



**CENTRALBIDDING**  
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**Hilliard N. Fletcher Water Resource Recovery Facility Phase II  
Improvements**  
City of Tuscaloosa

Project documents obtained from [www.CentralBidding.com](http://www.CentralBidding.com)  
10-Nov-2023 04:43:03 PM

# SPECIFICATIONS AND CONTRACT DOCUMENTS



For the Construction of

HILLARD N. FLETCHER WATER RESOURCE AND  
RECOVERY FACILITY PHASE II IMPROVEMENTS

TUSCALOOSA, ALABAMA

File No. OCA-23-1043  
Garver Project No. 19W10160

VOLUME 1 OF 4  
DIVISIONS 00 - 23

Prepared For:

City of Tuscaloosa



November 2023




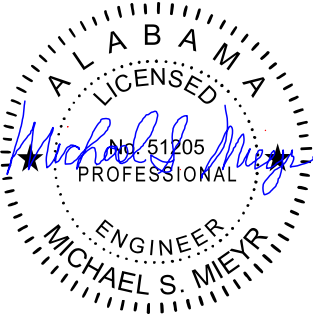
**CERTIFICATIONS**

**HFWRRF PHASE II IMPROVEMENTS  
GARVER PROJECT NO. 19W10160  
FILE NO. OCA-23-1043**

I hereby certify that the applicable portions of this project's specifications, details, and plans were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Alabama.

SEAL AND SIGNATURE	APPLICABLE DIVISION OR PROJECT RESPONSIBILITY
<p align="center">Wes Cardwell, P.E.</p>  <p align="center">Digitally Signed: November 10, 2023</p>	<p>Division 01 Division 02 Division 23 Division 40 Division 41 Division 44</p>
<p align="center">Kipp Martin, P.E.</p>  <p align="center">Digitally Signed: November 10, 2023</p>	<p>Division 03 Division 04 Division 05 Division 07 Division 08 Division 09</p>

**CERTIFICATIONS**

SEAL AND SIGNATURE	APPLICABLE DIVISION OR PROJECT RESPONSIBILITY
<p align="center">Jonathan White, P.E.</p>  <p align="center">Digitally Signed: November 10, 2023</p>	<p>Division 26</p>
<p align="center">Michael S. Mieyr, P.E.</p>  <p align="center">Digitally Signed: November 10, 2023</p>	<p>Division 31</p>

<p><b>GARVER, LLC CERTIFICATE OF AUTHORIZATION:</b></p>
<p><b>AL ENGINEERING COA NO. 500-E</b></p> <p>Expiration Date: December 31, 2023</p>



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PUBLIC WORKS BID PACKAGE**

**WALTER MADDOX, MAYOR**

**CITY COUNCIL OF TUSCALOOSA**

**Council Members:**

**Matthew Wilson**

**Raevan Howard Williams**

**Norman Crow**

**Lee Busby**

**Kip Tyner**

**John Faile**

**Cassius Lanier**

**Scott Holmes, City Attorney**

**PROJECT: Hilliard N. Fletcher WRRF Phase II Improvements**

**FILE NO.: OCA-23-1043 ENGINEERING PROJECT NO.: 2024.702.001**

**FOR: Water and Sewer**

**(2023)**

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**CITY OF TUSCALOOSA**  
**ADVERTISEMENT FOR PREQUALIFICATION AND BIDS FOR:**

**Project Name: Hilliard N. Fletcher Water Resource Recovery Facility Phase II Improvements**  
**File Number: OCA-23-1043    Engineering Project Number: 2024.702.001**

The project includes but is not limited to facility-wide improvements at the Hilliard N. Fletcher WRRF consisting of: 1. Rehabilitation of the North Aeration Basins including a new above grade air header with pipe bridge, replacement of the existing fine-bubble diffuser systems, and repairs to existing air piping and valves within the aeration basins. 2. Rehabilitation of the Anaerobic Digestion facility including cleanout and miscellaneous repairs of the existing digester tanks, demolition of existing digester mixing systems and internal gas piping, installation of new digester mixing pump stations with interior suction/discharge piping and mixing nozzle assemblies, installation of gravity transfer piping from the digesters to the digested sludge holding tank, installation of a hydrogen sulfide removal system for biogas conditioning. 3. Miscellaneous improvements to the Digester Control Building including improvements to the existing electrical room, replacement of electrical gear, HVAC improvements, and replacement of the existing building roofing system. The project is being constructed for the City of Tuscaloosa, which is the awarding authority.

PREQUALIFICATION: The prequalification procedure is MANDATORY and will identify responsible and competent General Contractor bidders relative to the requirements of the Project. Prequalification project summary information will be made available to prospective bidders on October 16, 2023, by contacting Wes Cardwell, PE, Project Manager via email at RWCardwell@GarverUSA.com.

Contractor Prequalification Submittals are to be submitted to Garver by prospective bidders no later than 5:00 pm CST on November 2, 2023, via electronic copy emailed RWCardwell@GarverUSA.com. No hard copies of the prequalification submittals are required. Notification of successful respondents will be issued no later than 5:00pm CST on November 10, 2023.

Additional qualifications and requirements for General Contractor Bidders and Subcontractors are indicated in the Bid and Contract Documents. **Only General Contractors who have successfully completed the prequalification process within the stated time limits, and which are properly licensed in accordance with criteria established by the State Licensing Board for General Contractors under the Provision of Title 34, Chapter 8, Code of Alabama 1975, as amended, will be considered for the Work of this Project.**

BID OPENING: Sealed Bid Proposals will be received by the City of Tuscaloosa, at the Council Chamber of City Hall, 2201 University Boulevard, on December 7, 2023, at 10:00 am local time for this project, at which time bids will be opened and read.

PRE-BID CONFERENCE: Attendance at the MANDATORY Pre-Bid Conference is required in order for a General Contractor to submit a bid on this Project. The Pre-Bid Conference will be held at the Council Chamber of City Hall, 2201 University Boulevard, on November 16, 2023, at 2:00 pm local time.

Award of the contract will be made within forty-five (45) calendar days from the date of the bid opening.

PLANS AND SPECIFICATIONS: Plans and specifications and all related Contract Documents are open for public inspection at the Hilliard N. Fletcher WRRF, located at 4010 Reese Phifer Avenue, Tuscaloosa, Alabama. The contact person for the project is Wes Cardwell, PE, Project Manager. They can be reached at RWCardwell@GarverUSA.com or (205) 443-3080.

Plans, specifications, and all related Contract Documents are available at [www.centralbidding.com](http://www.centralbidding.com). Hard copy bid documents will not be distributed. Electronic Bids can be submitted at [www.centralbidding.com](http://www.centralbidding.com). For any questions about the electronic bidding process, please contact Central Bidding at 225-810-4814 or [support@centralbidding.com](mailto:support@centralbidding.com).

**CITY OF TUSCALOOSA**  
**SECTION TWO- INSTRUCTION TO BIDDERS**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

- 1. Intention:** The Advertisement for Bids, Instruction to Bidders, Contract Agreement, any modifications or supplemental conditions to the Contract Agreement, Bid Proposal, and the Plans and Specifications are interrelated and apply to the complete work to which they relate.
- 2. Definitions:** Where the following words, or the pronouns used in their stead, occur herein, they shall have the following meaning:

"Awarding Authority" shall mean the City of Tuscaloosa, Alabama.

