owner's service.
   2. Comply with NECA 200 and NFPA 70.
   3. Maintain temporary service in safe condition and utilize in safe manner.

I. Use of Existing Stairs: Use of Owner's existing stairs will be permitted, as long as stairs and elevators are cleaned and maintained in condition acceptable to Owner's Representative.
   1. Coordinate daily usage with Owner's Representative and with requirements for facility operations.
   2. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs, elevator cars, and entrance doors and frame, and to maintain means of egress.
   3. At Substantial Completion, restore stairs and elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

J. Lighting: Owner will provide existing lighting at existing locations.
   1. Provide additional lighting, as necessary, with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   2. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

K. Provide insulation or temporary heating as necessary for curing, drying, and protection of installed construction.
   1. Select equipment that will not have harmful effect on completed installations or elements being installed.
   2. Maintain temporary heating on 24-hour basis until no longer needed.
   3. Unless noted otherwise, insulation is considered incidental to construction and will not be paid for separately.
   4. Unless otherwise specified, temporary heating will not be considered part of Work and will be paid as additional Work item. Notify Owner's Representative in advance of need for temporary heating and estimated added cost. Do not proceed with temporary heating until authorized in writing by Owner's Representative.

L. Snow removal: The contractor shall be required to remove snow from the work area.

M. Equipment:

1. Direct equipment exhaust away from occupied spaces and vent equipment operating within structure to outside.
2. Operate equipment at noise levels conforming to requirements of city, state, and federal laws and codes, and Owner limitations.

N. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of public authorities having jurisdiction. Construction debris shall be removed in a manner that avoids overloading adjacent structural members.

O. Protection:
1. Limit access to work areas.
2. Contractor shall provide protective barriers, fences, etc. to ensure the safety of pedestrians and vehicular traffic during the Work. All barriers and fences shall comply with local, state, and federal regulations and laws.
3. Provide adequate signage to direct pedestrian and vehicular traffic around the area under construction.
4. Prevent construction debris and other materials from coming into contact with pedestrians, motor vehicles, building, and other surfaces that could be harmed by such contact.
5. Existing Drains:
   a. Verify that drains in or near Work area are open and free flowing prior to start of Work.
   b. Lawfully remove construction effluent from Site. Do not allow construction debris to flow into existing drains or sewer systems.
   c. Rout or replace clogged drain lines at completion of Work.
6. Confine dust, debris and fumes to Work area and prevent from entering areas outside of the Work area.
7. Protect finished surfaces against damage.
8. Contractor shall be responsible for maintaining the water tightness of the areas of the structure being worked on during the course of the work. Providing temporary protection of the existing construction or structure from the weather until removed portions are completely replaced with new construction. The costs of damage and repairs shall be made at no cost to the Owner.
9. Maintain all protection in operable condition for the full duration of the project.

P. Temporary Fencing:
1. Tree and Plant Protection: Install temporary fencing located as indicated or outside drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
2. Site Enclosure Fence: Before construction operations begin, provide Site enclosure fence in manner that will prevent people and animals from easily entering Site except by entrance gates.

Q. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241. Coordinate with Owner's safety team.
1. Provide portable, UL-rated fire extinguishers with class and extinguishing agent as required by locations and classes of fire exposures.
2. Prohibit smoking on Site.
3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of public authorities having jurisdiction.

4. Store combustible materials in approved safety containers and enclosures, away from building if possible.
5. Develop and supervise overall fire-prevention and -protection program for personnel at Site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

PART 2 PRODUCTS

2.1 GENERAL

A. The products specified are believed to have properties adequate for successful completion of the Work. If the Contractor has found these products to be unacceptable or has had difficulty using these materials, the Contractor shall notify the Engineer in writing, and provide a request for substitution of material for which the Contractor has had successful experience.

B. No product substitutions will be allowed unless otherwise noted. Engineer's approval must be obtained for all substitutions prior to being awarded the project. Submit requested substitutions with bid form.

2.2 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in original containers and packaging with seals unbroken, labeled with manufacturer’s name, product brand name and type, date of manufacture, lot number, directions for storing, and complete manufacturer’s written instructions.

B. Keep materials dry and do not allow materials to be exposed to moisture during transportation, storage, handling, or installation. Reject and remove from Site new materials which have been exposed to moisture to their detriment.

C. Store and handle materials in accordance with manufacturer’s written instructions, safety requirements, and all applicable laws and regulations. Remove from Site, and replace at no cost to Owner, any materials that are damaged or otherwise negatively affected by not being stored or handled in accordance with manufacturer’s written instructions.

D. Store materials in original, undamaged containers and packaging in clean, dry, location on raised platforms and protected from weather, within temperature range required by manufacturer. Protect stored materials from direct sunlight and sources of ignition. Manufacturer’s standard packaging and covering alone is not considered adequate weather protection.

E. Locate materials in a secure location approved by Owner’s Representative.

F. Conspicuously mark damaged or opened containers, containers with contaminated materials, damaged materials, and materials that cannot be used within stated shelf life and remove from Site as soon as possible. Replace discarded materials in a timely manner at no cost to Owner.

G. Limit stored materials on structures so as to preclude damage to materials and structures.

H. Maintain copies of all applicable Safety Data Sheets (SDS) with materials in storage area, such that they are available for ready reference on Site.

PART 3 EXECUTION

3.1 DISCOVERY, FIELD VERIFICATION AND CHANGES IN WORK

A. Contractor shall verify all quantities. Quantities shown are for estimating purposes only.

B. Do not scale drawings. The Contractor shall field verify the existing dimensions and existing conditions prior to starting the work. Dimensions of the new construction shall be adjusted as necessary to fit the existing conditions. The Engineer shall be notified in writing of any significant deviations from the dimensions or conditions shown on these drawings.

C. During rehabilitation work, existing conditions may be encountered which are not known or are at variance with the Contract Documents. Such conditions may interfere with the Work and may consist of damage or deterioration of the substrate or surrounding materials or mislocation of embedded elements such as reinforcing steel, which may interfere with proper execution of the Work. Promptly report to Engineer as a request for information any of these conditions.

3.2 EXAMINATION FOR MATERIAL COMPLIANCE

A. Examine substrates and conditions with installer and manufacturer's representative, where appropriate, for compliance with requirements and for other conditions affecting installation or performance of the material.
   1. Verify dimensions so that proper installation of material for optimal performance is maintained.
   2. Ensure that work done by other trades is complete.
   3. Verify that areas and conditions under which Work is to be performed permit proper and timely completion of Work.
   4. Notify Engineer in writing of conditions which may adversely affect installation or performance of the material and recommend corrections.
   5. Do not proceed with Work until adverse conditions have been corrected and reviewed by Engineer.
   6. Commencing Work constitutes acceptance of Work surfaces and conditions.

3.3 CLEANING

A. Immediately clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

B. At the end of each workday, broom-clean Site and Work areas and place all items to be discarded in appropriate containers.

C. After completing Work:
   1. Clean all materials resulting from Work that are not intended to be part of the finished Work using appropriate cleaning agents and procedures. Exercise care to avoid damaging surfaces.
   2. Repair at no cost to Owner all items damaged during the Work.
   3. Remove and legally dispose of debris and surplus materials from Site.

3.4 PROTECTION

A. Take precautions to ensure safety of people (including building users, passers-by, and workers) and protection of property (including adjacent building elements, landscaping, and motor vehicles).
   1. Erect temporary protective canopies and walls, as necessary, at walkways and at points of pedestrian and vehicular access that must remain in service during Work.

B. Cover adjacent surfaces with materials that may be damaged.

C. Protect paving and adjacent areas from mechanical damage due to construction equipment.

D. Prevent dust, debris, coating overspray/spatter, and other construction materials from coming into contact with surfaces that could be harmed by such contact.

E. Limit access to Work areas.

F. Comply with manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products.

G. Assume responsibility for injury to persons or damage to property due to Work, and remedy at no cost to Owner.

H. Protect from damage, all elements of completed work and original construction to remain.

I. Protect Work during and after completion from contact with contaminating substances and from damage, so materials are without deterioration or damage at time of Substantial Completion.

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Contractor's bids shall be based on providing products or methods exactly as specified.

B. For products or methods specified only by reference or performance standards, select a product that meets or exceeds standards according to manufacturer's information. Product selection will be subject to Engineer's approval.

C. For products or methods specified by naming several products or manufacturers, select product and manufacturer named.

D. Where the phrase "or equal" occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically approved for this Work by Engineer. The decision of Engineer shall be final.

1.2 SUBSTITUTIONS, CONTRACTOR OPTIONS

A. No substitutions will be considered after Notice of Award except under one or more of the following conditions:
   1. Substitutions for compliance with final interpretations of code requirements or insurance regulations.
   2. Unavailability of specified products or methods, through no fault of Contractor.
   3. Subsequent information discloses inability of specified products or methods to perform properly or to fit in designated space.
   4. Manufacturer/fabricator refusal to certify or guarantee performance of specified products or methods as specified.
   5. When a substitution would be substantially to Owner's best interests.

1.3 SUBSTITUTION REQUIREMENTS

A. Submit four copies of each request for substitution. Include in request:
   1. Complete data substantiating compliance of proposed substitution with Contract Documents.
   2. For products:
      a. Product identification, including manufacturer's name and address.
      b. Manufacturer's literature, including product description; performance and test data, and reference standards; samples; and name and address of similar projects on which product was used and date of installation.
   3. For construction methods:
      a. Detailed description of proposed method.
      b. Drawings illustrating methods.
   4. Itemized comparison of proposed substitution with products or methods specified.
   5. Data relating to changes in construction schedule.
   6. Identify other contracts affected and changes or coordination required.

7. Accurate cost data on proposed substitution in comparison with products or methods specified.

B. In making requests for substitutions, Contractor represents:
   1. They have personally investigated proposed product or method and determined that it is equal or superior to that specified in every respect.
   2. They will provide the same guarantee for substitution as for products or methods specified.
   3. They will coordinate installation of accepted substitutions into Work, making changes for Work to be complete in every respect.
   4. Cost data is complete and includes related costs under their contract, but excludes:
      a. Costs under separate contracts
      b. Engineer's redesign
      c. Administrative costs of Engineer
   5. They will assume full responsibility for all additional costs and expenses for Owner, Engineer, and other Contractors.

C. Substitutions will not be considered when:
   1. They are indicated or implied on Shop Drawings or product data submittals without formal request submitted in accordance with the Specifications.
   2. Acceptance will require substantial revision of Contract Documents.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for submitting shop drawings, product data, samples, and other submittals.

B. Reference the Schedule of Submittals for a summary of required submittals.

1.2 SUBMITTALS

A. General:
   1. Identification: Include a permanent label or title block on the submittal or cover sheet, with the following information.
      a. Project name.
      b. Date.
      c. Names of Engineer, Contractor, subcontractor, manufacturer, supplier, and firm or entity that prepared submittal, as appropriate.
      d. Identification information, such as the number and title of the appropriate Specification section, Drawing number and detail references, location(s) where product is to be installed, or other necessary information.
      e. Label each submittal with Specification section number followed by decimal point and then sequential number (e.g., 06100.01). On resubmittals, include alphabetic suffix after another decimal point (e.g., 06100.01.A).
      f. Provide space approximately 6 by 8 inches on or beside the label or title block for the Contractor's approval stamp and the action stamp of the Engineer.
   2. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
   3. Submit one electronic copy of prints in PDF format. Prints shall have white background and dark lettering and line work. Prints will be returned electronically.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not use reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Dimensions, including notation of those established by field measurement.
      b. Identification of products.
      c. Fabrication and installation drawings.
      d. Roughing-in and setting diagrams.
      e. Shopwork manufacturing instructions.
      f. Templates and patterns.
      g. Schedules.
      h. Notation of coordination requirements.
      i. Relationship to adjoining construction clearly indicated.
      j. Seal and signature of professional Engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8 1/2 by 11 inches but no larger than 30 by 42 inches.
3. Submit one electronic copy of prints in PDF format. Prints shall have white background and dark lettering and line work. Prints will be returned electronically.

