PERSIGO WASTE WATER TREATMENT PLANT
Anaerobic Digester Repairs
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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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 and Elevators: Use of Owner's existing stairs and elevators 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 sidewalks, and adjacent building areas from mechanical damage due to scaffolding and other equipment.

D. Prevent dust, debris, coating overspray/spatter, and other construction materials from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other 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 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 07, 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 07 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 07 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 roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, 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 03 01 01

SHORING

PART 1 GENERAL

1.1 SUMMARY

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

1.2 PRICES

A. Shoring shall be included in the overall cost to perfrom the Work and not paid for separately.

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

Project

Project Name:

Project Number:

Date:

Mixer/Batching Team Name(s):

Repair Application (Form-and-pump overhead, top surface, top surface rapid-set, etc.):

Mixer Type:

Prepackaged Repair Material Information

Name:

Lot #:

Minimum WT or Volume of Water:

Maximum WT or Volume of Water

Admix volume required:

Aggregate

Name/Description:

Manufacturer or Supplier:

Size (in):

Batch #	Time	Ambient Air Temp	Prepackaged Material Temp	Prepackaged Material Weight (bag wt.)	Prepackaged Material Admixture Volume	Aggregate Weight	Aggregate Moisture Condition (SSD, etc.)	Water Weight or Volume	Mixing Time	Final Mixture Temp	Notes (batch where testing was performed, etc.)

SECTION 03 01 34

CONCRETE REPAIRS - PREPACKAGED MATERIALS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Supply and placement of prepackaged concrete repair materials, including formwork, batching procedures, placement procedures, finishes, curing and protection.

1.2 PRICES

A. Perform Work on unit price basis. Unit prices below include concrete removal, surface preparation of steel and concrete surfaces, and installation of supplemental reinforcing, prior to placement:
   1. Vertical-surface repair, full depth. Payment based on surface area of removal area from one surface and average depth of 4 inches.
   2. Top-surface coping repair, full depth. Payment based on surface area of removal area, and average height of 12 inches.

1.3 DEFINITIONS

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

B. Testing Agency: Third party testing agency qualified to perform the testing specified. Refer to Specification Section 01 40 00 for additional requirements.

C. Batch: Either of the following:
   1. A quantity of material mixed at one time or in one continuous process;
   2. To weigh or volumetrically measure and introduce into the mixer the ingredients for a quantity of material.

D. Mixture: The assembled, blended comingled ingredients of the concrete repair material or the proportions of its assembly.

1.4 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 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 Owner and Engineer in advance of any changes.

B. Mockups: Construct mockups to demonstrate construction procedures, quality of Work, and aesthetic effects.
   1. Mockup and Quality Testing shall be completed in full prior to proceeding with Work. If the Contractor wishes to proceed with Work prior to completion, they may proceed at their

own risk. Any revisions or additional Work as a result of proceeding shall be the sole responsibility of the Contractor and no other party.

2. Construct mockups with at least:
   a. Vertical-surface: 2 adjacent corner spall repairs
3. Mockup locations will be selected by Engineer after schedule and work sequence is submitted by contractor.
4. Use personnel, equipment, materials, and procedures proposed for use on Project.
5. Construct mockups on existing members under same weather conditions expected during Work.
6. Provide access to mockup locations during work and after to allow for completion of observations and testing.
7. Engineer will observe the following conditions prior to the Contractors work proceeding on mockup (hold points). Provide Owner and Engineer with a schedule for mockup activities at least one week prior to start of mockup work. Clearly define sequence of work including required Engineer hold point observations. **Mockup shall be coordinated and staffed to allow for hold point observations to be completed during back to back work days, afternoon of one day to morning of next.** Group all mockups such that visits for different repair types are prepared and ready for review during the same visits. Additional visits to review hold points may be charged to the Contractor, or withheld from payment. Allow Engineer 24 hours to observe work at each hold point, complete all work indicated prior to Engineer Visit.
   a. Engineer Hold Point Visit 1:
      1) Concrete and steel surface preparation work.
      2) Prepared and cleaned concrete removal areas including prepared concrete and steel surfaces (prior to coating)
      3) Steel coating application.
   b. Engineer Hold Point Visit 2:
      1) Completed concrete and steel surface preparation, including completed steel coating installation.
      2) Installation of concrete repair material
         a) Batching
         b) Testing
         c) Finishing
      3) Installation of curing and protection measures
8. Coordinate performance of, or perform, quality control measures and testing as required by this section; including, but not limited to (see Quality Control for Responsible Entity):
   a. Reinforcing inspections
   b. Fresh or plastic concrete repair material testing
   c. Compressive strength testing
9. If Engineer or Owner determines mockup does not comply with requirements, modify mockup or construct new mockup until mockup is approved. Remove and replace mockups that are not approved.
10. Approved mockups shall be maintained in undisturbed condition throughout Project as basis for acceptance of completed work and may become part of completed Work if undisturbed at time of Substantial Completion.
11. Do not proceed with repair Work until mockups have been approved by Engineer and Owner.