"Bidder" shall mean any person, firm or corporation, that is responsible, submitting a responsive bid for the Project contemplated by the contract documents, who meets the requirements set forth in the contract documents, maintains a permanent place of business, has adequate forces and equipment to perform the work on the Project properly and within the time limit that is established, has sufficient experience in the type work provided for in the contract documents and has adequate financial status and resources to meet its obligations contingent to the work.

"City" or "Owner" shall mean the City of Tuscaloosa, Alabama, as the awarding authority or its authorized and legal representatives.

"Construction Manager" shall mean that person or entity employed by the City to provide Construction Manager services on the work or Project, who shall be the City's representative on the Project.

"Contractor" shall mean initially the successful or probable low bidder and then the party of the first part to the construction agreement or the legally authorized representatives of such party, including a trade contractor.

"Engineer/Architect" shall mean an Engineer or Architect responsible for design and related services on the Project, and if no Construction Manager is employed, then the Engineer is the representative of the City of Tuscaloosa, Alabama, on the Project. References to the "Engineer" shall mean the Construction Manager, if the City has employed such services, to the extent such services are applicable to construction management activity as set forth in the agreement between the City and the Construction Manager, and the context herein indicates that it would relate to services traditionally and customarily performed by a Construction Manager; otherwise, "Engineer" shall refer to the Engineer or Architect.

"Force Account Work" work paid for by reimbursing for the actual cost for labor, materials and equipment usage incurred in the performance of the work, as directed, including a percentage for overhead and profit where appropriate.

"Gender": a word importing one gender shall if appropriate extend to and be applied to the other gender. The masculine shall include the feminine and vice versa, unless the context clearly indicates otherwise.

"Inspector" shall mean a representative of the Engineer/Architect, Construction Manager or the City, as the case may be.

"Non-Resident Contractor" shall mean a contractor which is neither (a) organized and existing under the laws of the State of Alabama nor (b) maintains its principal place of business in the State of Alabama. A non-resident contractor which has maintained a permanent branch office within the State of Alabama for at least five (5) continuous years shall not thereafter be deemed to be a non-resident contractor so long as the contractor continues to maintain a branch office within Alabama.

"Project" shall mean the Public Work to which these Contract Documents relate, including the labor, materials and all work to be done by Contractor that is the subject of the bid, plans, specifications and contract documents.

"Public Property" Real property which the awarding authority owns or has contractual right to own or purchase, including easements, rights-of-way, or otherwise.

"Public Work(s)" shall mean a Project consisting of the construction, repair, renovation, or maintenance of public buildings, structures, sewers, water works, roads, bridges, docks, underpasses and viaducts, as well as any other improvement to be constructed, repaired or renovated or maintained on public property to be paid, in whole or in part, with public funds or with financing to be retired with public funds in the form of lease payments or otherwise.

"Responsible Bidder" shall mean a bidder who, among other qualities determined necessary for performance, is competent, experienced and financially able to perform the contract.

"Responsive Bidder" shall mean a bidder who submits a bid that complies with the instructions, terms and conditions of the invitation for bids, including plans, drawings, specifications and other provisions of the contract documents.

"Retainage" shall mean that money belonging to the Contractor which has been retained by the awarding authority conditioned upon final completion and acceptance of all work in connection with the Project.

"Singular/Plural" the singular shall include the plural and vice versa, unless the context clearly indicates otherwise.

"Trade Contracts" "Trade contracts" or "multiple prime contracts" are multiple but separate contracts with the City on the same Project that represent significant construction activities performed concurrently with and closely coordinated with construction activities performed on the Project under other trade contracts.

"Unbalanced Bid" Unbalanced bids may be considered non-responsive and may be subject to rejection. An unbalanced bid includes but is not limited to one which results in a substantial advance payment to the contractor.

**3. Work to be Performed:** The City contemplates the construction of a public works project as generally described in the Advertisement for Bid and as more particularly described, shown and depicted on the plans, specifications, drawings and in the contract documents.

**4. Bidding, Generally:**

- A. Bids must be enclosed in a sealed envelope, addressed to the City of Tuscaloosa, Attention: City Clerk, 2201 University Boulevard, City Hall, Tuscaloosa, Alabama, or may be submitted by controlled, secure electronic means through Central Bidding at [www.centralbidding.com](http://www.centralbidding.com). For any questions about the electronic bidding process, please contact Central Bidding at 225-810-4814 or [support@centralbidding.com](mailto:support@centralbidding.com).
- B. Bids shall be labeled on the outside of the sealed envelope to indicate the Project Name and include the following language: "Bid Enclosed." Electronic bids will follow all of these listed conditions B through H.
- C. Bids shall be labeled on the outside of the sealed envelope with the General Contractor's license number.
- D. When submitting a bid, Bidders must use proposal forms contained in the contract documents or bid schedules provided to plan holders. Bidders shall state the amount bid for each item as shown therein and all blanks shall be properly filled in and bid proposal executed as required. All sealed Bids shall include a copy of the General Contractor's license and failure to include a copy of the bidder's General Contractor license within the bid will result in the bid being rejected.
- E. Any bidder may withdraw his or its bid, either personally or by written request (not by facsimile) at any time prior to the scheduled opening time for receipt of bids. Except as provided in Ala. Code §39-2-11(b)(c)(d), no bid may be withdrawn after opening of bids prior to the time of returning bid bonds as provided for herein.
- F. Any unauthorized conditions, limitations or provisos attached to the bid proposal, except as otherwise provided herein, will render a bid proposal informal and may cause its rejection.



- G. Unbalanced bids may be subject to rejection. Bids without a copy of the General Contractor's license will be rejected.
- H. Bids will be opened in public at the time and date specified in the Notice of Advertisement for bids, unless otherwise altered by addendum. All bidders are invited to be present at the opening of bids. No bids will be received after the time established for the opening of bids.

**5. Responsible, responsive bidders:** The City reserves the right to reject any bid determined by the City to not be a responsible bidder or whose bid proposal is not responsive.

In determining whether a bidder or bid is responsible and/or responsive, the City reserves the right to also request and consider the following factors:

- A. Types or kinds of materials or items best suited to the City's needs for the Project.
- B. If requested, the current financial statement provided by the bidder and/ or the bidder's bonding capability or limits.
- C. If requested, the City may consider the following provided by the Bidder: an accurate inventory of equipment to be used on the Project; a list of key personnel who will work on the Project and detailed histories of key personnel's qualifications and/or experience.
- D. The City may consider similar work performed by any person, firm, or corporation associated with the Bidder, key personnel of the Bidder and/or Members, Officers and Directors of the Bidder within the last five (5) years.
- E. The City may consider references familiar with the bidder's competence, qualifications, experience, capabilities, skill and integrity.
- F. The City may consider Bidder's bankruptcies, judgments, liens or litigation (including any arbitration or mediation proceedings) to which the bidder (the legal entity, corporation, LLC, company), officers and the key personnel on the Project are a party to or have been a party to.
- G. The Bidder's General Contractor's State license number and class.
- H. Bidder's performance and prosecution of past projects for the City of Tuscaloosa and listed references.
- I. An unbalanced bid.
- J. Other information asked for and supplied in the bid proposal.