C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. Clearly mark each copy of the submittal to show which products and options are applicable. Delete information which is not applicable. Supplement standard information with project-specific information.
   2. Include the following information, as applicable:
      a. Manufacturer's catalog cuts, product specifications, schematic drawings, installation instructions, and written recommendations.
      b. Compliance with referenced standards.
      c. Testing by recognized testing agency.
      d. Include manufacturer's literature including written instructions for evaluating, preparing, and treating substrate.
      e. Technical data including tested physical and performance properties
      f. Mixing and application or placement instructions.
   3. Include temperature ranges for storage and application of materials, and special cold-weather application requirements or limitations.
   4. Include Globally Harmonized System (GHS) Safety Data Sheets or, if not yet available, Material Safety Data Sheets. For information only.

D. Samples: Submit physical samples to illustrate functional and aesthetic characteristics of the product, for review of materials and workmanship, for compatibility with other elements, and for comparison with the actual installed elements.
   1. Samples shall be of sufficient size to show the general visual effect.
   2. Include sets of at least three samples that show the full range of color, pattern, texture, graining, and finish.
   3. Transmit samples that contain multiple, related components, such as accessories, together in one submittal package.
   4. Identification: Attach a label on an unexposed side of each sample that includes the following:
      a. Generic description of sample.
      b. Product name, name of manufacturer, and sample source.
      c. Number and title of appropriate Specification section.
   5. Samples for Initial Selection: Submit two full sets of units or sections of units from the supplier's product line, showing the full range of colors, textures, and patterns available. Engineer will retain one set and return one set with the options selected.
   6. Samples for Verification: Submit full-size units or samples of the size indicated, prepared from the same material to be used for the Work, cured and finished in the manner specified, and physically identical with material or product proposed for use, and that show the full range of color and texture variations expected.
      a. Submit the number of samples required by the Contractor plus one that will be retained by the Engineer. Mark up and retain one returned sample as a Project Record Document.
   7. Maintain approved samples at the Site, available for quality-control comparisons during construction. Samples may be used to determine final acceptance of construction associated with the sample.

E. Delegated Design:
   1. Where required by the Contract Documents, in addition to shop drawings, product data, and other required submittals, submit a statement, signed and sealed by responsible design professional, for each product and system specifically assigned to the Contractor to be designed or certified by a design professional.
      a. Indicate that products and systems comply with performance and design criteria in the Contract Documents.
      b. Include a list of codes, loads, and other factors used in performing these services, and signed and sealed design calculations where required.
      c. Electronic submittals in PDF format are preferred; however, print copies will be accepted. Submit number of prints needed by contractor plus two for retention by the Owner and Engineer.

1.3 SUBMITTAL PROCEDURE

A. Coordinate the preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals requiring concurrent review, and related activities that require sequential activity.
   2. Allow sufficient time for submittal and resubmittal review. Failure to provide sufficient time for submittal and resubmittal reviews will not be a basis for extension of the Contract Time.

B. Review Time:
   1. Allow five working days for the review of each submittal and resubmittal.
   2. Allow additional time if coordination with subsequent submittals is required. The Engineer will advise the Contractor when the submittal being processed must be delayed for coordination.
   3. Time for review shall commence when the Engineer receives the submittal.

C. Contractor Review:
   1. Review each submittal, coordinate with other Work, and check for compliance with the Contract Documents. Verify field dimensions and conditions. Identify variations from the Contract Documents and product or system limitations that may be detrimental to the successful performance of completed Work. Note corrections.
   2. Before submitting to the Engineer, stamp with a uniform approval stamp including the reviewer's name; the date of Contractor's approval; and a statement certifying that the submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
   3. Submittal Log: Maintain submittal log that lists submitted items per specification section. Record dates submitted, dates returned, and disposition of each item based on Engineer's review. Submit final log showing approved materials at Substantial Completion.

D. Transmittal: Package each submittal individually and appropriately for transmittal and handling.

E. Engineer Action:
   1. Engineer will not review submittals that are received from sources other than the Contractor or that do not bear the Contractor's approval stamp, and will return them without action to the Contractor.
   2. Engineer will not return submittals requested for information only.
   3. Engineer will review each submittal for conformance with the design concept of the Project and compliance with the Contract Documents. Engineer will make marks to

indicate corrections or modifications required, and stamp with an action stamp. The action stamp will include the reviewer's name, date of review, and required Contractor action. Contractor actions may include making corrections or modifications to the submittal or resubmitting the submittal, or both.

F. Resubmittals: Make resubmittals in the same form and number of copies as the initial submittal.
   1. Note the date and content of previous submittal.
   2. Note the date and content of the revision in the label or title block and clearly indicate the extent of the revision and changes made.
   3. Resubmit until the Engineer indicates that no resubmittal is required.
      a. No resubmittal is required when submittal is marked "No Exceptions Taken" or "Make Corrections Indicated".

G. Distribution: Furnish copies of the final submittals to the Site file, the record documents file, manufacturers, subcontractors, suppliers, fabricators, installers, public authorities having jurisdiction, and others as necessary for performance of construction activities. Show the distribution on the transmittal forms.

H. Use only the final submittals with the Engineer's action stamp, for construction.
   1. Only items marked "No Exceptions Taken" or "Make Corrections Indicated" shall be used for construction.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for quality assurance and quality control, testing, special inspections and mockups.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated, and do not relieve the Contractor of responsibility for compliance with requirements of the Contract Documents.
   1. Specified tests, inspections, and related actions performed by others do not limit the Contractor's other quality assurance and quality control procedures that facilitate compliance with requirements of the Contract Documents.
   2. Requirements for the Contractor to provide quality assurance and quality control services required by the Engineer, Owner, or public authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections:
   1. See sections in Divisions 02 through 09, and Drawings sheets for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during the execution of the Work to guard against defects and deficiencies and substantiate that the proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after the execution of the Work to evaluate that the actual products incorporated into the Work and the completed construction comply with requirements.
   1. Services do not include contract enforcement activities performed by the Engineer, such as observations.

C. Testing Agency (also known as Third Party Testing Agency): Entity responsible for performing specified testing or special inspections in Divisions 02 through 09 and on the Construction Drawings.

D. Special Inspector: A qualified person employed or retained by an approved agency (such as the testing agency), and approved by the building official as having competence necessary to insect a particular type of construction requiring special inspection.

E. Special Inspection: Review of completed work or work in progress performed by the Special Inspector, or where specifically identified, by the Engineer. Items typically required by the governing building code.

1.3 COMPLIANCE CRITERIA

A. General: If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement.

B. Minimum Quantity or Quality Level: Quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements.

C. Refer uncertainties to the Engineer for a decision before proceeding.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 QUALITY CONTROL

A. Reference the Special Inspection Schedule on the Construction Drawings for special inspection requirements for this section.

B. Owner Responsibilities: The Owner will engage a qualified testing agency to perform all special inspections and select testing as explicitly identified in the Contract Documents.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and descriptions of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to the Contractor.

C. Testing Agency/Special Inspector Responsibilities: Cooperate with the Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Determine location from which test samples will be taken and in which in-situ tests are conducted.
   2. Notify the Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from requirements.
   4. Submit a certified written report of each test, inspection, and similar quality control service.
   5. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
   6. Do not perform any duties of the Contractor.

D. Engineer Responsibilities: Engineer may perform some testing on completed on in-process work as noted in the Contract Documents.

E. Tests and inspections not explicitly assigned to the Owner or Engineer, and testing and inspecting requested by the Contractor and not required by the Contract Documents, are the Contractor's

responsibility. Unless otherwise indicated, provide quality control services specified and those required by public authorities having jurisdiction, whether specified or not.

F. Coordination: Coordinate the sequence of activities to accommodate the required quality assurance and quality control services with a minimum of delay and to avoid the necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.
   2. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel.

G. Associated Services: Cooperate with the Engineer and testing agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Provide the following:
   1. Submittals of concrete mix designs and other materials and products necessary for the testing agency to test and evaluate field work.
   2. Access to the Work.
   3. Incidental labor and facilities necessary to facilitate tests and inspections.
   4. Adequate quantities of representative samples of materials that require testing and inspecting. Assist the testing agency in obtaining samples.
   5. Facilities for storage and field curing of test samples.
   6. Security and protection for samples and for testing and inspecting equipment at Site.

H. Repair and Protection:
   1. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   2. Provide materials and comply with installation requirements specified in other sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
   3. Protect construction exposed by or for quality control services.
   4. Repair and protection are the Contractor's responsibility, regardless of assignment of responsibility for quality control services.

END OF SECTION

SECTION 01 70 20

PROJECT CLOSEOUT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for contract closeout, including final cleaning; Substantial Completion and final completion procedures.

B. Related Sections:
   1. Divisions 02 through 09 sections for special cleaning and specific closeout requirements for Work in those sections, including warranties.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. During Work, maintain one set of Drawings and reviewed shop drawings, Specifications, WJE site visit reports, and product data for recording deviations of as-built construction from design information. Include addenda and Contract modifications.
   1. Accurately document and record changes and modifications as soon as possible after they occur, in understandable manner.
   2. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Record and check markup before enclosing concealed installations.
   3. Include:
      a. Dimensional changes.
      b. Revisions to Drawing details and details not on Drawings.
      c. Changes made by Change Order or Engineer's written orders or direction based on Site Visit Reports or Construction Observation Reports. Note Change Order numbers, Site Visit Report Item numbers or similar identification.
      d. Field records for variable and concealed conditions.
      e. Record information on Work that is shown only schematically or omitted from Drawings.
      f. Actual products and materials used.
         1) Include product data, specifically marked for Project, and cross-referenced to Specifications, Drawings, and Change Orders.
         2) Include names of manufacturer and Installer, and other information necessary to provide record of selections made.

3) Include significant changes in product delivered to Site and changes in manufacturer's written instructions for installation.

4. Mark record document most capable of showing actual physical conditions completely and accurately. Cross-reference on other record documents.
5. Mark record documents with erasable, red-colored media. Use other colors to distinguish between changes for different categories of Work at the same location.

B. Store Record Documents and samples in field apart from Contract Documents used for construction. Do not use Record Documents for construction purposes. Maintain Record Documents in good order and in clean, dry, legible condition, protected from deterioration and loss. Provide access to Record Documents for Engineer's reference during normal working hours.

C. Prepare final document markup in digital format for submission.
1. Incorporate changes and additional information previously marked on record prints. Erase, redraw, and add details and notations where applicable.
2. Refer questions to Engineer for resolution.
3. For new details and drawings, bind new sheets as necessary to appropriate document.
4. Identify and date each Record Drawing. Include names of project, Engineer, and Contractor, and designation "PROJECT RECORD DOCUMENT" in prominent location.
5. Organize PDF information into separate electronic files that correspond to each sheet of Drawings, report or item. Name each file with identification of item contained.

3.2 FINAL CLEANING

A. General: Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations. Return adjacent surfaces and areas to condition existing before Work began.

B. In areas disturbed by construction activities, complete the following cleaning operations before requesting inspection for certification of Substantial Completion. Clean each surface or unit to the condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions. Employ experienced workers or professional cleaners.
1. Remove tools, construction equipment, machinery, and surplus material from Site.
2. Clean Site, yard, and grounds, including landscaped areas, of rubbish, waste materials, litter, and other foreign substances.
   a. Broom clean paved areas. Remove petrochemical spills, stains, and other foreign deposits.
   b. Rake grounds that are neither planted nor paved to smooth, even-textured surface.
3. Clean exposed exterior and interior hard-surfaced finishes to dirt-free condition, free of stains, films, and similar foreign substances. Polish surfaces to achieve specified finish. Avoid disturbing natural weathering of exterior surfaces.
   a. Touchup and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that show evidence of repair or restoration.
      1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
4. Clean and restore transparent and reflective surfaces, such as mirrors and glass in doors and windows, to their original condition. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

5. Remove labels that are not permanent.
6. Remove debris and surface dust from limited access spaces, including plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
7. Sweep floors broom clean.
8. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove paint and mortar droppings and other foreign substances.
9. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    a. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.
10. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
11. Leave Project clean and ready for reuse.

END OF SECTION

SECTION 02 22 00

EXISTING CONDITIONS ASSESSMENT

PART 1 GENERAL

1.1 SCOPE

A. This Section covers observations of existing conditions made by the Engineer at the site as well as additional documentation of site conditions.

1.2 OBSERVATIONS

A. The following figures and captions are provided for reference by the Contractor.

B. The remaining concrete at the north dividing wall has numerous vertical cracks spaced between 0 and 10 feet on-center. In addition, there is a large horizontal crack roughly 3 feet up from the slab on this wall.