1.5 SUBMITTALS

A. Formed vertical and overhead repair material product data.

B. Aggregate compliance with C33.

C. Batch Logs.

1.6 WARRANTY

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

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 repair 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-Release Agent: Commercially-formulated form-release agent that will not bond with, stain, or adversely affect the concrete repair 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 PREPACKAGED CONCRETE REPAIR MATERIALS

A. Formed Vertical and Overhead Repairs
   1. Pour pre-blended aggregate and mortar or neat mortar extended with aggregate per manufacturer's recommendations during batching: Use product specifically intended for this application, for which the Contractor has had proven successful experience installing. Use one of the following, or approved equal:
      a. MasterEmaco S 440 manufactured by BASF Construction Chemicals, LLC.
      b. Sikacrete 211 SCC Plus manufactured by Sika Corporation.

B. Do not use materials that contain added gypsum.

C. Provide all like materials with the same manufacturers lot number.

D. Testing of concrete repair material(s), in final batched project condition, shall confirm the following properties:
   1. 28-day Compressive Strength (ASTM C39).
      a. 5,000 pounds per square inch, minimum. This strength shall be considered the minimum specified compressive strength, regardless of the proprietary repair material manufacturers published compressive strength data.

2.3 CURING MATERIALS

A. Membrane-Forming Curing Compound (vertical and overhead repairs only): ASTM C309, Type 2; VOCs less than legal limits. Silicate materials shall not be used.

B. Water: Potable.

PART 3 EXECUTION

3.1 GENERAL

A. Follow the requirements of these specifications and the prepackaged repair material manufacturer's written instructions, whichever is more stringent as determined by the Engineer. If a conflict is identified between these specifications and the manufacturer's written instructions, notify the Engineer prior to performing Work and Engineer will determine which requirements apply.

3.2 FORMWORK

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

B. Construct formwork so concrete repairs 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 3.6.
   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.

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.

3.3 BATCHING AND MIXING

A. Ensure that all materials have been stored and pre-conditioned to proper temperatures as required by the prepackaged repair material manufacturer.

B. Batch materials by weight on basis of whole bags of prepackaged repair material, NEVER USE PARTIAL BAGS.

C. Mix materials in appropriate mixer (drum or paddle type) as specifically required by the prepackaged repair material manufacturer. Provide sufficient number or size of mixer(s) so that placement operations will proceed uninterrupted at each placement location.

D. Ensure that all mixer elements are cleaned of all materials from previous batch, and mixer components have been pre-wetted or charged prior to batching.

E. Mix ingredients to uniform consistency with mixing times per the manufacturer's recommendations or instructions.

F. Compile a Batch Log for each batch of material. A sample batch log containing the minimum information required is attached to this Section.

G. Cold-Weather: Protect material from physical damage or reduced strength due to frost, freezing, or low temperatures.
   1. When the air temperature has fallen or is expected to fall below 40 degrees F, uniformly heat water, aggregates, and cement (prepackaged materials) before mixing to obtain a mixture temperature of not less than 50 degrees F and not more than 80 degrees F at the point of placement; no single component shall be less than 40 degrees F or more than 90 degrees F prior to mixing. 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.

3.4 PLACEMENT (GENERAL)

A. For repair 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.

B. Do not allow material to fall a vertical distance greater than 4 feet from the point of discharge to final position.

C. Do not allow material to disturb or displace reinforcing bars or other embedded items.

D. Place material at a rate so that the material is plastic and flows readily into corners of forms or openings and into spaces fully around reinforcing bars.

E. Place material continuously until the repair volume or section is completed, with no cold or construction joints unless explicitly approved in writing by Engineer prior to placement.

F. Dispose of material that has partially set prior to placement or that has been contaminated by foreign material.

G. Cold-Weather Placement: Protect material from physical damage or reduced strength due to frost, freezing, or low temperatures.

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 repair 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 repair areas with water-soaked burlap so the formwork, concrete substrate and steel temperature does not exceed the ambient air temperature.
4. Provide windbreaks or sunshades, or both.