The City may make such investigations as he deems necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the City all such information and data for this purpose as the City may request. The City reserves the right to reject any Proposal if the evidence submitted by, or investigation of, such Bidder fails to satisfy the City that such Bidder is properly qualified to carry out the obligations of the Contract and complete the work contemplated therein.

**6. Bid Bonds:** Each bidder must submit with its bid, a cashier's check drawn on an Alabama bank, made payable to the City of Tuscaloosa or a fully executed bid bond on the form that is

contained in the contract documents, executed by a surety company duly authorized and qualified to make bond in the State of Alabama. All bonds and/or cashier's check will be made payable to the City of Tuscaloosa for an amount not less than five (5) percent of the City's or its engineers or architects estimated cost of the Project or of the total bid in the proposal, but in no event more than \$10,000.00. The purpose of said bid bond is to insure that the successful bidder will enter into a written contract with the City for the Project on the form included in the contract documents and furnish a performance bond and payment bond executed by a surety company duly authorized and qualified to make such bond in the State of Alabama, in the amount required and provide evidence of insurance as required by the bid documents within time specified or if no time is specified, within twenty (20) days after the forms have been presented to the successful bidder for signature. Provided; however, if extenuating circumstances prevail, the City may grant an extension of time not exceeding ten (10) days for the return of the contract bonds and evidence of insurance.

**The price or cost of all items bid shall remain in effect for a period of fifty (50) days after Notice of Award.**

**7. Return of Bid Bonds:** All bid bonds, except those of the three lowest bona fide bidders, will be returned immediately after bids have been checked, tabulated and the relation of the bids established. The bid bonds of the three lowest bidders may be retained and will be returned as soon as the contract bonds and the contract documents of the successful bidder have been approved and properly executed. Award of the contract will be made within the time specified after the opening of bids. In the event no award is made within such time, all bids may be rejected and all bonds returned.

Provided; however, the potentially successful bidder may enter into a written agreement with the City for an extension of time for consideration of its bid, in which case, the bidder's bond shall remain in full force and effect or the City may permit said bidder to substitute a satisfactory surety for the cashier's check if submitted as a guaranty to the bid bond.

**8. Forfeiture of Bid Bonds:** Should the successful bidder or bidders to whom a contract is awarded fail to execute a contract(s) and furnish acceptable contract securities and evidence of insurance, as required, within thirty (30) days after the prescribed forms have been presented to him/her, the City may retain from the proposal guaranty, if it is a cashier's check or recovered from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the contract as awarded, and the amount of the proposals of the new lowest bidder. If no other bids are received, the full amount of the proposal guaranty may be so retained and recovered as liquidated damages for such default. Any sum so retained or recovered shall be the property of the awarding authority.

**9. Consideration of Bid Proposals:**

A. Generally: The contract will be awarded to the lowest responsible and responsive bidder, unless the City determines that all the bids are unreasonable or that it is

not in the best interest of the City to accept any of the bids. Award of the contract will be made on the basis of the lowest actual bid amount for the contract, which is defined as the total of the bid and/or extended total amounts for unit price items, plus requested and accepted additive or deductive alternates, pursuant to the provisions hereof. The City reserves the right to reject all bids and/or reject and rebid the Project should it determine the same is in the best interest of the City.

- B. Minor irregularities, as determined by the City, will not cause a bid to be non-responsive and may be waived by the City.
- C. Bidder must possess all licenses and permits required by applicable law, rule or regulation for the performance of the work prior to bidding.
- D. Where the City elects to prequalify contractors prior to bidding, it shall be understood that such prequalification may be general in nature and shall not limit the City's right to revoke such prequalification pursuant to Ala. Code §39-2-4(d) (1975).
- E. Joint ventures shall not generally be considered acceptable bids without special waiver from the City, which must be requested in writing at least fourteen (14) days prior to bid opening.
- F. Additive and/or Deductive Alternates: If the City has elected to request bids for additive and/or deductive alternates, then the following procedure shall be the basis for calculating such bids:
  - 1) Deductive Alternates: Any deductive alternate from the base bid shall constitute cumulative deductions from the base bid; and in determining the lowest bidder, if the City elects to consider any deductive alternates, the City will proceed to consider the bids upon the basis of the base bids of all qualified bidders minus the respective deduction stated for the first alternate. If the City determines that it wishes to proceed to consider additional deductive alternates, it may do so sequentially and in like manner throughout the deductive alternates the City elects, so that the base bids of all qualified bidders shall be calculated minus the respective number of deductive alternates in sequence the City has elected to consider. The lowest responsible responsive bid will be the lowest actual base bid of a qualified bidder less the selected sequential deductive alternates.
  - 2) Additive Alternates: To determine additive alternates, any additive alternate shall constitute cumulative additions to the base bid; and in determining the lowest bidder if the City elects to consider any additive alternates, the City will proceed to consider the bids upon the basis of the base bid of all bidders plus the respective addition stated for the first alternate. If the City determines that it wishes to proceed to consider additional additive alternates it may do so sequentially, and in like manner, throughout the additive alternates, the City elects, so that the base bids of all qualified bidders shall be calculated plus the respective number of additive alternates in sequence the City has elected to consider. The

lowest responsible responsive bid will be the lowest actual base bid of a qualified bidder plus the selected sequential additive alternates. Once the City has determined the lowest responsible responsive bidder as set forth herein, then it may award the contract on the basis of accepting and/or rejecting any additive and/or deductive alternates of that bid as it determines is in the best interest of the City.

- G. Contracts will be awarded in compliance with Code of Alabama Sec. 39-2-6.

**10. Materials and Work:** All materials, which the engineering plans specify or are required, will be installed as they are shown on the drawings, plans and/or specs.

- A. Brand names, catalog numbers, weights, etc., are used to indicate levels of quality only and are not intended to restrict the bidding. If bidding on an item of another brand or manufacturer than that specified, bidder's proposal should be accompanied by brochures or other pertinent literature giving detailed specifications of the item(s) on which the proposal is being made. Bids or proposals received without sufficient literature to determine equal quality may not be considered. Final determination as to equal quality will be made by the City.
- B. Quantities: The quantities shown in the proposal shall be considered by the contractor as the quantities required to complete the work for the purpose of bidding. Should the actual quantities required in the construction of the work be greater or less than the quantities shown, an amount equal to the difference of quantities at the unit prices bid for the items will be added to or deducted from the contract total.
- C. Adjustment Items: During the course of work, the prices bid for adjustment items may be used by the City to increase or decrease the total cost for the work if the quantity of work exceeds or is less than the amount shown on plans.
- D. The attention of all bidders is called to the fact that all or a portion of this Project may be federally funded and if so, the special conditions of a federally funded contract including federal labor standard provisions, the minimum wage rates included in the contract documents, plans and specifications must be followed.
- E. Construction Crews: The Contractor will be required to furnish at least one separate construction crew during the work as set forth in the contract. Unless waived by the City, the Contractor shall perform on the sites and with his own organization and equipment, at least fifty percent of the total amount of the work to be performed under this Contract. The Contractor may only subcontract a maximum of fifty (50%) percent of the work without City consent. If, during the progress of the work hereunder, the Contractor requests a reduction of such percentage, and the City representative determines that it would be to the City's advantage, the percentage of the labor required to be performed by the Contractor's own organization may be reduced; PROVIDED prior written approval of such reduction is obtained by the Contractor from the City.