C. The south dividing wall has partially collapsed. The collapsed portions of the wall, which are to be removed and properly disposed of, are within Cell 3.

D. The Observations presented in this section do not eliminate the need for the Contractor to visit the site and confirm existing conditions prior to submitting a bid or commencing with Work.

1.3 ADDITIONAL DOCUMENTATION

A. The WJE Geotechnical Report dated October 22, 2019 is available from the Owner and shall be referenced for completion of the Work.

B. The Original Construction Documents are available from the Owner and shall be referenced for completion of the Work.

Figure 1. Overall view of north dividing wall (January 2020).

Figure 2. Closeup of the west end of the north dividing wall showing slope down (June 2020).

Figure 3. Overall view of the south dividing wall (January 2020).

Figure 4. Overall view of the south dividing wall (June 2020)

Figure 5. Remaining roughly 3'-0" tall portion of the south dividing wall where collapsed.

Figure 6. Typical condition of bent #6 reinforcing, at 5 1/2" on-center, from the slab to be repaired.

Figure 7. Chlorine contract area/chamber adjacent to south wall which has been filled with soil.

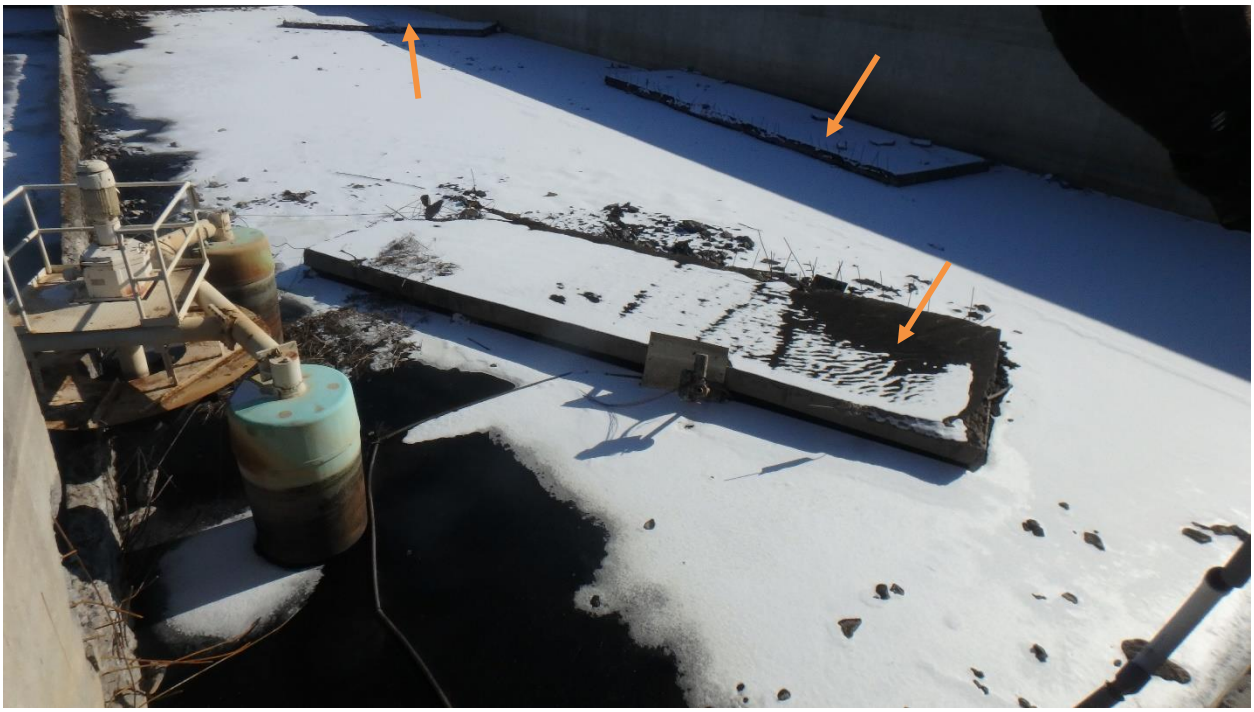

Figure 8. Portions of collapsed wall in Cell 3.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment, and supervision to perform all Work necessary for and incidental to selective demolition in preparation for other Work specified in the Contract Documents. Demolition includes the following:
   1. Remove distressed concrete from rebuild areas indicated on plans as required to perform the Work.
   2. Install and Remove temporary shoring upon completion and curing of rebuild.

1.2 PRICES

A. All Work shall be performed as a lump sum as identified in the bid form.

1.3 REFERENCES

A. American National Standards Institute (ANSI)
   1. ANSI/ASSE A10.6-2006: Safety Requirements for Demolition Operations – American National Standard for Construction and Demolition Operations

B. National Fire Protection Association (NFPA)
   1. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; latest edition

1.4 SUBMITTALS

A. Demolition and disposal plan (information only).
   1. Include equipment and processes proposed for the removal and disposal of material from the project site.

1.5 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

C. Remove and salvage: Detach items from existing construction and securely store away from work area.

D. Existing to remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition Work similar in material and extent to that indicated for this Project. Submit list of 3 projects of similar size and scope completed over the previous 5 years.

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

C. Standards: Comply with ANSI A10.6 and NFPA 241.

D. Pre-demolition Meeting: Prior to demolition of various elements, schedule a meeting at the site with Owner and Engineer to verify areas of demolition.

1.7 PROJECT CONDITIONS

A. Conduct selective demolition so that Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner to the extent practical.

C. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Owner will remove hazardous materials under a separate contract.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, repair, and rebuild materials and surfaces cut or damaged during selective demolition with appropriate methods and materials to maintain existing warranties.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Survey existing concrete element conditions for embedded items, including conduits and embedded anchors, bearing plates, etc.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged, where applicable.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended functions or designs are encountered, investigate and measure the nature and extent of conflict. Notify and promptly submit a written report to Owner and Engineer.

E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities. Promptly notify Owner and Engineer if hazards are encountered.

3.2 PROTECTION

A. Protect existing elements from damage including, but not limited to, railings, concrete, and aluminum members.
   1. Provide temporary controls and barriers.
   2. Protect existing surfaces and features that are to remain from damage that could result from selective demolition Work.
   3. Damage to existing surfaces and features that are a result of selective demolition shall be repaired to the satisfaction of Owner at no cost to Owner.
   4. Monitoring points (elevation and horizontal control) shall be installed prior to removing lower portion of North Wall (if partial demolition option selected). Monitoring points to be monitored during the course of the project for satisfactory performance. Coordinate with Engineer.

3.3 PREPARATION

A. Examine existing conditions of Work, including elements subject to movement or damage during cutting, patching and selective demolition.

B. After uncovering Work, examine conditions affecting installation of new products or performance of Work.

C. Provide protection for other portions of Project.

D. Provide protection from elements.

E. Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walkways, existing utility services, and surrounding site and water.

3.4 SELECTIVE DEMOLITION

A. General: Demolish and remove existing elements only to the extent required by the Work and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
   2. Cut or drill into concealed surfaces from the exposed or finished side to avoid marring existing finished surfaces.
   3. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on structure.
   4. Dispose of demolished items and materials promptly and daily.

B. Concrete
   1. Remove concrete from areas as indicated on plans or as required to perform the required Work.

C. Steel
   1. Remove exposed and embedded steel elements indicated on plans or as required to perform the required Work.

D. Upon completion of rebuild, temporary shoring shall be removed. Temporary shoring may not be removed until structure is fully self-supporting and concrete rebuilds meet strength as specified in Section 03 31 00. Contractor to rebuild concrete areas related to temporary shoring.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

3.5 ALUMINUM

A. Remove aluminum handrails where indicated.

3.6 CUTTING AND PATCHING

A. Execute cutting required to:
   1. Interface new and existing Work.
   2. Make several parts fit properly.
   3. Uncover Work to provide for installation of ill-timed Work.
   4. Remove and replace defective Work.
   5. Remove and replace Work not conforming to requirements of Contract Documents.

B. Do not cut structural members without coordination with and approval by Engineer.

C. Execute fitting and adjustment of products to provide finished installation to comply with specified tolerances, and finishes.

D. Execute cutting and demolition by methods that will prevent damage to other Work, and will provide proper surfaces to receive installation of rebuild and new Work.

E. Restore Work that has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.

F. Refinish entire surfaces as necessary to provide an even finish:
   1. Continuous surfaces: To nearest intersections.
   2. Assembly: Refinish entirely.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project Site and legally dispose of them at the end of each Workday.

B. Do not burn demolished materials.

3.8 CLEAN UP

A. Regulated clean-up procedures are to be followed if any of the site is affected. Contact Owner immediately if the site is disturbed by Work.

B. Clean adjacent sites and buildings of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

C. Conduct post-demolition assessment of adjacent structures with Owner and Engineer. Compare with pre-demolition assessment to identify damage.

END OF SECTION

SECTION 03 01 01

SHORING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Supply, installation, and removal of temporary shoring.

1.2 PRICES

A. All Work shall be performed as a lump sum in accordance with the Option selected for each wall, as applicable and identified in the bid form.

1.3 COORDINATION

A. Coordinate with Owner's Representative and with other trades to ensure that shoring does not interfere with Owner use of Site or Work of other trades.

1.4 SUBMITTALS

A. Shop Drawings: Shop drawings showing locations, distribution, and quantity of shoring. Include connection and bearing details. Incude loads for which shoring was designed. Shop drawings shall be prepared by or under supervision of qualified, licensed professional engineer and shall be sealed by engineer.

B. Product Data (for information only): Manufacturer's literature and technical data indicating type of shoring proposed for use and safe load-carrying capacity of shoring for heights and lengths of shoring components to be used.

C. Design Calculations (for information only): Calculations prepared by or under supervision of a qualified, licensed professional engineer, and sealed by engineer, indicating that shoring meets design criteria.

1.5 PROJECT CONDITIONS

A. Comply with Owner's limitations and restrictions for Site use and accessibility as well as restricitons indicated on the construction documents pertaining to temporary anchorages.

PART 2 PRODUCTS

2.1 MANUFACTURED ASSEMBLIES

A. Design Criteria:
   1. Structure dead load per dimensions provided on original drawings prepared by Henningson, Durham and Richardson, and verified in field by contractor.
   2. All loads shall be accounted for in accordance with ASCE 37, including but not limited to dead, construction, and live.

a. Live loads shall be coordinated by the contractor to reflect their selected means, methods and equipment.

3. Provide a minimum factor of safety of 2.0.
4. Consider removal of loads from member and transfer of loads into structure below, without overloading structural members.
5. Detail shoring to avoid interference with Owner operations and completion of the Work.
6. Consider shoring stiffness relative to stiffness of members being shored.

B. Shoring: Steel posts, steel frames, or other steel assemblies with sufficient capacity to support calculated shoring loads at spacing and positioning shown on shop drawings.
1. Adjustable through positive means, such as screw jacks, to achieve tight fit to structure above and below and to compensate for elastic shortening of shores during loading and service.
2. Use undamaged components, including bracing, supplied by shoring manufacturer.

2.2 ACCESSORIES

A. Attachment: provide connections to existing members and structure which will not leave embedded items after removal.

B. Spreaders:
1. At bottom of shores: 4x4 timber cribbing, 2x wood bearing pads, or other material; with sufficient bearing area and length to distribute shoring reactions into supporting structural element below.
2. At top of shores: Timber or steel spreader beams or wood bearing pads; to fully support member being shored without damage to member surface.

C. Shims: Wood or steel; at bearing points above shores to ensure tight contact with shored member.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements and other conditions affecting installation or performance of shoring Work.
1. Notify Engineer in writing of conditions which may adversely affect installation or performance of shoring Work, and recommend corrections.
2. Do not proceed with shoring Work until adverse conditions have been corrected and reviewed by Engineer.
3. Commencing shoring Work constitutes acceptance of Work surfaces and conditions.

3.2 INSTALLATION

A. Install shoring to brace elements as required prior to beginning Work.

B. Install shoring in accordance with manufacturer’s recommendations and approved shop drawings. Installed assembly shall be of such quality that assembly will support imposed loads without excessive settlement or deflection.
1. Position to avoid interference with Owner operations.