3.5 FORM AND POUR PLACEMENT

A. Place material as near as possible to its final position to avoid segregation due to re-handling or flowing.

B. If conventional repair materials are used (non-SCC), consolidate material with mechanical vibrating equipment, so that the material is thoroughly worked around reinforcement and other embedded items and into corners.
1. Use internal vibrators with a 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 repair material.
3. Insert and withdraw vibrators vertically at uniformly spaced locations no farther apart than the visible effectiveness of the vibrator.
4. At each insertion, limit the duration of the vibration to the time necessary to consolidate the material without causing constituents to segregate.

3.6 FINISHING FORMED SURFACES

A. Provide surface finish 2.0 (SF-2.0) unless otherwise specified, at concrete surfaces exposed to public view.

B. Edge of repair shall be flush with adjacent concrete surface with 1/8-inch tolerance.

C. Do not apply a rubbed finish.

D. Surface Finish Type Definitions:
1. Surface Finish-2.0 (SF-2.0): Repair voids larger than 3/4-inch wide or 1/2-inch deep. Repair 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 repair surface irregularities to 1/4-inch (ACI 117 Class B).

3.7 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 Vertical and Overhead Surfaces: Curing compound
    b. 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. 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 repair material above 55 degrees F until it has reached 3,500 psi based on field cured concrete cylinders, manufacturer's test data (if testing is for cubes, value shall be 4,250 psi), or seven days, whichever is less.

3.8 REMOVAL OF FORMWORK

A. Non-structural elements: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support the weight of the structure or concrete, may be removed after curing at not less than 24 hours, provided concrete is hard enough not to be damaged by form-removal operations.

B. 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 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.

3.9 QUALITY CONTROL

A. Sampling and testing of fresh repair material shall be performed by the Testing Agency retained by the Owner according to the following requirements:
1. 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.
2. Fresh repair material tests shall include:
a. Unit weight (ASTM C138)
b. Slump (ASTM C143) or Spread (ASTM C1611)
c. Temperature (ASTM C1064)
d. Fabrication of compressive strength specimens (as defined below)
3. Fabrication of compressive strength specimens shall be 4 by 8-inch cylinders.

B. Material Compressive Strength Testing.
1. Testing shall be performed by Testing Agency retained by Owner.
2. A strength test shall be considered three 4 by 8-inch cylinders.
3. 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)	28 days	3 days	
Total Number of Cylinders to be cast and tested	3	3	**6**

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 field-cured specimens cast at the Contractors discretion/option and shall be in addition to those minimums shown.

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 repair material.

4. Conformance Requirements: Material testing 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. Strength tests confirming 28-day strength are acceptable at earlier ages.
   a. If the Contractor has elected to reduce lap lengths based on using a higher compressive strength material, test results shall be provided confirming that the strength meets the strength shown for lap lengths used. i.e. if lap lengths for 8,000 psi material are used, strength tests must confirm that 8,000 psi is achieved for the material

C. The Contractor shall visually review, and mechanically sound using a chain or hammer, each 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 repair Work or material:
   1. Delaminations.
   2. Voids, spalls, air bubbles, honeycomb, rock pockets, and form-tie voids, more than 2 percent of the repair surface area, or those which compromise strength.
   3. Crazing and cracks in excess of 0.010 inch wide, 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.
   4. Latent defects or those not on exposed surfaces that affect concrete's durability and structural performance as determined by Engineer.
   5. Surface finish meets specified requirements.
   6. Offsets at perimeter exceeding those specified.

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. Remove and replace material or Work.
   3. Repair or replace non-conforming Work or materials using alternate repair approved by Owner and Engineer.
   4. Provide an extended warranty for the repairs as deemed acceptable to the 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

SECTION 03 21 00

REINFORCING STEEL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Coating existing reinforcing bars and embedded steel with corrosion-inhibiting material.
   2. Supply, fabrication, and installation of new supplemental mechanical anchors.

1.2 PRICES

A. Perform the following Work on unit price basis:
   1. Supply, fabrication, and installation of new supplemental mechanical anchors. Payment shall be included in concrete replacement cost.
   2. Coating of existing reinforcing bars shall be included in concrete replacement cost.

1.3 QUALITY ASSURANCE

A. Contractor Qualifications: Experienced firm that has successfully completed concrete repair work and installation of helical anchors 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 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 Owner and Engineer in advance of any changes.