**11. Execution of Contract, Notice to Proceed:** Award of the contract will be made within the time specified after the opening of bids. The bidder to whom award is made shall enter into a written contract for the Project with the City on the forms provided in the contract documents, furnish the required performance and labor and material bonds with proper surety and furnish the evidence of insurance as required, all within twenty (20) days of presentation of the prescribed forms to the bidder. If extenuating circumstances prevail, the City may grant an extension of time not exceeding five (5) days for the return of the contract, required bonds and evidence of insurance. Within twenty (20) days after presentation by the bidder to the City, the City shall review the bonds, surety and evidence of insurance to ascertain whether they meet the requirements of the contract documents, and if such requirements have been met the City shall complete the execution of the contract. Unless otherwise agreed by the parties in writing, a notice to proceed order will be issued by the City or its representatives within fifteen (15) days after final execution of the contract by the City. The Contractor shall begin work on the date specified in the Notice to Proceed.

**12. Labor, Material and Performance Bonds:** Within twenty (20) days after the prescribed forms have been presented, the successful bidder shall execute a performance bond with good and sufficient surety from a company duly authorized and qualified to make such bond in the State of Alabama, a performance bond made payable to the City of Tuscaloosa, with a penalty equal to 100 percent of the amount of the contract price and in addition thereto, another bond with good and sufficient surety by a surety company duly authorized and qualified to make such bond in the State of Alabama, payable to the City of Tuscaloosa, in an amount equal to 100 percent of the contract price with an obligation that such contractor shall promptly make payments to all persons supplying it or them with labor, materials or supplies for or in prosecution of the Project provided for in such contract and for the payment of reasonable attorney fees incurred by any successful claimants or plaintiffs in civil actions on said bond, pursuant to the provisions of Ala. Code §39-1-1 (1975).

**13. Surety and Insurer Qualifications:** All certificates of insurance and bonds (furnished in connection with the work to be performed under this contract) shall be countersigned by a licensed agent residing and engaged in doing business in the State of Alabama. The surety and insurer shall be licensed and authorized to do business in the State of Alabama. The surety companies on bonds shall be rated A- or better by A. M. BEST and listed on the United States Treasury Department 570 list.

**14. Power-of-Attorney:** The attorney-in-fact (resident agent) who executes the performance bond and/or payment bond on behalf of the surety must attach a notarized copy of his or her power-of-attorney as evidence of his authority to bind the surety of the date of execution of the bonds. Certification by a resident agent authorized to do business in Alabama is required.

**15. Insurance:** The successful contractor shall file with the City, at the time of delivery of the signed contract, satisfactory evidence of insurance, the requirements as set forth in the contract agreement. Satisfactory evidence of insurance shall include at a minimum, the insurers standard "Certificate of Insurance" (modified pursuant to insurance requirements of the contract

agreement) and the agents verification of insurance as required by Section 26. If the City deems that additional evidence or clarification, etc., of insurance is appropriate, the bidder shall promptly furnish the same to the City upon request.

**16. Examination of Contract Documents and of the Site of the Project:** Before submitting a bid proposal for the Project, each bidder shall carefully examine the Contract Documents, including but not limited to plans, drawings, specifications, contract, etc., visit the site, and satisfy itself as to the nature and location of the Project, and the general and local conditions, including weather, the general character of the site or building, the character and extent of existing work within or adjacent to the site, any other work being performed or proposed thereon at the time of submission of their bids. It shall obtain full knowledge as to transportation, disposal, handling, and storage of materials, availability of water, electric power, and all other facilities in the area which will have a bearing on the performance of the Project for which they submit their proposals. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and visit and has judged for and satisfied himself as to conditions to be encountered regarding the character, difficulties, quality, and quantities of work to be performed and the material and equipment to be furnished, and as to the contract requirements and contingencies involved. It shall be the Bidder's obligation to verify for himself and to his complete satisfaction, all information concerning site and surface conditions.

**17. Subsurface Reports:** Prior to Bid opening, the City will make available to prospective Bidders, upon request, any information that it may have as to subsurface conditions and surface topography at the work site. Investigations of subsurface conditions were made for the purpose of study and design, and neither the City nor its consultants that performed such testing assume any responsibility whatsoever in respect to the sufficiency or accuracy of borings, or of the logs of test borings, or of other investigations that have been made, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unforeseen developments may not occur.

Logs of test borings, geotechnical reports, or topographic maps showing a record of the data obtained by the investigations of surface and subsurface conditions that are made available shall not be considered a part of the Contract Documents, and are available only for the convenience of the Bidders. Such logs and reports represent only the opinion of the Engineer/Architect or Consultant as to the character of the materials encountered by him in his investigations of the test borings.

Information derived from inspection of logs of test borings, or pits, geotechnical reports, topographic maps, or from Drawings showing location of utilities and structures will not in any way relieve the Contractor from any risk, or from properly examining the site and making such additional investigations as he may elect, or from properly fulfilling all the terms of the Contract Documents.

The City shall not be responsible for any interpretations or conclusions drawn from any subsurface exploration reports or borings. Each bidder is to base his bid upon his determination of the subsurface conditions and of the types and quantities of material to be encountered or needed. Additional tests or other exploratory operations may be made at no cost to the City.

**18. Interpretation of Plans and Specifications:** If any bidder contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of plans, specifications, or other proposed contract documents, he may submit to the Engineer/Architect or Construction Manager, as the case may be, a written request for an interpretation thereof at least ten (10) days prior to bid opening or as otherwise proscribed in the bid documents. The bidder submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by written addendum duly issued and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. The City, Construction Manager or Engineer/Architect will not be responsible for any other explanations or interpretations of the proposed documents.

**19. General Contractor's Permit or License:** The attention of all bidders is called to the provisions of the State law governing general contractors as set forth in Ala. Code §34-8-1 et seq. (1975), particularly in regard to the need for and evidence of a State general contractor's license. The provisions of said statute are adopted herein by reference and form a part of the Contract with the selected bidder should this Project be awarded. Bidders are reminded that they will be governed by said statutes insofar as they are applicable. To summarize the above quoted statutes, Ala. Code §34-8-1, et seq. (1975) provides that no one is entitled to bid and no contract may be awarded to anyone who does not possess a valid general contractor's permit or license, including specialty classifications for the work, as provided by the foregoing sections of the State Code, and rules and regulations promulgated pursuant thereto and that said bid may not be considered without evidence being produced that he is so qualified. Trade contractors must be duly licensed in accordance with applicable law. The City may not enter into a contract with a nonresident corporation that is not qualified under the State law to do business in Alabama. Bidder MUST include with proposal contractor's current license number and a copy of the license. State law, Ala. Code §34-8-8(b) (1975) requires all bids to be rejected which do not contain general contractor's license number.