2. Install plumb and square. Install cross-bracing recommended by shoring manufacturer and shoring designer to prevent buckling failure of individual members and overall shoring stability failure.
3. Install spreader beams or bearing pads and shims as necessary, and adjust shores to ensure tight, uniform fit against structural element to be supported. Minimize differential loading of vertical shoring members.
4. Install timber cribbing wood or wood bearing pads as necessary to distribute loads into supporting elements. If more than one layer of cribbing is required, install each successive layer perpendicular to preceding layer.
5. If shoring is to be placed on coated or finished surface, protect surface from damage with plywood, plastic sheets, or other means.
6. Do not provide permenant corrosive connections into members to remain.

C. All shoring shall be installed snug-tight.

D. Protect shores from damage from construction activities, Owner use of facility, and other causes.

E. Check shores daily and adjust as necessary to maintain snug condition or design preload, plumbness, and full effectiveness.

F. Modify and adjust shoring as required to meet conditions of work and to ensure Project safety.

3.3 REMOVAL OF SHORES

A. Remove shores when compressive strength of rebuild concrete reaches 75 percent of its specified 28-day required strength. Contractor may elect to have additional concrete strength tests performed at their own expense, to confirm when rebuild material meets removal requirements.

B. Store shoring materials in approved storage area at Site, such that materials do not interfere with Owner’s continued use of facility. Promptly remove shoring materials from Site when no longer needed for work.

END OF SECTION

SECTION 03 01 32

DISCRETE GALVANIC ANODES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Supply and installation of discrete galvanic anodes embedded in concrete rebuilds or encapsulated in concrete encasements.

1.2 PRICES

A. Cost of installation of anodes shall be included in the concrete rebuild cost for each element.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Certified by anode manufacturer as trained and approved for anode installation.

1.4 SUBMITTALS

A. Product Data.

B. Manufacturer's letter of recommended spacing.

C. Product samples.

D. Manufacturer report for installation.

E. Contractor certificate.

PART 2 PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain materials through one source from single manufacturer.

B. Discrete Galvanic Anodes in Concrete Rebuilds: Alkali activated, Type IA, consisting of zinc in compliance with ASTM B418, Type I, with at least 100 g of zinc metal; encased in highly alkaline cementitious shell with pH of 14 or greater; specifically intended for application. Unit shall contain no added sulfate, chloride, bromide, or other constituents that are corrosive to reinforcing steel per ACI Guideline 222R-01. Anodes shall be supplied with integral tie wires for tying to reinforcing steel.
   1. Anode shall provide minimum ten-year service life in similar environment.
   2. Use one of the following or approved equal:
      a. Galvashield XP4 (zinc mass = 160g) by Vector Corrosion Technologies.
      b. Sentinel Gold Galvanic Anodes (zinc mass = 200g) by Euclid Chemical Company.

C. Conductive embedding mortar: Use one of the following low resistivity embedding mortar products, or approved equal:

1. Galvashield Embedding Mortar by Vector Corrosion Technologies.
2. Eucopatch by Euclid Chemical Company.
3. Sika Galvashield Embedding mortar by Sika Corporation.

PART 3 EXECUTION

3.1 INSTALLATION OF DISCRETE GALVANIC ANODES

A. Remove unsound concrete and prepare concrete and steel surfaces as specified.
   1. Remove sufficient concrete at anode locations to permit anode installation.
   2. Leave 2 inches of uncoated steel at anode connections, or as recommended by anode manufacturer.

B. Install anodes in accordance with recommendations of anode manufacturer.
   1. Install anodes along the perimeter of the concrete removal area at spacing recommended by anode manufacturer. Notify Engineer of required anode spacing in letter from manufacturer.
   2. Position anodes as close to perimeter of concrete removal area as possible. Locate at intersections of bars if possible.
   3. Position anodes to provide at least 1 inch of clear cover. If necessary, position anodes next to or underneath reinforcing bars.
   4. Provide sufficient clearance between anodes and existing concrete substrate to allow rebuild material to encase anode.
   5. Electrically connect anodes to clean reinforcing bars as close as possible to edge of removal area.
      a. Wrap anode wires around reinforcing bar and twist tight to allow little or no free movement.
      b. At bar intersections, secure to both bars.
      c. Position tie wires at least 1 inch from surfaces.

C. Confirm electrical continuity of reinforcing steel in removal area and of anodes with reinforcing steel by measuring DC resistance.
   1. Resistance shall be less than 1 ohm.
   2. If continuity of reinforcing steel is not acceptable, add additional steel tie wires until continuity is acceptable.
   3. If continuity of anode to reinforcing steel is not acceptable, modify wrapping of anode tie wires until acceptable.

D. Encapsulate anodes in conductive mortar and fill gaps between anodes and concrete substrate with conductive mortar as recommended by anode manufacturer.
   1. Completely encapsulate anode with at least 1/2 inch of mortar.
   2. Fill gap between anode and concrete substrate over area with minimum diameter of 4 inches.

E. Take care not to disturb anodes when installing concrete.

END OF SECTION

SECTION 03 15 13

WATERSTOPS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes requirements for installation of new and retrofit waterstops between new and existing concrete sections.

1.2 PRICES

A. Costs for waterstops shall be included in rebuild cost and not paid for separately.

1.3 REFERENCES

A. United States Army Corps of Engineers: CRD-C 572-74, Corps of Engineers Specifications for Polyvinylchloride Waterstop

B. ASTM International (formerly American Society for Testing and Materials)
   1. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
   2. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
   3. ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness

1.4 SUBMITTALS

A. Product Data (for each application)
   1. Waterstops for each installation.
   2. Accessory materials.
   3. Installation procedures to be followed on project (information only).

B. Letter from waterstop manufacturer stating that materials submitted are appropriate for application as shown on the Construction Drawings to provide a watertight joint.

1.5 QUALITY ASSURANCE

A. Contractor Qualifications: Contractor to have a minimum of five years of installation of concrete waterstops. Demonstrate that firm has completed work similar in material, design, scope, size, and extent to that indicated for this Project with a record of successful in-service performance.
   1. Field Supervision: maintain experienced full-time supervisors on Project site during times that removal, preparation, and installation work is in progress. Supervisor shall have minimum of three years of experience in installation of waterstops.

B. Waterstop manufacturer shall demonstrate five years continuous experience in production of waterstops.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials according to the manufacturer's recommendations and in such a manner as to prevent damage to materials and structure.
   1. Store materials to protect from oil, dirt, and sunlight.

PART 2 PRODUCTS

2.1 MATERIALS

A. Waterstops at New to Existing Concrete Elements
   1. Prime virgin polyvinyl chloride (PVC) waterstops:
      a. Sika Greenstreak Style Number 655. Waterstop shall be installed with Sika stainless steel batten bars and Epoxy 7300 in accordance with Sika product literature.
      b. Approved equal.

B. Waterstops at New Joints (new vertical joints):
   1. Dumbell waterstops at expansion joints: prime virgin polyvinyl chloride (PVC) with center bulb and corresponding ribbed or dumbbell shape;
      a. Sika Greenstreak Style Number 698 or 705.
      b. Approved equal.

2.2 ACCESSORIES

A. Provide epoxy, or similar as recommended by waterstop manufacturer, to secure waterstop to rough, damp or dry concrete.
   1. Sika Epoxy 7300 two component epoxy gel
   2. Approved equal

B. Provide single-component hydrophilic sealant to secure waterstop to rough, dry concrete.
   1. Sika Leakmaster LV-Z sealant.
   2. Approved equal.

C. Provide cyanacrylate adhesive (super glue) for all splices.
   1. As recommended by manufacturer.

D. Waterstop filler at splices.
   1. As recommended by manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Follow approved manufacturer installation instructions and details.
   1. Notify Engineer of any discrepancies between Drawings and manufacturer recommendations.

B. Cut coil ends square (or at proper angle for mitered corners) with shears or sharp blade to fit splices together without overlaps.

C. Splice ends of non-hydrophilic waterstops with cyanacrylate adhesive (super glue) or other material as recommended by waterstop manufacturer to provide a watertight splice.
   1. Seal watertight any exposed cells of waterstop using Leakmaster sealant, or manufacturer approved alternate, prior to splicing and super glue application.

D. Ensure that waterstop materials are secured in place and will not move or shift during concrete installation.

E. Do not damage waterstop during concrete installation.

3.2 QUALITY CONTROL

A. Water tightness testing as indicated on the drawing shall be used to evaluate joint performance.

END OF SECTION

SECTION 03 21 00

REINFORCING STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Supply, fabrication, and installation of new reinforcement.
   2. Supply, fabrication, and installation of new adhesive anchored (epoxy or other) reinforcement.
   3. Supply and installation of mechanical reinforcing couplers.
   4. Welding of reinforcing.

1.2 PRICES

A. Perform the following Work on unit price basis:
   1. Splicing of new to existing reinforcing bars.
      a. Supply and installation of mechanical couplers for steel reinforcing.
      b. Welding of new reinforcing bars to existing reinforcing bars/

B. All other work shall be performed on a lump-sum basis and included in the repair/rebuild cost.

1.3 SUBMITTALS

A. Shop Drawings: Placement drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, schedules, bending diagrams, and arrangements; material grades; stirrup, tie, and hoop spacing; splices and laps; mechanical connections; and supports.

B. Certifications:
   1. For installer of adhesive anchored items: ACI-CRSI Certification as Adhesive Anchor Installer.

C. Product data.
   1. Corrosion inhibiting coating.
   2. Adhesive for adhesive anchors.

D. Material Test Reports:
   1. Mill test reports for steel reinforcement, including adequate information on chemical and physical properties to demonstrate conformance with specified standard.
   2. ICBO, ICC-ES or IAMPO-ES reports for reinforcing bar couplers and other mechanical splices.
   3. Carbon Equivalence Testing results for existing reinforcing steel if specified to be welded. Test shall clearly show the Carbon Equivalence (CE) as calculated in accordance with AWS D1.4.

E. Welding: The following items shall be submitted prior to welding for each size and type of weld specified on the drawings. Please note that qualifications shall be performed on reinforcing bar with the same or higher CE.
   1. Welder Qualification Records, submit for each welder.

2. Welding Procedure Specifications (WPS)
3. Procedure Qualification Record (PQR)

F. Submit the following as available during the work:
1. Special Inspection Reports (for information only)

1.4 QUALITY ASSURANCE

A. Qualifications for Installer of Adhesive Anchored Items: Experienced individual with current ACI-CRSI certification as Adhesive Anchor Installer.

B. Welding:
1. Welders shall be certified and poses current welder qualification records for the welds specified.

PART 2 PRODUCTS

2.1 MATERIALS

A. Corrosion-Inhibiting Coating Materials: Use material specifically intended for reinforcing steel embedded in concrete. Use one of the following or approved equal:
1. Cementitious Coating:
a. Sika Armatec 110 EpoCem supplied by Sika Corporation.
b. MasterEmaco P 124 supplied by BASF Construction Chemicals, LLC.
c. Duralprep A.C. by Euclid Chemical Company.
2. Epoxy: Sikadur 32 Hi-Mod supplied by Sika Corporation.
3. Zinc-rich Steel Primer:
a. Sika Armatec -10 ZR supplied by Sika Corporation
b. MasterProtect P 8100 AP supplied by BASF Construction Chemicals, LLC.

B. Reinforcing Bars: ASTM A615, Grade 60;. Sizes as shown on Drawings.

C. Reinforcing Bars to be welded: ASTM A706, Grade 60; Sizes as shown on Drawings.

D. Adhesive for Anchors and Reinforcing Bars (Adhesive Anchors):
1. Adhesive: Use one of the following or approved equal:
a. HIT-RE 500 V3 epoxy adhesive supplied by Hilti, Inc.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: CRSI Manual of Standard Practice; Steel wire, plastic, or precast concrete.
1. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcing in place. Support welded wire fabric with slab bolsters.
2. For concrete surfaces exposed to view, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports where legs of wire bar supports contact forms.

B. Tie Wire: 16 gauge minimum:
1. Corrosion resistant.

C. Mechanical Bar Couplers/Splices: Shall be capable of developing 125% of yield strength of reinforcing being coupled as demonstrated through ICBO, ICC-ES or IAMPO-ES testing. Finish to match reinforcing finish. Use one of the following or approved equal:
   1. Bar-lock by Dayton Superior.
   2. Lenton Lock B-series by Erico International Corporation

2.3 FABRICATION

A. Fabricate and detail steel reinforcement to shapes and dimensions shown on Drawings, in accordance with and within fabricating tolerances shown in CRSI Manual of Standard Practice.