B. Mockups: Construct mockups to demonstrate construction procedures, quality of Work, and aesthetic effects.
   1. Installation of new helical anchors at one panel where supplemental mechanical anchorage is designated.
   2. Mockup locations will be selected by Engineer after schedule and work sequence is submitted by contractor.
   3. Use personnel, equipment, materials, and procedures proposed for use on Project.
   4. Construct mockups on existing members under same weather conditions expected during Work.
   5. Provide access to mockup locations during work and after to allow for completion of observations and testing.
   6. If Engineer or Owner determines mockup does not comply with requirements, modify mockup or construct new mockup until mockup is approved. Remove and replace mockups that are not approved.
   7. Approved mockups shall be maintained in undisturbed condition throughout Project as basis for acceptance of completed work and may become part of completed Work if undisturbed at time of Substantial Completion.
   8. Do not proceed with repair Work until mockups have been approved by Engineer and Owner.

C. Mockup for surface preparation of embedded reinforcing shall be in accordance with Section 03 01 34, including demonstrating adequacy of concrete removal and surface preparation procedures.

1.4 SUBMITTALS

A. Corrosion inhibiting coating material product data.

B. Mechanical anchor product data.

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: Sika Armatec 110 EpoCem supplied by Sika Corporation.
   2. Epoxy: Sikadur 32 Hi-Mod supplied by Sika Corporation.
   3. Zinc-rich Steel Primer: MasterProtect P 8100 AP supplied by BASF Construction Chemicals, LLC.

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

C. Supplemental mechanical anchors
   1. Helical anchors shall be stainless steel, between 8mm and 10mm in diameter. Use one of the following, or approved equal:
      a. DryFix anchors manufactured by Helifix.
      b. Stitch Tie manufactured by CTP Anchors
      c. Heli-Tie manufactured by Simpson Strong-Tie.

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.

C. Measure reinforcing section loss in accordance with ACI 364.14T.

D. 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.

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

F. Inspect prepared steel surfaces and clean remaining contaminants.

G. Apply **two** coats of corrosion-inhibiting material on exposed steel surfaces.

1. Batch, mix, and apply material according to recommendations of material supplier.
   a. Minimum dry film thickness: 10 to 12 mils.
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 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. Unless permitted by Engineer, do not bend reinforcing bars embedded in hardened concrete.

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

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

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

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

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

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

K. Coat new bars in accordance with the requirements for existing reinforcing.

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.

B. Payment to be based on linear feet of sealant installed.

1.2 PRICES

A. Perform work on a unit price basis based on lineal feet of sealant removed and replaced.

1.3 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.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Install sealant when existing and forecast weather conditions permit sealant to be installed according to sealant manufacturer's written instructions and warranty requirements.
   1. Do not install sealant when ambient or substrate temperatures are below 40 degrees F or are expected to fall below 40 degrees F in next 12 hours.
   2. Do not proceed with installation during inclement weather except for temporary work necessary to protect building interior and installed materials. Remove temporary work and Work that becomes moisture damaged.

1.5 SUBMITTALS

A. Sealant product data.

B. Warranties.

C. Field adhesion testing.

1.6 WARRANTY

A. Manufacturer's Warranty:
   1. Written warranty, signed by sealant manufacturer.

2. 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. General:
   1. Comply with ASTM C920 and other requirements indicated.
   2. Compatibility: 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.
   3. Select products based on mockups, preconstruction testing, and sealant manufacturer's previous testing and experience.
   4. Source Limitations: Obtain each type of joint sealant through one source from single manufacturer.
   5. Colors of Exposed Joint Sealants: Selected and approved in writing by Owner's Representative, from sealant manufacturer's full range.

B. Single-Component, Non-sag, Silicone Sealants:
   1. 756 SMS Building Sealant manufactured by Dow Corning Corporation.
   2. SCS9000 SilPruf NB manufactured by Momentive Performance Materials Inc.
   3. Spectrem 3 manufactured by Tremco Commercial Sealants & Waterproofing.

2.2 AUXILIARY MATERIALS

A. General: Sealant-backer materials, primers, surface cleaners, masking tape, and other materials recommended by sealant manufacturer, that are non-staining and compatible with substrates; based on mockups, preconstruction testing, and sealant manufacturer's previous testing and experience.

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. Non-sag sealants
    a. Install sealant with the recess specified on the details.
    b. 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.

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: Testing and Inspection Agency shall perform non-destructive and destructive field adhesion tests on sealant in accordance with ASTM C1521.
   1. 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 2x the 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 with absence of voids, and for joint configuration in compliance with requirements. Record observations and sealant dimensions
      f. Perform test every 250 feet.
   2. Test reports shall include date when sealant was installed, name of person who installed sealant, test date, test location, and whether primer was used.
   3. Immediately after testing, Contractor shall 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.
   4. Sealant not evidencing adhesive failure from testing or noncompliance with requirements will be considered satisfactory.
   5. Where Engineer 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