**20. U. S. Products Preference:** The successful bidder (contractor) shall comply with Ala. Code §39-3-1 (1975), shall agree to utilize in the execution of the Project, materials, supplies and products manufactured, mined, processed or otherwise produced in the United States or its territories, if the same are available at reasonable and competitive prices and not contrary to any sole source specifications. It is further stipulated that a breach of the foregoing provision of this agreement by the contractor in failing to utilize domestic products shall result in a downward adjustment in the contract price equal to any realized savings or benefit to the Contractor.

**21. Use of Domestic Steel:** The attention of all bidders and that of the successful bidder (contractor) is drawn to Ala. Code §39-3-4 (1975), requiring the use of steel produced within the United States for municipal construction projects when specifications in the construction

contract require the use of steel and do not limit its supply to a sole source. This provision is subject to waiver if the procurement of domestic steel products becomes impractical as a result of national emergency, national strike or other causes. Violations of the use of domestic steel requirements shall result in a downward adjustment in the contract price to equal any savings or benefit to the Contractor.

**22. In State Bidder Preference:** Pursuant to Ala. Code §39-3-5 (1975), in the letting of public contracts in which municipal funds are utilized, except those contracts funded in whole or in part with funds received from a federal agency, preference shall be given to resident contractors, and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded Alabama public contracts only on the same basis as the nonresident bidders' state awards contracts to Alabama contractors bidding under similar circumstances; and resident contractors in Alabama, as defined in Ala. Code §39-2-12 (1975), be they corporate, individuals or partnerships, are to be granted preference over non-residents in awarding of contracts in the same manner and to the same extent as provided by the laws of the state of the domicile of the nonresident. Nonresident bidders must accompany any written bid documents with a written opinion of an attorney-at-law licensed to practice law in such nonresident bidder's state of domicile, as to the preferences, if any or none, granted by the law of that state to its own business entities whose principal places of business are in that state in the letting of a public contract.

**23. Applicable Laws:** Each Bidder shall inform himself of, and the Bidder awarded a contract shall comply with, federal, state, and local laws, statutes, and ordinances relative to the execution of the work. This requirement includes, but is not limited to, applicable regulations concerning minimum wage rates, the use of domestic products, U.S. steel and resident labor, non-discrimination in the employment of labor, protection of public and employee safety and health, environmental protection, the protection of natural resources, fire protection, burning and non-burning requirements, permits, fees and similar subjects. Certain statutory requirements are summarized immediately hereinafter. The attention of all bidders is called to the fact that the work will be subject to compliance with all applicable City building and technical codes and will be subject, in addition to all other inspections, to inspection by a representative of the City of Tuscaloosa Building Inspections Department.

**24. SRF/DWSRF Special Requirements.** If all or any portion of the Project to which this contract applies is funded in whole or in part by the proceeds of a loan or loans from the Alabama Department of Environmental Management (ADEM) through either a State Revolving Fund for Wastewater or Water (SRF or DWSRF, respectively), additional requirements for the Contractor exist (Requirements). These Requirements relate to Project objectives for utilization of Minority Business Enterprises/Women Business Enterprises (MBE/WBE). The Contractor must document efforts made to utilize MBE/WBE firms and submit to ADEM, with a copy to the City within ten (10) days after contract execution, evidence of the positive steps in accordance with the requirements to utilize small minority and women businesses in the procurement of subcontracts.



Other Requirements relate to Federal Labor Standards, Title VI of the Civil Rights Act of 1964, Equal Employment Opportunity, Affirmative Action Equal Opportunity Clause, Goals and Timetables, compliance with Occupational Safety and Health Act of 1970 and Section 107 of Contract Work Hours and Safety Standards Act (PL91-54) which are adopted herein by reference to the extent applicable. For DWSRF and SRF funded projects, special requirements are also set forth in Supplemental General Conditions. If not attached to the contract documents, Contractors should contact the City representative and/or the City's consulting engineer for a copy of all special requirements and conditions.

**25. Special Conditions for Federally Funded Contracts.** If all or any portion of the Project to which this contract applies is funded in whole or in part by the proceeds of a grant from an agency of the United States Government, additional requirements for the Contractor exist. A summary of these requirements entitled, "Special Conditions for Federally funded Contracts," is attached hereto and made a part hereof. Bidder should contact the Engineer or City Representative to confirm the applicability of these requirements to the Project.

**26. Agent's Verification of Insurance.** This form or a letter equivalent from the Insurance Agent should be submitted with each Contractor's Bid, or in the alternative, Contractor may provide a copy of the insurance policy or policies reflecting the coverages required herein.

**27. Compliance with Immigration Law.** By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom, to the extent allowed by Federal law.

**28. Compliance with Affordable Health Care Act.** By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal compliance laws pertaining to the Affordable Health Care Act. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom, to the extent allowed by Federal law.

**29. Compliance with the City of Tuscaloosa Minority Enterprise / Disadvantage Business Enterprise (MBE/DBE/WBE) Policy for Public Works Projects Over \$100,000.** The City of Tuscaloosa has voluntarily adopted a Minority / Disadvantaged Business Enterprise ("MBE/DBE/WBE") Program designed to encourage the participation and development of minority and disadvantaged business enterprises and to promote equal business opportunities to the fullest extent allowed by state and federal law.

It is the intent of the City to foster competition among contractors, suppliers, and vendors that will result in better quality and more economical services rendered to the City. Under this policy, the City of Tuscaloosa has established a goal of ten to twenty percent (10-20%) inclusion of minority and disadvantaged business enterprises for all services required to deliver City projects.

In no case shall the stated percentage be the determining factor in contract awards. Rather, contractors must demonstrate a good faith effort to attain the desired percentage goal.

The Policy as adopted is entitled THE CITY OF TUSCALOOSA MINORITY ENTERPRISE / DISADVANTAGED BUSINESS ENTERPRISE (MBE/DBE/WBE) POLICY FOR PUBLIC WORKS PROJECTS OVER \$100,000, and is attached hereto as "Exhibit A" (the "Policy"). Contractors are encouraged read the Policy in its entirety, and must follow the instructions contained therein. **The Policy requires submission of various forms at specified times, and failure to do so may result in rejection of bid due to non-responsiveness.** Contractors shall work in coordination with the City of Tuscaloosa's Department of Infrastructure and Public Services:

Contact information is as follows:

Caramyl Drake  
Community Development Program Manager  
Community & Neighborhood Services  
City of Tuscaloosa  
Phone: (205) 248-5725  
cdrake@tuscaloosa.com

**30. Compliance with Act 2016-312.** By signing this contract, the contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

**[END OF SECTION TWO- INSTRUCTION TO BIDDERS]**

**CITY OF TUSCALOOSA  
SECTION THREE- BID PROPOSAL**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

**For Trade Package Bids (when applicable):**  
**Trade:** \_\_\_\_\_  
**Trade Package No.:** \_\_\_\_\_

**BIDDER (name of legal entity):** \_\_\_\_\_

**Address:** \_\_\_\_\_  
**Phone:** \_\_\_\_\_                      **Email:** \_\_\_\_\_

**NAME OF CONTACT PERSON FOR BIDDER:** \_\_\_\_\_  
**PHONE AND EMAIL:** \_\_\_\_\_

Licensed, Class \_\_\_\_\_ Alabama General Contractor No.: \_\_\_\_\_ (Attach Copy)

Alabama General Contractor Specialty \_\_\_\_\_

Alabama General Contractor License Major Categories:

(1) \_\_\_\_\_ (2) \_\_\_\_\_

**ADDENDA:** The Bidder hereby acknowledges that he has received Addenda No's. \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ (Bidder shall Insert No. of each Addendum received) and agrees that all addenda issued are hereby made part of the Contract Documents, and the Bidder further agrees that his Proposal(s) includes all impacts resulting from said addenda.