B. Bends and hooks shall conform to standard hook dimensions in CRSI Manual of Standard Practice unless otherwise shown on Drawings.

2.4 WELDING

A. Welding electrodes shall 70 ksi minimum ultimate strength low-hydrogen filler metal.

B. Touch up Primer: Corrosion inhibiting coating.

PART 3 EXECUTION

3.1 EXISTING STEEL PREPARATION (REINFORCING AND EMBEDMENTS)

A. Leave existing reinforcing in place unless otherwise directed by Engineer.

B. Notify Engineer of reinforcing bars that are incorrectly located or have less than 1/2 inch of concrete cover; are damaged or fractured; or have lost more than ten percent of their original cross-sectional area at any point. Engineer will determine remedial action.
   1. Measure reinforcing section loss in accordance with ACI 364.14T.

C. Prepare exposed steel surfaces to SSPC-SP 6/NACE No. 3 finish, commercial blast cleaning, including exposed reinforcement and steel embedments. Exercise care to prepare undersides of reinforcing bars and to prevent application of coating to the concrete substrate.

D. Clean steel surfaces with dry, oil-free compressed-air jet.

E. Inspect prepared steel surfaces and clean remaining contaminants.

F. Apply a minimum of **two** coats of corrosion-inhibiting material on exposed steel surfaces.
   1. Batch, mix, and apply material according to recommendations of material supplier for thickness per coat.
   2. Exercise care to coat difficult-to-reach surfaces, such as undersides of reinforcing bars.
   3. Minimize spillage on concrete surfaces. Remove materials that will act as bond breaker by chipping or other means.
   4. Inspect coated steel surfaces and apply additional coats to uncoated or thinly-coated areas.

3.2 INSTALLATION OF ADHESIVE ANCHORED ITEMS

A. Remove unsound concrete at new reinforcing locations prior to installation.

B. Drill, clean and install adhesive and reinforcing in accordance with adhesive material manufacturer's requirements, and those listed below. If a conflict exists between the requirements of these specifications and the adhesive manufacturer, notify Engineer and request direction.

C. Drill holes as required by adhesive manufacturer for application shown on drawings.
   1. Locate existing reinforcement using non-destructive methods and position holes to avoid existing reinforcement.
   2. Do not damage existing reinforcement.
   3. Make hole diameter as recommended by adhesive manufacturer for application shown on drawings.

D. Clean holes as required by adhesive manufacturer for application shown on drawings.

E. Inject adhesive into hole based on adhesive manufacturers requirements for application shown on drawings. The method of installation is intended to achieve 100 percent filling of the annular space between the embedded item and the drilled hole.

F. Promptly remove excess adhesive.

3.3 PLACING REINFORCEMENT

A. General: Comply with CRSI Manual of Standard Practice and Drawings for placement of reinforcement.

B. Bar spacing, concrete cover, and bar splices shall conform to Drawings and CRSI Manual of Standard Practice, unless otherwise noted on drawings.

C. Accurately position, support, and secure reinforcement to prevent displacement during concrete placement. Locate and support reinforcement with bar supports to maintain specified minimum concrete cover. Wire dowels securely in place before depositing concrete.

D. Place reinforcement continuous between expansion and control joints. Stop reinforcement at expansion joints.

E. Unless permitted by Engineer, do not bend reinforcing bars embedded in hardened concrete.

F. Bend tie wires and turn ends toward inside of concrete section, away from exposed concrete surfaces.

G. During concrete placement, protect reinforcement from damage from transporting or pumping equipment with runways or other means.

H. Before placing concrete, clean reinforcement of loose rust and mill scale, earth, ice, dust, and other foreign materials that would reduce bond to concrete.

I. Allow Engineer at least 24 hours to inspect condition and placement of reinforcing prior to completing formwork and ordering concrete.

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

K. Do not weld reinforcement unless specifically approved by Engineer.

3.4 WELDING OF REINFORCING

A. All welding shall comply with the requirements of AWS D1.4.

B. Welds shall be the size, type and length specified on the drawings. All welds shall be continuous unless otherwise specified.

C. Remove coatings and corrosion from existing surfaces to be welded by grinding or abrasive blasting. At a minimum the steel surfaces shall be prepared in accordance with SSPC-SP 3: Power tool cleaning.

D. After welding is complete, clean surfaces of reinforcing to remove slag and other contaminants to achieve a minimum surface consistent with SSPC-SP 3: Power tool cleaning.

3.5 QUALITY CONTROL

A. Reference the Special Inspection Schedule on the Construction Drawings for special inspection requirements for this section.

END OF SECTION

SECTION 03 31 00

STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Supply and placement of ready-mix concrete for wall rebuilds, including formwork, concrete materials, mix design, batching procedures, placement procedures, finishes, and curing.

1.2 PRICES

A. Costs for concrete shall be included in rebuild cost and not paid for separately.

1.3 DEFINITIONS:

A. Cementitious Materials: Portland cement alone or in combination with one or more of fly ash, silica fume, slag cement, or other pozzolans..

B. Concrete Mixture: A single combination of materials as specified including cement, pozzolans, coarse aggregate(s), fine aggregate(s), water, and chemical admixtures. Changes to material sources or proportions shall constitute a new concrete mixture unless otherwise approved by the Engineer

C. Testing Agency: Third party testing agency qualified to perform the testing specified.

D. The term concrete, ready-mix, material, replacement material, repair material, and rebuild material shall generally refer to the ready-mix concrete mix used to perform the work.

1.4 SUBMITTALS

A. Design Mixes: For each concrete mixture, include:
   1. Proportions of materials.
   2. Mill tests and certification for cement, fly ash, and slag cement. Certification for silica fume.
   3. Macro-synthetic (and micro-synthetic if used) fibers: Manufacturer's product and test data for fiber reinforcement based on selected dosage rate.
   4. Aggregate documentation indicating compliance to all of the requirements of ASTM C33, **including gradation, deleterious substance, and alkali silica reactivity**.
   5. Slump
   6. Air content
   7. Unit Weight
   8. Strength
      a. 28-day laboratory compression test results. Minimum three cylinders at each test age.
      b. Maturity Method test data to be used for estimating in-situ concrete strength, a maturity curve shall be submitted with mix design.
   9. Amount of mix water to be withheld for later addition at Site.

10. Range of high-range, water-reducing admixture dosage that may be added at Site without adversely affecting hardened concrete.
11. **Shrinkage testing**

B. Joint Layout: Proposed construction, control, and isolation joint layout required to Work, subject to approval by Engineer.

C. Product data for moisture retaining cover.

D. Submit the following as available:
1. Quality Control (for information only):
   a. Batch tickets for ready-mix concrete. Include amount of held water which was added at the project site and all actual batched material weights.
   b. Fresh material testing
   c. Compressive strength testing

E. Warranties: Submit warranties after substantial completion and prior to application for final completion (for information only).

1.5 QUALITY ASSURANCE

A. Contractor Qualifications: Experienced firm that has successfully completed concrete repair work similar in material, design, and extent to that indicated for the Project. Must have successful construction with specified materials in local area in use for a minimum of five years.
1. Employ foreman with minimum five years of experience as foreman on similar projects, who is fluent in English, to be on Site at all times during the Work. Do not change foremen during the course of the Project except for reasons beyond the control of Contractor; inform Engineer in advance of any changes.

B. Ready-Mix Supplier Qualifications: ASTM C94/C94M; Certification of Production Facilities and Delivery Vehicles by National Ready Mixed Concrete Association.

C. Concrete testing laboratories that perform testing services on concrete mixes shall meet the requirements of ASTM C1077.

D. Mockups: Construct mockups to demonstrate construction procedures, quality of Work, and aesthetic effects.
1. North Wall and South Wall: A mockup demonstrating the following items as hold points shall be performed on the first placement:
   a. Waterstop installation
   b. Reinforcing steel placement/installation.
   c. Concrete placement.

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated.
1. ACI 117-10 - Standard Specifications for Tolerances for Concrete Construction and Materials
2. ACI 301-16 - Standard Specification for Structural Concrete
3. ACI 318-14 - Building Code Requirements for Structural Concrete
4. ACI 350-06 - Code Requirements for Environmental Engineering Concrete Structures.

1.6 WARRANTY

A. Installer's Warranty:
   1. Written warranty, signed by Applicator. See warranty form in Section 00 65 36.
   2. Warranty Period: two years after Substantial Completion date.

PART 2 PRODUCTS

2.1 FORM MATERIALS

A. Form Panels: Plywood, lumber, metal, plastic, or another material capable of producing final product as specified here-in.
   1. Use panels that will provide continuous, true, and smooth rebuild surfaces.
   2. Furnish panels in largest practicable sizes to minimize number of joints.
   3. Do not use rust-stained steel form-facing material.
   4. Use form-facing material capable of producing smooth, uniform texture on concrete. Do not use form-facing materials with raised grain, torn surfaces, worn edges, dents, or other defects that will impair texture of concrete surface.

B. Accessories:
   1. Chamfer Strips: Wood, metal, PVC, or rubber strips.
   2. Form Ties: Factory-fabricated; removable or snap-off metal or glass-fiber-reinforced plastic form ties; designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
      a. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete rebuild surface.
      b. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete rebuild surface.
      c. Furnish ties with integral water-barrier plates for walls indicated to receive dampproofing, waterproofing or coating.
   3. Form-Release Agent: Commercially-formulated form-release agent that will not bond with, stain, or adversely affect the concrete rebuild surface and will not impair subsequent treatments of the surface. Form-release agent shall have a rust inhibitor for steel form-facing materials.

2.2 CONCRETE MATERIALS

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

B. Portland Cement: ASTM C150, type per exposure.

C. Fly Ash: ASTM C618, Class F or C.

D. Silica Fume: ASTM C1240, amorphous silica.

E. Slag Cement: ASTM C989 Class 100 or 120.

F. Fibers
   1. Microsynthetic/Macrosynthetic Fibers: ASTM C1116, Type III.

2. 1 inch maximum length.
3. Synthetic fiber shown to have long-term resistance to deterioration when exposed to moisture and alkalis.

G. Aggregates: Fine and coarse aggregates for normal weight concrete shall conform to ASTM C33 (coarse aggregate to meet requirements of Class 4S) and shall consist of natural or manufactured sand and gravel or crushed stone. Aggregate particles shall be clean, hard, tough, durable, of uniform quality, and free from soft, thin elongated pieces, disintegrated stone, dirt, organic, or other injurious materials occurring in either free or as coating. Aggregates shall be from a single source with documented record of at least ten years of satisfactory service using similar aggregates and cementitious materials in similar applications and service conditions. Aggregate gradation shall conform to ASTM C33 with the following limitations:
1. Coarse Aggregates: Uniformly graded; size per table; Class 4S.
2. Alkali Reactivity: Coarse and fine aggregates shall have expansion indicative of innocuous behavior; that is, less than 0.08 percent expansion after 16 days when tested according to C1260. If one or more of the aggregate expansions exceed 0.08 percent at 16 days, then perform ASTM C1567 testing of that aggregate including SCM type and replacement percent showing mitigation of ASR per ASTM C1778. The expansion of the test specimens, tested in accordance with ASTM C1567 as required, shall not exceed 0.08 percent at 16 days. If ASTM C1567 testing is required, the concrete mixtures containing that aggregate must contain at least the same SCM type and minimum proportion showing mitigation in the ASTM C1567 testing.
    a. Testing must be performed within one year of proposed placement date.

H. Water: Potable.

I. Admixtures:
1. General: Admixtures certified by manufacturer to contain no more than 0.1 percent chloride ions and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
    a. Air-Entraining Admixture: ASTM C260.
    b. Water-Reducing Admixture: ASTM C494, Type A.
    c. High-Range, Water-Reducing Admixture: ASTM C494, Type F.
    d. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.
    e. Water-Reducing and Retarding Admixture: ASTM C494, Type D
    f. Special -Use Admixture: ASTM C494, Type S, only if approved by the Engineer.