**LUMP SUM:** The Bidder agrees to accept as full payment of the work proposed under this Project, as services are rendered, as herein specified and as shown on the Contract Documents, upon the undersigned's own estimate of quantities and costs, the following lump sum of:  
\_\_\_\_\_ Dollars and \_\_\_\_\_ cents  
(\$ \_\_\_\_\_ ) (*Amount written in words has precedence*)

**ALTERNATES:** Attach additional sheets for additive or deductive alternates, if in contract documents.

**UNIT PRICES:** Where the Project is bid in unit prices then Bidder agrees to perform the work in the stated quantities of the materials at the unit prices so bid, the cumulative total of which constitutes the base bid set forth below, and to accept as final payment for the work performed

under this Project as herein specified the extension of each such unit price for the quantities actually installed in accordance with the following or attached unit price schedule.

An unbalanced bid, as herein defined, may be considered non-responsive. A bid resulting in a substantial advance payment on an item that is for a single lump sum payment may be considered non responsive.

**Prices for mobilization and demobilization combined shall not exceed 5% of the total base bid unless a reasonable explanation is provided in writing with the bid and accepted by the Owner.** Lump sum payments and unit price bids for a single or lump sum payment may be spread over the course of the period of work until the line item is complete at owner's option.

The Bidder's unit price for materials listed is as including the payment of taxes (See Page 3) where applicable: (Attach additional sheets if required)

**BID:**

	<b>Material</b>	<b>Quantity</b>	<b>Unit Price</b>	<b>TOTAL</b>
1.	See Attachment A – Bid Proposal			
2.				
3.				
		<b>TOTAL BASE BID</b>	<b>\$</b>	

**SALES AND USE TAX SAVINGS ACCOUNTING:**

Contractor MUST account for the sales tax NOT included in the bid proposal form as follows:

**ESTIMATED SALES AND USE TAX**

BASE BID: \$ \_\_\_\_\_

Deductive Alternate (if applicable): \$ \_\_\_\_\_

Failure to provide an accounting of sales tax may render the bid non-responsive. Other than determining responsiveness, sales tax accounting shall not affect the bid pricing nor be considered in the determination of the lowest responsible and responsive bidder.

**AS BUILT DRAWINGS:** The Bidder's Proposal contains \$ \_\_\_\_\_ for "as built drawings."

**BIDDER'S DECLARATION AND UNDERSTANDING:** The undersigned, hereinafter called the Bidder, declares that the only persons or parties interested in this Proposal are those named herein, that this Proposal is, in all respects, fair and without fraud, that it is made without

collusion with any official of the City, and that the Proposal is made without any connection or collusion with any person submitting another Proposal on this Contract.

The Bidder further agrees that he has checked and verified the completeness of the Contract Documents and that he has exercised his own judgment regarding the interpretation of subsurface information utilizing all pertinent data in arriving at his conclusions. The Bidder shall be fully responsible for any damages or liability arising out of his or his subcontractors pre-bid investigations.

The Bidder understands and agrees that if a Contract is awarded, the City may elect to award all schedules under one Contract, lump sum, separately, or in any combination that best serves the interests of the City.

The Bidder further declares that he has carefully examined the Contract documents for the construction of the Project and has checked and verified the completeness of the Contract Documents, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved. Bidder further declares that he is fully aware of the fact that the description of the work, quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the said quantities with the detailed requirements of the Contract Documents. Bidder also declares that this Proposal is made according to the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Proposal.

The Bidder declares that he understands and agrees that the quantities shown in the Advertisement for Bids and in the Proposal are approximate only and are subject to either increase or decrease; and that should quantities be decreased, he also understands and agrees that payment will be made on actual quantities installed at the unit bid prices, and will make no claim for anticipated profits for any decreases in the quantities. Actual quantities will be determined upon completion of the work.

**START OF CONSTRUCTION AND CONTRACT COMPLETION TIME:** The Bidder further agrees to begin work on the date stated in the Notice to Proceed and to fully complete the work, in all respects, within the time specified in the contract documents for completion.

**EXPERIENCE OF BIDDER:** Bidder MUST submit the following list of at least three clients for whom projects involving construction of similar projects have been performed within the past 5 years.

1.

Name of Client		Telephone Number
Street		City
Facility	Size	Date
Name of Engineer/Architect /Engineering Firm		Telephone Number

2.

Name of Client		Telephone Number
Street		City
Facility	Size	Date
Name of Engineer/Architect/Engineering Firm		Telephone Number

3.

Name of Client		Telephone Number
Street		City
Facility	Size	Date
Name of Engineer/Architect /Engineering Firm		Telephone Number

**PERFORMANCE OF WORK BY CONTRACTOR:** The Bidder shall perform at least 50 percent of the work with his own forces (refer to the INSTRUCTIONS TO BIDDERS).

**SUBCONTRACTORS:** Unless the same information has been provided in the prequalification statement, the Bidder further certifies that if his bid is accepted, the following subcontracting firms or businesses will be awarded subcontracts for the following portions of the work:

Description of Work \_\_\_\_\_

\_\_\_\_\_  
Name

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
Street City State Zip

\_\_\_\_\_  
Description of Work

\_\_\_\_\_  
Name

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
Street City State Zip

\_\_\_\_\_  
Description of Work

\_\_\_\_\_  
Name

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
Street City State Zip

\_\_\_\_\_  
Description of Work

\_\_\_\_\_  
Name

\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
Street City State Zip

**SURETY:** If the Bidder is awarded a construction contract on this Proposal, the Surety who provides the Performance Bond and Payment Bond will be:

\_\_\_\_\_ whose address is

\_\_\_\_\_  
Street City State Zip  
Single Job Bond Limit \_\_\_\_\_ Aggregate Job Bond Limit \_\_\_\_\_

The Bidder declares that he understands and agrees that the quantities shown in the Advertisement for Bids and in the Proposal are approximate only and are subject to either increase or decrease; and that should quantities be decreased, he also understands and agrees that payment will be made on actual quantities installed at the unit bid prices, and will make no claim for anticipated profits for any decreases in the quantities. Actual quantities will be determined upon completion of the work.

If the Bidder is a corporation, the Proposal shall be signed by an officer of the corporation; if a partnership it shall be signed by a partner. If signed by others, authority for signature shall be attached.