2.3 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mixes or field-test data, according to ACI 350-06, ACI 318-14 and ACI 301-16 as recommended by ACI 211.1.
1. Mix designs for normal weight concrete used for this project shall be proportioned in accordance with ACI 211.1 and this specification. Mix designs proposed for use, when tested in a laboratory, shall have an average 28-day compressive strength in excess of design strength as required in Article 4.2.3 of ACI 301-16.
2. Use qualified independent testing agency conforming to requirements of ASTM C1077 for preparing, testing, and reporting proposed mix designs for laboratory trial mix basis.
3. Mix designs shall be for a cohesive mix which can be easily placed without segregating.

B. No chlorides shall be intentionally introduced into concrete mix.

1. In hardened concrete, limit acid-soluble chloride ion content to 0.10 percent by weight of cement when tested according to ASTM C1152, or water-soluble chloride ion content to 0.08 percent by weight of cement when tested according to ASTM C1218.
2. If hardened concrete exceeds chloride ion limits above, limit water-extractable chloride ion content to 0.08 percent by weight of cement when tested according to ASTM C1524.
3. Provide test results necessary to demonstrate concrete and aggregates do not exceed chloride ion limits, unless waived by Engineer.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture. Alternately use high-range, water-reducing admixture (superplasticizer), as required, for placement and workability.
2. Use retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Adjust for free water in high-dosage admixtures, including shrinkage reducing admixtures, when utilizing in concrete. Slump of concrete shall be 6 inches to 9 inches at the time the concrete is discharged at the job site. Further, the slump of concrete shall not exceed 10 inches at the time of batching. Job-site water addition shall not be allowed, and high-range water reducer (superplasticizer) is to be used to increase slump of concrete at the job-site prior to discharge.
4. Incorporate calcium nitrite-based corrosion inhibiting admixture where requires, such as Grace DCI or approved equivalent, at a minimum dosage of 2 gallons per cubic yard, or as noted on drawings.

D. The concrete shrinkage shall not exceed values listed in Table 1 after 28 days of drying, in accordance with ASTM C157 except as modified herein:
1. Cast three, 3-inch by 3-inch by 11-inch, concrete test specimens for shrinkage, and leave in molds covered with plastic in standard laboratory conditions for first 24 hours.
2. De-mold specimens and move to wet cure (>95 percent relative humidity) until a total age of 7 days.
3. Obtain zero-age reading at this time and move specimens to controlled environment per ASTM C157.
4. Perform length-change measurements at 0, 4, 7, 14, 21, and 28 days of drying following wet-cure period and use the 7-day wet-cure reading as the initial comparator reading.

E. Provide concrete mixes shown in Table 1. (see notes below)

Table 1. Concrete Mix Design Requirement Summary

	Full Wall Rebuild	Catwalk and Stairs
Exposure Categories (per ACI 318)	F2, S3, W1, C1	F2, S0, W0, C1
Density	Normal Wt.	Normal Wt.
Compressive Strength, psi (28-day)	5,000 min 8,000 max	5,000 min 8,000 max
w/c	0.45 max	0.45 max
Cementitious Content	600 lb max	600 lb max
Agg Size (nom. max.)	67, 3/4-inch	67, 3/4-inch
Macro Fibers	Optional	Optional
Micro Fibers	No	Optional
Air Content	6.0%	6.0%
Shrinkage	0.4 % @ 28 days max	No Testing Required
Corrosion Inhibitor	Not Required	Not Required

1. w/c = water-to-cementitious materials Ratio, by weight
2. Where two values are present, minimum/maximum are shown,
3. If allowed or required, Micro-synthetic fibers may (shall) be provided in addition based on Manufacturer recommendations to aid in the control of plastic shrinkage cracking.
4. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content shown. Tolerance for air content shall be plus 1.5 percent and minus 1.5 percent of value shown, no additional tolerance allowed.

2.4 CURING MATERIALS

A. Formwork.

B. Moisture-Retaining Cover: ASTM C171, white burlap-polyethylene sheet. 4 mil minimum thickness.

C. Water: Potable.

PART 3 EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork to support vertical, lateral, static, dynamic, and construction loads that might be applied prior concrete rebuild reaching 75 percent of their specified minimum compressive strength.

B. Construct formwork so concrete rebuild are of size, shape, alignment, elevation, and position indicated and tight enough to prevent loss of material.
   1. Ensure flatness and smoothness as required for finish type per Section 3.4.
   2. Chamfer exterior corners and edges of permanently exposed concrete to match existing, if chamfered.

C. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not use form release agents containing waxes, oils, silicones or other resins that may inhibit adhesion of coatings.

D. Provide temporary openings for cleanouts, venting, and inspection ports (witness holes) where the interior area of the formwork is inaccessible. Close openings with panels or dowels tightly fitted to forms and securely braced to prevent loss of material.

3.2 CONCRETE BATCHING AND MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information. The following exceptions and/or specific requirements shall be included:
   1. Aggregate moisture contents shall be accounted for in the batch water and aggregate batch weights.
   2. After introduction of mix water, deliver concrete to Site and discharge within 90 minutes or before 300 revolutions of mixer drum, whichever comes first, unless otherwise approved by the Engineer. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes. Concrete that exceeds the specified time limits shall be rejected, unless approved by the Engineer.
   3. High range water-reducing admixtures may be added on site to increase slump, but only at the guidance of the ready-mix producer. Introduce high-range, water-reducing admixture at the Site with additional mixing per the manufacturer’s recommendations. If unspecified, 70 revolutions of the drum shall be required to ensure proper mixing.
   4. Reject concrete that arrives at the Site with a slump exceeding the maximum specified slump.
   5. Site added water, beyond the amount withheld during initial batching as “trim water”, is not allowed. Do not add water to adjust slump. Do not exceed design w/cm.
   6. No air adjustments may be made at the site after initial discharge of material. This prohibits the addition of either liquid air entraining admixtures, Fritz air entrainment, and Air Minus products.
   7. Fibers: All fibers shall be added at the batch plant in accordance with the manufacturer’s recommendations and ASTM C1116 Type III. Exclude the use of “shredable”, “dissolvable”, “degradable”, or other similar packaging. All fibers shall be removed from packaging when added to the concrete mix.
   8. All tests of record shall be performed after any and all changes or additions to the concrete batch have occurred.

B. Air-entraining and chemical admixtures, when used, shall be incorporated into the mix in amounts and manner recommended by the manufacturer and approved by the Engineer. Accuracy of measurement of any admixture shall be within ± 3 percent. Two or more admixtures may be used in the same concrete provided such admixtures are added separately and that the combination is compatible and has no deleterious effect on the concrete.

C. The temperature of the concrete, when discharged, shall be not less than 65ºF when the air temperature is below 40ºF. If heated water or aggregates are used, the water shall be combined with the aggregates in the mixer before cement is added. Cement shall not be added to mixtures of water and aggregate when the temperature of the mixture exceeds 70ºF.

D. The temperature of the concrete, when discharged, shall not exceed 90ºF. The Contractor is cautioned that difficulty may be encountered with concrete at temperatures approaching 90ºF and every effort should be made to maintain it at lower temperatures.

3.3 CONCRETE PLACEMENT

A. Allow Engineer at least 24 hours to observe forms, screed rails or guides, prepared concrete surfaces, reinforcement, and embedments.

B. Before placing concrete, verify the following:
   1. Surface preparation has been completed in accordance with applicable Specifications and/or Drawings.
   2. Installation of formwork, reinforcement, and embedded items is complete.
   3. Concrete surfaces and forms are clean of frost, ice, mud, debris, and water.
   4. Difference between substrate and concrete temperatures is no more than 20 degrees F.
   5. Forms are thoroughly wetted or oiled.
   6. Reinforcement is securely tied in place and thoroughly cleaned of ice and other coatings that may reduce or destroy bond with concrete.
   7. Required inspections have been performed.
   8. Equipment for mixing and transporting concrete is clean.
   9. Vibrators are operational.

C. For rebuild areas where material will be cast against, and bonded to, existing concrete surfaces, wet existing surface to saturated surface-dry condition at least 1 hour prior to placement. Maintain surfaces at this condition until placement. If forms are filled with water prior to placement to achieve this condition, ensure that standing or flowing water is removed and surfaces are allowed to dry to saturated, surface-dry condition.

D. Convey concrete from the mixer to the place of deposit in a manner such that no segregation or loss of materials occurs.

E. Deposit concrete:
   1. Place concrete as near as possible to its final position to avoid segregation due to re-handling or flowing.
   2. Do not allow concrete to fall a vertical distance greater than 4 feet from the point of discharge to the point of deposit.
   3. Do not allow concrete to disturb or displace reinforcing bars or other embedments.
   4. Place concrete at a rate so that the concrete is plastic and flows readily into corners of forms and into spaces around reinforcing bars.
   5. Place concrete continuously until the member or section is completed, with no cold joints.
   6. Dispose of concrete that has partially set prior to placement or that has been contaminated by foreign material.

F. Consolidate concrete with mechanical vibrating equipment, so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   1. Use internal vibrators with minimum speed of 7,000 vibrations per minute and that are sufficiently narrow to fit into spaces between reinforcing bars, formwork, and existing concrete. Have extra vibrators at the Site in case a vibrator does not work.
   2. Do not use vibrators to transport concrete.
   3. Insert and withdraw vibrators vertically at uniformly spaced locations no farther apart than the visible effectiveness of the vibrator, to rapidly penetrate layer being placed and

at least 6 inches into preceding layer. Do not insert vibrators into lower concrete layers that have begun to lose plasticity.

4. At each insertion, limit the duration of the vibration to the time necessary to consolidate the concrete without causing mix constituents to segregate.

G. Cold-Weather Placement: Protect concrete from physical damage or reduced strength due to frost, freezing, or low temperatures. Comply with ACI 306R and as follows.

1. When the air temperature has fallen or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at the point of placement. Mix water and aggregates together before adding cement. Do not add cement if the temperature of the water/aggregate mixture exceeds 70 degrees F.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix design.

H. Hot-Weather Placement: Protect material from physical damage or reduced strength due to rapid evaporation or overheating of concrete. Do not allow the temperature of the material at the time of placement to exceed 90 degrees F, or as required by the concrete rebuild material manufacturer. When hot-weather conditions exist, use one or more of the following procedures:

1. Place material at night or early in morning when ambient air temperatures are lower.
2. Cool ingredients before mixing to maintain the material temperature below required at the time of placement. Chilled mixing water or chopped ice may be used to control the temperature; include the water equivalent of the ice in the mixing water quantity.
3. Cover rebuild areas with water-soaked burlap so the formwork, concrete substrate and steel temperature does not exceed the ambient air temperature.
4. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
5. Provide windbreaks or sunshades, or both.

3.4 FINISHING TOP SURFACES

A. Do not wet concrete surfaces or add cement prior to or during finishing.

B. Do not use finishing aids of any kind, or any other product added during finishing.

C. Do not apply a trowel finish on concrete rebuild in non-conditioned spaces, or on any rebuild material with air content greater than 3 percent.

D. Default finish types shall be as follows, unless otherwise noted on the construction documents:

1. Float finish: all surfaces to receive a waterproofing or coating. Any surface not otherwise described.
2. Broom finish: all exterior surfaces subject to vehicular and pedestrian traffic.

E. Finish Type Definitions:

1. Float finish: Consolidate the surface with a power-driven float or by hand floating if the area is small or inaccessible to a power driven float (troweling machines with float blades or pans slipped over trowel blades may be used; trowel machines with normal trowel blades or combination blades shall not be used). Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until the surface is left with uniform, smooth, granular texture.

2. Broom Finish: After applying float finish, apply broom finish by drawing a broom across the surface to give the surface a coarse-scored texture. Broom Finish shall be applied perpendicular to traffic flow on top surfaces subjected to pedestrian traffic.

F. The finished surface flatness shall be such that the measured gaps between the surface and a 10-foot-long straightedge resting on two high spots anywhere on the surface does not exceed 1/2 inch.

G. Edge of rebuild shall be flush with adjacent concrete surface with 1/2-inch tolerance.

H. At the 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. DO NOT USE STEEL TROWEL FINISH ON EXTERIOR CONCRETE. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

I. Hot-Weather Conditions: Fog the surface with water if hot, dry, or windy conditions cause moisture loss approaching 0.2 pounds per square foot per hour (estimated per ACI 305R chart) before or during finishing operations.

3.5 FINISHING FORMED SURFACES

A. Provide surface finish 2.0 (SF-2.0) unless otherwise specified, at concrete surfaces exposed to public view, or those to be covered with another material applied to the concrete.
1. Note that coating application may require additional preparation beyond this default. Contractor shall coordinate with coating requirements.

B. Edge of rebuild shall be flush with adjacent concrete surface with 1/2-inch tolerance.

C. Surface Finish Type Definitions:
1. Surface Finish-2.0 (SF-2.0): Rebuild voids larger than 3/4-inch wide or 1/2-inch deep. Rebuild or patch all form tie holes and similar construction related blemishes. Limit abrupt (over 1-inch or less) or gradual (5-foot straight edge) concrete rebuild surface irregularities to 1/4-inch (ACI 117 Class B).
2. Surface Finish-3.0 (SF-3.0): Rebuild voids larger than 3/4-inch wide or 1/2-inch deep. Rebuild or patch all form tie holes and similar construction related blemishes. Limit abrupt (over 1-inch or less) or gradual (5-foot straight edge) concrete rebuild surface irregularities to 1/8-inch (ACI 117 Class A).

3.6 JOINTS

A. Construction Joints:
1. Construct joints true to line with faces perpendicular to the surface plane of the concrete rebuild.
2. Place joints perpendicular to the main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
3. Provide sufficient joints so that members or sections can be cast continuously.
4. Form keyed joints as indicated on drawings. Embed keys at least 1 1/2 inches into concrete.
5. Locate joints in slabs, beams, joists, and girders in middle third of spans. Offset joints in girders a minimum distance of twice the beam width from beam-girder intersection.

6. Locate horizontal joints in walls and columns at the underside of slabs, beams, and girders and at the top of footings. Do not allow inclined joints.
7. Space vertical joints in walls as shown on the construction drawings. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

B. Control Joints:
1. Construct joints true to line with faces perpendicular to the surface plane of the rebuild.
2. Provide tooled control joints, as default unless adjacent construction uses sawcut joints.
3. If sawcut joints are necessary, sawcut as soon as possible without damaging surface of rebuild. In no instance shall this occur after the rebuild material is expected to reach 1,500 psi. Sawcut joints at least 1/3 of slab depth or 1 inch, whichever is greater. Do not damage reinforcing with sawcut.

3.7 REMOVAL OF FORMWORK

A. Structural Elements: Leave formwork for beam soffits, joists, slabs, and other structural elements that support the weight of concrete in place for seven days, or until concrete rebuild/repair material has achieved at least 75 percent of specified 28-day compressive strength based on filed cured cylinders. Remove forms only if shoring has been arranged to permit removal of forms without loosening or disturbing shoring.

3.8 CURING AND PROTECTION

A. General:
1. Curing method shall be applied within 30 minutes of material finishing.
2. Curing period shall be seven days. Maintain material in a moist condition for at least seven days after placing.
3. Curing method shall be as noted below:
   a. Unformed Top Surfaces: Moisture retaining cover (first three days minimum), curing compound acceptable thereafter, install within 30 minutes of removing cover.
   b. Unformed Vertical and Overhead Surfaces: Curing compound
   c. Formed surfaces: Formwork, as specified in Section 2.1, shall meet requirements of curing for these elements. If formwork is removed prior to full curing period, install curing compound within 30 minutes of removing formwork.

B. Curing Methods:
1. Moisture-retaining cover
   a. Place cover in widest practicable width, with sides and ends lapped at least 12 inches.
   b. Seal sides and ends of cover by holding down with soil, concrete pieces, or some other weight, or by using waterproof tape or adhesive.
   c. Immediately repair holes or tears in cover during curing period, using cover material and waterproof tape.
   d. Re-wet rebuild surface as necessary to maintain in moist condition.
2. Curing compound
   a. Apply curing compound uniformly in a continuous operation by power spray or roller according to manufacturer's written instructions and recommended coverage rate.
   b. Recoat areas subjected to heavy rainfall within three hours after initial application.
   c. Maintain continuity of compound and repair damage during curing period.

C. Cold Weather Protection: Provide protection such as blankets, heated blankets, insulation, enclosures, and/or heaters to keep concrete protected from cold temperatures and frost.
   1. Protection methods shall be installed immediately following installation of curing method.
   2. Maintain concrete rebuild material above 55 degrees F until it has reached 3,500 psi based on maturity data, or seven days, whichever is less.

3.9 QUALITY CONTROL

A. Review and submit batch tickets to engineer for ready-mix concrete within 48 hours of placement.

B. Hammer tap concrete replacements to locate delaminations. Remove and recast delaminated replacements at no cost to Owner.

C. Test results shall be reported in writing DIRECTLY to Owner's Representative, Engineer, concrete supplier, and Contractor within 48 hours of testing.

D. Fresh cementitious material testing shall include:
   1. Plastic air content per ASTM C231
   2. Slump or spread per ASTM C143 or ASTM C1611, respectively. Spread shall be for all self-consolidating concretes.
   3. Unit weight per ASTM C138
   4. Test frequency shall be first truck and every 4th truck thereafter.

E. Sampling and testing of fresh rebuild material for compressive strength shall be performed by the testing agency according ASTM C39 and the following requirements:
   1. Fabrication of compressive strength specimens shall be 4 by 8-inch cylinders based on the following:
      a. Cylinders shall be fabricated for aggregate extended mortars, or concrete, and rebuild locations which include the use of pre-placed aggregate. Pre-placed aggregate samples shall be fabricated in a manner similar to the concrete rebuild placement.
   2. Take test sample from point of discharge onto final structure according to ASTM C172. Take additional samples at other locations only if directed by Engineer.
   3. Frequency of testing shall be a minimum of once per placement on the first truck, and once every 4th truck thereafter.

F. Material Compressive Strength Testing.
   1. Testing shall be performed by testing agency ONLY.
   2. Testing shall be in conformance with ASTM C39.
   3. A strength test shall be considered three 4 by 8-inch cylinders.
   4. Compressive strength sample fabrication shall include adequate numbers of samples such that testing can be performed as noted blow.

Compressive Strength Testing Ages and Quantity

Curing Method	Standard Cured	Field Cured	TOTAL
Strength Test Age(s)	3@3 days 3@7 days 3@28 days	None.	
Total Number of Cylinders to be cast and tested	9	None.	**9**

a. Additional strength tests at earlier ages may be performed at the Contractors option.
b. All confirmations of in-situ strength for stripping of forms or removal of shoring shall be based on maturity data.
c. Standard-cured (lab-cured):
   1) Store specimens at the Site for at least 16 hours at a temperature of 60 to 80 degrees F. Provide a temperature-controlled box or other enclosure if necessary.
   2) After at least 16 hours, but not more than 30 hours, transport the specimens to the laboratory and air cure at 73 degrees F and 100 percent relative humidity.
d. Field-cured: Cure in the vicinity of the area that they represent and in the same manner as the rebuild material.

G. Conformance Requirements:
1. Air content test requirements: Air content shall be within the tolerance of this specification. Concrete with an air content outside of the tolerance listed shall not be placed and shall be rejected.
2. Compressive strength requirements: Compressive strength is satisfactory if the average of the 28-day standard-cured compressive-strength tests equals, or exceeds, the specified 28-day compressive strength and no test value is more than 500 pounds per square inch less than the specified 28-day strength.

H. Non-Conforming Materials: If tests indicate that the material or preparation is not in conformance with the Contract Documents, remove and replace non-conforming concrete or perform additional testing, acceptable to Engineer, to verify conformance with the Contract Documents, at no cost to Owner. Additional testing may include:
1. If tests indicate that the slump, air entrainment, or other requirements have not been met, examine core samples petrographically, according to ASTM C856, to evaluate hardened concrete characteristics. If petrographic study indicates that acceptance criteria are not met, remove and replace non-conforming concrete areas at no cost to Owner.
2. If compressive strength test results do not meet the acceptance requirements, procure core, test and submit results for three core samples in accordance with ASTM C42 from each portion of the structure represented by the unsatisfactory test results. Material shall be considered acceptable if the average of three cores is equal to 85 percent of the design strength, and no single test is less than 75 percent of the design strength. If strength acceptance criteria are not met, remove and replace non-conforming concrete areas at no cost to Owner.

I. The Contractor shall visually review, and mechanically sound using a chain or hammer, each rebuild/repair area for defects after curing and protection. In addition to the requirements of this document, the following additional items shall constitute non-conformance of the Work or material:
1. Voids, spalls, bugholes, honeycomb, rock pockets, and form-tie voids, more than 2 percent of the rebuild surface area, or those which compromise strength.
2. Cracks greater than 0.010-inch-wide (or in large numbers) which appear in concrete during the curing period, and any that penetrate to the depth of reinforcement or completely through section. Notify Engineer immediately of cracks that penetrate completely thought the cross section.
3. Latent defects or those not on exposed surfaces that affect concrete's durability and structural performance as determined by Engineer.

4. Surface finish that does not meet specified requirements.
5. Offsets at perimeter exceeding those specified.

J. Perform additional inspection and testing, at no cost to the Owner, to determine the compliance of replaced or additional work with the specified requirements.

3.10 NON-CONFORMING WORK OR MATERIALS:

A. If tests or observations indicate that the material, or Work, is not in conformance with the Construction Documents, at no cost to Owner, or Engineer, either:
   1. Perform additional testing acceptable to Engineer to verify conformance with the Construction Documents.
   2. Repair or remove and replace material or Work.
   3. Repair or replace non-conforming Work or materials using alternate repair approved by Owner and Engineer.

B. Perform additional inspection and testing, at no cost to the Owner, to determine compliance of replaced, or additional corrective Work.

C. Additional time and expenses for Engineer resulting from non-conforming Work or material may be back-charged to the Contractor, or withheld from payment to the Contractor at the Owners option.

END OF SECTION

05 52 00

ALUMINUM GUARDRAILS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes guardrails, handrails and kick plates along with all necessary mounting and installation hardware.

B. Furnish all labor, materials, tools, equipment, and supervision necessary for installation of aluminum guardrails.

1.2 PRICES

A. Perform work on a cost per linear foot basis.

1.3 REFERENCES

A. Aluminum Association, Inc. (AA):
   1. SAS-30: Specifications for Aluminum Structures

B. Aluminum Welding Society (AWS):
   1. D1.2/D1.2M: Structural Welding Code - Aluminum

C. ASTM International (ASTM), most recent edition:
   1. B209: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
   2. B211: Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, Wire.
   3. B221: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
   4. B247: Standard Specification for Aluminum and Aluminum Die Forgings, Hand Forgings and rolled Ring Forgings.
   5. B429: Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
   6. E985: Standard Specification for Permanent Metal Railing Systems and Rails for Buildings

D. International Code Council (ICC):
   1. 2018 International Building Code (IBC)

1.4 SUBMITTALS

A. Product Data: Provide product data for all system components indicating compliance with this section.

B. Calculations or Load Tests: Submit test results from ASTM E935 conducted on the manufacturer’s supplied system indicating compliance with required design and performance requirements.

C. Shop Drawings: Shop drawings for fabrication and installation of pipe and tube railings. Include plans, elevations and detail sections. Indicate materials, methods, finishes and types of joinery, fasteners, anchorages and accessory items.

D. Installation Instructions (segmental systems only): Complete procedures for proper installation of the guardrail system, including all necessary components and required steps.

E. Maintenance Data: Submit for finished aluminum components including cleaning materials, methods, and precautions.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

A. Comply with requirements of building authorities having jurisdiction in Project location and the following:
   1. Handrail Standard: ANSI A1264.1
   2. Occupational Safety and Health Administration - 29 CFR 1910.23 - Guarding floor and wall openings.
   3. 2010 ADA Standards for Accessible Design.

B. Top of guardrail shall be installed at 42 inches above adjacent walking surface and designed to meet the requirements to serve as a handrail, and match the existing handrails present at the stairs in front of the clarifier entrances. At tank perimeter where no walking surface is adjacent, guardrail shall be 42 inches above top of tank.

C. Provide 4-inch-tall kickplate at base of all components adjacent to walking surfaces.

D. All components and connections to the concrete structure shall be designed by an Engineer licensed in the State of Colorado to withstand the effects of gravity loads as well as a live load on handrails and intermediate rails within allowable stress limits in accordance with appropriate material building code as referenced in IBC 2018 (i.e. concrete anchors per ACI 318). Live loads on handrails and intermediate rails shall be:
   1. Uniform load of 50 lbf/ft. applied in any direction.
   2. Concentrated load of 200 lbf applied in any direction.
   3. Uniform and concentrated loads need not be assumed to act concurrently.