**If Sole Proprietor or Partnership:**

**IN WITNESS** hereto the undersigned has set his (its) hand this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Signature of Bidder

\_\_\_\_\_  
Title

**If Corporation:**

**IN WITNESS WHEREOF** the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Name of Corporation

By \_\_\_\_\_

Title: \_\_\_\_\_

(seal)

Attest \_\_\_\_\_

Secretary



Attached hereto is a Bid Bond or (Check) for the sum of \$ \_\_\_\_\_  
according to the conditions under "Instructions to Bidders" and provisions therein.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

BY: \_\_\_\_\_

\_\_\_\_\_  
Title

**[END OF SECTION THREE- BID PROPOSAL]**

**Attachment A – Bid Proposal**

**Hilliard N. Fletcher WRRF Phase II Improvements**

(For additional information, reference Specification Section 01 29 00 – PAYMENT PROCEDURES)

**Base Bid**

<b>Base Bid Item No.</b>	<b>Bid Qty</b>	<b>Description (Bidder to write Bid Price/Unit Price in words)</b>	<b>Unit Price</b>	<b>Bid Price</b>
1	1 LS	Mobilization and demobilization for the lump sum of (maximum of 5% of base bid):  _____  _____	N/A	\$
2	1 LS	All Work as necessary for the Facility 05 – Site Civil Improvements, defined in the Contract Documents except those items listed separately below, for the lump sum of:  _____  _____	N/A	\$
3	1 LS	All Work as necessary for the Facility 11 – Anaerobic Digester No. 1 Improvements, defined in the Contract Documents except those items listed separately below, for the lump sum of:  _____  _____	N/A	\$
4	500 Dry Tons	Anerobic Digester No. 1 Cleaning: Removal and disposal of biosolids, residuals, and debris associated with cleaning Anaerobic Digester No. 1 in accordance with Specification Section 44 10 00 for the unit price of:  _____  _____	\$	\$

Base Bid Item No.	Bid Qty	Description (Bidder to write Bid Price/Unit Price in words)	Unit Price	Bid Price
5	1 LS	Anaerobic Digester No. 1 Cover System Protective Coating Replacement: Surface preparation and installation of protective coating system on underside of Anaerobic Digester No. 1 cover system in accordance with Specification Section 09 90 00 for the lump sum price of:  _____  _____	N/A	\$
6	1 LS	Contingency Allowance to be used on a change authorization basis for repairs to the existing fixed cover system on Anaerobic Digester No. 1, as identified and recommended by the Manufacturer and to be used only after Owner approval, for the lump sum of:  <b><u>Fifty-Thousand Dollars</u></b>	N/A	\$50,000
7	1 LS	All Work as necessary for the Facility 12 – Anaerobic Digester No. 2 Improvements, defined in the Contract Documents except those items listed separately below, for the lump sum of:  _____  _____	N/A	\$
8	500 Dry Tons	Anerobic Digester No. 2 Cleaning: Removal and disposal of biosolids, residuals, and debris associated with cleaning Anaerobic Digester No. 2 in accordance with Specification Section 44 10 00 for the unit price of:  _____  _____	\$	\$
9	1 LS	Anaerobic Digester No. 2 Cover System Protective Coating Replacement: Surface preparation and installation of protective coating system on underside of Anaerobic Digester No. 2 cover system in accordance with Specification Section 09 90 00 for the lump sum price of:  _____  _____	N/A	\$

Base Bid Item No.	Bid Qty	Description (Bidder to write Bid Price/Unit Price in words)	Unit Price	Bid Price
10	1 LS	Contingency Allowance to be used on a change authorization basis for repairs to the existing fixed cover system on Anaerobic Digester No. 2, as identified and recommended by the Manufacturer and to be used only after Owner approval, for the lump sum of:  <b><u>Fifty-Thousand Dollars</u></b>	N/A	\$50,000
11	1 LS	All Work as necessary for the Facility 13 – Anaerobic Digester No. 3 Improvements, defined in the Contract Documents except those items listed separately below, for the lump sum of:  _____  _____	N/A	\$
12	500 Dry Tons	Anerobic Digester No. 3 Cleaning: Removal and disposal of biosolids, residuals, and debris associated with cleaning Anaerobic Digester No. 3 in accordance with Specification Section 44 10 00 for the unit price of:  _____  _____	\$	\$
13	1 LS	Anaerobic Digester No. 3 Cover System Protective Coating Replacement: Surface preparation and installation of protective coating system on underside of Anaerobic Digester No. 3 cover system in accordance with Specification Section 09 90 00 for the lump sum price of:  _____  _____	N/A	\$
14	1 LS	Contingency Allowance to be used on a change authorization basis for repairs to the existing fixed cover system on Anaerobic Digester No. 3, as identified and recommended by the Manufacturer and to be used only after Owner approval, for the lump sum of:  <b><u>Fifty-Thousand Dollars</u></b>	N/A	\$50,000

Base Bid Item No.	Bid Qty	Description (Bidder to write Bid Price/Unit Price in words)	Unit Price	Bid Price
15	1 LS	All Work as necessary for the Facility 20 – Digester Control Building Improvements, defined in the Contract Documents except those items listed separately below, for the lump sum of:  _____	N/A	\$
16	1 LS	All Work as necessary for the Facility 35 – Digester Gas Scrubber Improvements, defined in the Contract Documents except those items listed separately below, for the lump sum of:  _____	N/A	\$
17	1 LS	All Work as necessary for the Facility 40 – North Aeration Basin Improvements, defined in the Contract Documents except those items listed separately below, for the lump sum of:  _____	N/A	\$
18	1 LS	Contingency Allowance to be used on a change authorization basis for items required during completion of the Project to be used solely at the discretion of the Owner, for the lump sum of:  <b><u>One Hundred Thousand Dollars</u></b>	N/A	\$ 100,000
<b>Total Base Bid Price</b>				\$

**Deductive Alternates**

<b>Deductive Alternate Item No.</b>	<b>Bid Qty</b>	<b>Description (Bidder to write Bid Price in words)</b>	<b>Unit Price</b>	<b>Bid Price</b>
1	1 LS	Deduct all work associated with Facility 35 – Digester Gas Scrubber Improvements in its entirety.  _____  _____	N/A	\$
2	1 LS	Deduct all work associated with rehabilitation of Anaerobic Digester No. 2 (Facility 12) in its entirety including associated bid items included in the Base Bid specifically pertaining to Anaerobic Digester No. 2.  _____  _____	N/A	\$
3	1 LS	Deduct all work associated with rehabilitation of Anaerobic Digester No. 3 (Facility 13) in its entirety including associated bid items included in the Base Bid specifically pertaining to Anaerobic Digester No. 3.  _____  _____	N/A	\$
4	1 LS	Deduct all work associated with replacement of the existing membrane roofing system for the Digester Control Building, as detailed in Facility 20 drawings, in its entirety.  _____  _____	N/A	\$
5	1 LS	Deduct all work associated with replacement of control panels FP-13-1, FP-15-1, and FP-16-7, as detailed in Facility 20 drawings, in its entirety.  _____  _____	N/A	\$

**Attachment B – List of Manufacturers**

**Hilliard N. Fletcher WRRF Phase II Improvements**

<b>Specification Section</b>	<b>Equipment</b>	<b>Base Bid Equipment Manufacturer (Circle One)</b>
26 24 19	Motor Control Centers	<ol style="list-style-type: none"><li>1. Square D; by Schneider Electric</li><li>2. ABB</li><li>3. Allen-Bradley</li><li>4. Siemens</li></ol>
41 10 01	Digester Gas Safety Equipment	<ol style="list-style-type: none"><li>1. Varec Biogas</li><li>2. Shand &amp; Jurs</li></ol>
41 20 00	Hydrogen Sulfide Removal Equipment	<ol style="list-style-type: none"><li>1. Unison</li><li>2. MARCAB</li></ol>
44 42 00	Hydraulic Mixing Systems	<ol style="list-style-type: none"><li>1. Vaughan Co., Inc. - Rotamix System</li><li>2. Hayward Gordon - Hydromix System</li></ol>
44 42 13	Fine Bubble Fixed Grit Aeration System	<ol style="list-style-type: none"><li>1. Sanitaire – Xylem</li><li>2. SSI</li></ol>