E. Load testing to demonstrate compliance of system is acceptable if performed in accordance with ASTM E935 with no failure of any component and no permeant deflection (full rebound of system after removal of loading). System testing shall include connection hardware in similar configuration as to contemplated.

F. Provide expansion joints for horizontal elements as necessary to accommodate thermal movement without distress to the system.

1.6 QUALITY ASSURANCE

A. Field Measurements: Take field measurements prior to preparation for guardrail installation. Verify dimensions on site prior to shop fabrication for proper connection to structure.

B. Sequence: Coordinate guardrail installation with coating work.

C. Mockup: Install mockup consisting of one section adjacent to west end to verify selection and adequacy of railing system and to set quality standards for installation.

1.7 WARRANTY

A. The completed installation of guardrail system shall be guaranteed jointly and severally by the product Manufacturer and Contractor against defects in material and application, for a period of five (5) years from the completion of the application.

B. Any work proving defective within five (5) years from the date of acceptance shall be corrected at no cost to the Owner.

PART 2 PRODUCTS

2.1 APPROVED PRODUCTS

A. Use one of the following systems, or approved equal:
   1. Series 500 Aluminum Pipe Railing System by Superior Aluminum Products, Inc.
   2. Kee Lite Smooth Railing System by Kee Safety, Inc.
   3. TABCO Aluminum Railing by Tuttle.
   4. Smooth Aluminum Handrail by Modular Railing Systems.

B. Alternate systems must meet the requirements of this Specification and shall not be used without prior approval by Owner and Engineer.

2.2 RAILING MATERIALS

A. Shapes, configurations, and sizes: As shown in the product data.

B. Horizontal Pipe Rail Guard Railing:1.9-inch outer diameter, schedule 40 pipe (inner diameter 1.5 inches)

C. All fasteners shall be in accordance with the railing manufacturer's requirements such that final system meets the design and performance requirements of this section.
   1. Concealed fasteners on all handrails.

D. All components shall be of compatible metals to prevent galvanic corrosion.

E. Do not embed railing in concrete or cementitious materials (grout), use mounting bases only.

2.3 FABRICATION

A. Components or railing sections shall be fabricated at the manufacturing facility in largest practical site delivery sizes.

B. Pipe cuts shall be square and accurate for minimum joint-gap. Cuts shall be clean and free of chamfer, from deburring, nicks and burrs.

C. For railings that are angled horizontally, machine castings shall be incorporated to provide proper angle.

PART 3 EXECUTION

3.1 INSTALLATION

A. Assemble railing sections in accordance with manufacturer's installation instructions, current code requirements, Drawings, and requirements provided in this Specification.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form work true to line and level with accurate angles and surfaces.

D. Do not allow any gaps larger than 4-inches between adjacent guardrails.

E. Securely anchor to structure in accordance with manufacturer's instructions to meet the performance requirements of this Specification.

F. Install all fasteners in accordance with manufacturer's installation instructions and requirements provided in this Specification.

G. Tighten all fasteners so that completed railing is rigid and free of play at joints and component attachments.

H. Install concealed fasteners for interconnecting railing components and for attaching them to other Work, unless exposed fasteners are unavoidable or are standard fastening method for handrail and railing indicated.

I. Provide and install washers as required to allow proper fastener bearing.

J. Install gates and adjust hardware for smooth operation. After installation, test gate. Open and close a minimum of five times. Correct any deficiencies and adjust.

K. Expansion Joints: Provide expansion joints for continuous spans in excess of 40 feet. Construct joints by deleting structural attachment from one end of the spliced joint so that it is free to move in or out of the pipe (longitudinal movement only). If a joint is provided every 30 feet, the width of the gap should allow 1/8 inch expansion for each 40 degrees F of expected temperature rise from material installation temperature. Correct for other lengths.

3.2 ERECTION TOLERANCES

A. Install railings plumb and level, securely fastened, with vertical members plumb.
   1. Maximum variation from plumb: 1/4 inch.
   2. Maximum misalignment from true position: 1/4 inch.
   3. Maximum misalignment between adjacent separated members: 1/8 inch.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation and installation of sealant in joints.

1.2 PRICING

A. Joint sealant shall be paid for a on a cost per linear foot basis.

1.3 SUBMITTALS

A. Product data.

B. Field testing report.

C. Warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Experienced firm that has successfully completed sealant work similar in material, design, and extent to that indicated for Project; that is approved, authorized, or licensed by sealant manufacturer to install sealant; and that is eligible to receive sealant manufacturer's warranty. Must have successful installations of specified materials in local area in use for minimum of five years.
   1. Employ foreman with minimum five years of experience as foreman on similar projects, to be on Site at all times during Work. Do not change foremen during the course of the Project except for reasons beyond the control of the Installer; inform Engineer in advance of any changes.

B. Compatibility Tests: Include sealant and sealers or coatings that may come into contact with sealant following sealant installation.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside below 40 degrees F (5 degrees C), or expected to be below 40 degrees F within 12 hours, or are above or below sealant manufacturer's recommended limitations.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
   5. When joint preparation, which may include cleaning substrate surfaces, removing inclusions, and repairing substrate surfaces have not been performed or performed adequately.

1.6 WARRANTY

A. Manufacturer's Warranty:
   1. Written warranty, signed by sealant manufacturer. Manufacturer's standard form in which sealant manufacturer agrees to furnish the specified joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   2. Defective sealant includes leakage through sealed cracks, debonded sealant, loss of cohesion, or other distress associated with material deficiencies.
   3. Warranty may exclude deterioration or failure of elastomeric joint sealants from the following:
      a. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
      b. Disintegration of joint substrates from natural causes exceeding design specifications.
      c. Mechanical damage caused by individuals, tools, or other outside agents.
      d. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.
   4. Warranty Period: 5 years from date of Substantial Completion.

B. Installer's Warranty:
   1. Completed warranty form signed by sealant Installer. Warranty form included in section 00 65 36.
   2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 ELASTOMERIC JOINT SEALANTS

A. Comply with ASTM C920 and other requirements indicated.

B. Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing on similar projects, mockups and preconstruction testing for Project, and field experience.

C. Select products based on mockups, preconstruction testing, and sealant manufacturer's previous testing and experience.

D. Source Limitations: Obtain each type of joint sealant through one source from single manufacturer.

E. Colors of Exposed Joint Sealants: Selected and approved in writing by Owner's Representative, from sealant manufacturer's full range.

A. For immersion conditions beneath coating system: Non-sag, two-component polyurethane or polysulfide sealant:
   1. Sikaflex-2c NS EZ, by Sika Corporation
   2. Thiokol 2235M, by PolySpec LP.
   3. Approved equal.

2.2 AUXILIARY MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote adhesion of sealants to joint substrates.

C. Backer Rod: Closed cell polyethylene.

D. Bond Breaker: As recommended by sealant manufacturer.

E. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

A. Remove existing sealant and other foreign material from joints.

B. Repair damaged or deteriorated substrate surfaces according to sealant manufacturer's written instructions, as detailed and as approved by Engineer.

C. Clean joint substrates immediately before installing sealant, to comply with sealant manufacturer's written instructions based on mockups and preconstruction testing.
   1. Remove from substrate foreign material that could interfere with adhesion of sealant, including dirt, dust, existing sealant, oil, grease, and surface coatings.
   2. Provide dry substrate; prevent wetting of substrate prior to sealant installation.
   3. Clean porous substrates, such as concrete, masonry, stone, wood, by brushing, grinding, blast-cleaning, mechanical-abrading, or combination of methods to produce clean, sound substrate capable of developing optimum bond with sealant. Remove laitance and form-release agents from concrete. Remove loose particles remaining after cleaning operations by vacuuming or blowing out joints with oil-free, compressed air.
   4. Clean nonporous surfaces, such as metal, with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of sealant.

3.2 INSTALLATION OF SEALANT

A. General: Comply with these documents and sealant manufacturer's written installation instructions for products and applications indicated, based on mockups and preconstruction testing. Notify Engineer of discrepancies between these documents and manufacturers typical details, written recommendations or instructions. Engineer shall determine which apply.

B. Joint Priming: Prime all porous joint substrates. Prime additional substrates where recommended in writing by sealant manufacturer, based on mockups and preconstruction testing. Apply primer to comply with sealant manufacturer's written instructions.

1. Confine primer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.
2. Limit priming to areas that will be covered with sealant in same day. Unless recommended otherwise by sealant manufacturer, reprime areas exposed for more than 24 hours.

C. Install sealant backer and position to produce cross-sectional shape and proper depth of installed sealant.
1. Use properly-sized backer. Do not use multiple-backer units or braided-backer units to accommodate wide joints.
2. Install backer with device that will provide consistent depth between substrate surface and outer surface of backer.
3. Do not leave gaps between ends of sealant backers.
4. Do not stretch, twist, puncture, or tear sealant backers.
5. Remove wet backers and replace with dry materials.

D. Install bond-breaker tape at back of designated joints.

E. Install sealant immediately after installing backer material; to produce uniform, cross-sectional shape and depth; to directly contact and fully wet joint sides and backer material; and to completely fill recesses in joint configuration.
1. Install sealant flush with surface.
2. Immediately after sealant application and before skinning or curing begins, tool joint with slightly concave surface, compressing sealant into joint to form smooth, uniform sealant bead; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Do not use tooling agent.
    a. Remove excess sealant from surfaces adjacent to joints.
    b. Provide concave joint configuration per contract documents and Figure 5A in ASTM C 1193, unless otherwise indicated.

3.3 QUALITY CONTROL

A. At completion of Project, observe installed sealant for damage or deterioration. If damage or deterioration occurs, neatly cut out and remove damaged or deteriorated sealant, prepare and prime surfaces, and install new sealant. Replace sealant immediately so new sealant is indistinguishable from original Work.

B. Field-Adhesion Testing: Contractor to perform the following testing and submit log of test results to Owner and Engineer. Notify Owner of testing schedule and provide access to test locations for Owner/Engineer review Contractor to perform non-destructive and destructive field adhesion tests on sealant in accordance with ASTM C1521
1. Non-destructive testing per ASTM C1521, possible procedures:
    a. Depress center of sealant bead with probing tool to depth of 50 percent of bead width; or
    b. Depress sealant bead near substrate bond-line until it appears visually that sealant is about to fail in cohesive; or
    c. Apply uniform pressure with roller no more than one-half sealant bead in width, to create depression that represents approximately 50 percent of sealant deflection; advance roller along centerline of sealant bead; and note anomalies in sealant performance.
    d. Record anomalies in sealant performance, if failures are adhesive or cohesive, and maximum surface depression as percent of joint or crack width.

e. Perform test every 24 inches for first 100 linear feet of joint or crack; if no test failure is observed, test every 5 feet thereafter.

2. Destructive testing, Method A:
   a. Cut 6-inch-long tail of sealant loose from substrate.
   b. Mark tail 1 inch from adhesive bond.
   c. Grasp tail 1 inch from adhesive bond and pull until tail extends to 2 times published movement capability of sealant. If sealant has not failed, continue pulling to failure.
   d. Record elongation at failure and if failure was adhesive or cohesive.
   e. Observe sealant for complete filling of joint or crack with absence of voids, and for joint or crack configuration in compliance with requirements. Record observations and sealant dimensions
   f. Perform test every 100 feet for first 1,000 linear feet of joints and cracks; if no test failure at 2 times movement capability occurs, test every 400 feet thereafter.
   g. Test reports will include date when sealant was installed, name of person who installed sealant, test date, test location, and whether primer was used.
   h. Immediately after testing, replace failed sealant in test areas. Neatly cut out and remove failed sealant, prepare and prime surfaces, and install new sealant. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
   i. Sealant not evidencing adhesive failure from testing or noncompliance with requirements will be considered satisfactory.

3. If testing determines that sealant has failed adhesively from testing or does not comply with requirements, additional testing will be performed to determine extent of non-conforming sealant. Neatly cut out and remove non-conforming sealant, prepare and prime surfaces, and install new sealant. Perform field adhesion tests on new sealant. Additional testing and replacement of non-conforming sealant shall be at Contractor's expense.

END OF SECTION