**CITY OF TUSCALOOSA  
SECTION FOUR- BID BOND**

**BID BOND TO THE CITY OF TUSCALOOSA, ALABAMA**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

**KNOW ALL MEN BY THESE PRESENTS,** that we, the undersigned, \_\_\_\_\_  
\_\_\_\_\_ as Principal; and \_\_\_\_\_  
\_\_\_\_\_ as Surety, (**NOTE:** If cashier's check drawn on an Alabama Bank utilized in lieu of corporate surety, attach check as required by bid documents) are hereby held and firmly bound unto the City of Tuscaloosa, Alabama, a Municipal Corporation, as obligee, hereinafter called the City, in the sum of \_\_\_\_\_ Dollars (\$ \_\_\_\_\_) for the payment of which sum, well and truly to be made, the said Principal and Surety hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to the City a certain Bid (Proposal) attached hereto and made a part hereof, to enter into a contract in writing with the City, for this Project.

**NOW, THEREFORE,**

- (a) If said Bid shall be rejected, or in the alternate,
- (b) If said Bid shall be awarded and the Principal shall execute and deliver a contract in the Form of Agreement as included in the Contract Documents for the Project, and shall execute and deliver Performance Bond and Payment Bond in the Forms as attached to the Contract Documents executed by a surety company authorized and qualified to make such bonds in the State of Alabama and in the amounts as required by the Instructions to Bidders and submit the insurance certifications as required by the bid document and fulfill all other qualifications and requirements of the Contract Documents and bid specifications (all properly completed in accordance with said Bid), and shall in all other respects perform the agreement created by the acceptance of said Bid within thirty (30) days after the prescribed forms have been presented to Bidder for execution;

Then, this obligation shall be void, otherwise, the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all default of the Principal hereunder shall be the amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall in no way be impaired or affected by any extension of the time within which the City may accept such Bid; and said Surety does hereby waive notice of any such extension.

**IN WITNESS WHEREOF,** the above-bonded parties have executed this instrument under their several seals, this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ the name and corporate seal of



each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

**WITNESS:**

\_\_\_\_\_

**PRINCIPAL:**

\_\_\_\_\_ (SEAL)

By: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

**SURETY:**

\_\_\_\_\_ (SEAL)

\_\_\_\_\_

(Business Address)

\_\_\_\_\_

**ATTEST:**

\_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

Attorney in Fact

**NOTE:** Surety must be qualified and duly authorized to make bonds in the state. All Bonds and Sureties are subject to review and approval by the City Attorney. Valid current Power of Attorney for Corporate Surety must be attached.

**NOTE:** Bidder may submit a cashier's check drawn on an Alabama bank to the order of the City of Tuscaloosa equal to 5% of the amount bid, but in no event more than \$10,000.00, in lieu of a Corporate Surety, under the same terms.

**[END OF SECTION FOUR- BID BOND]**

**CITY OF TUSCALOOSA  
SECTION FIVE- CONTRACT**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

**THIS AGREEMENT** made and entered into by and between \_\_\_\_\_  
\_\_\_\_\_, hereinafter sometimes called the CONTRACTOR, as party of the first part, and the  
CITY OF TUSCALOOSA, Alabama, a Municipal Corporation, hereinafter sometimes called the CITY  
or OWNER, as party of the second part,

**W-I-T-N-E-S-S-E-T-H:**

In consideration of the amounts herein named and of the mutual agreements and provisions herein contained, the Contractor and the City agree in regard to a public works project (hereinafter either the "work" or the "Project") as described in the Advertisement for Bids.

The Contractor will perform the work and/or construct the Project as well as furnish at his own cost and expense all labor, tools, equipment and transportation as are herein and in the Contract documents required to be furnished by the Contractor, and shall perform all the work in a manner and form required to construct the Project described in and shown on the contract documents as the same are hereinafter more specifically described and as provided by the plans, specifications and documents which are attached hereto and made a part hereof, as if fully set out herein and addenda together with all plans and drawings on file in the office specified below.

**ARTICLE I. GENERALLY**

A.     **Contract Documents:** As used throughout the documents constituting the contract, the term "Contract Documents" shall mean and include the following: Advertisement for Bids, Addenda (if issued), the Instructions to Bidders, the Bid Proposal, the General Specifications, the Detail Specifications, Supplemental and Special Conditions (if attached), together with this Contract Agreement and any modifications, including change orders, if made, and the drawings, plans and profiles that are now on file in the office referred to in the advertisement, the Performance Bond and the Labor and Material Bond, executed by the Contractor in connection with this Contract and insurance requirements and certificates.

All such documents hereinabove enumerated are adopted herein by reference and constitute the Contract between the parties to the same extent as if each were set out in full in this agreement.

B.     **Independent Contractor:** The Contractor enters into this Contract with the City as an independent contractor and, as such, agrees that neither the City nor its officers, agents, employees or inspectors shall be responsible for the acts or omissions of the Contractor, or any subcontractor, or any of the Contractor's or subcontractor's agents or employees, or any other

persons performing any of the work pursuant to this Contract. The Contractor shall be solely responsible for controlling construction manner, means and techniques consistent with the contract documents, plans and specifications.

C. **Order of Precedence:** Should there be a direct conflict between the various elements of the contract documents to the extent that the same cannot be reconciled to be read *in para materia*, then precedence shall be given the same in the following order:

1. Subsequent modifications (change orders or amendments) to contract agreement after execution
2. Addenda (if issued)
3. Supplemental general conditions and special conditions (if included)
4. The Contract Agreement
5. General and technical specifications
6. Large Scale Drawings (if included)
7. Enlarged Plans (if included)
8. Plans (if included)
9. Instructions to bidders
10. Advertisement for bids
11. Proposal (Bid)
12. Purchasing Agent Appointment Agreement (if utilized)

Where more than one document relates to the same matter if both can be given reasonable effect both are to be retained. Written specifications will take precedence over drawings.

D. **Integration; Contract Terms and Construction:**

1. Integration: This Agreement, together with all documents which constitute the "Contract Documents," constitute the entire agreement of the parties, as a complete and final integration thereof with respect to its subject matter. All understandings and agreements heretofore had between and among the parties are merged into this Agreement, which alone fully and completely expresses their understandings. No representation, warranty, or covenant made by any party which is not contained in this Agreement or expressly referred to herein has been relied on by any party in entering into this Agreement.
2. Amendment in Writing: This Agreement may not be amended, modified, altered, changed, terminated, or waived in any respect whatsoever, except by a further agreement or change order, in writing, properly executed by all of the parties.
3. Binding Effect: This Agreement shall bind the parties and their respective personal representatives, heirs, next of kin, legatees, distributees, successors, and assigns.
4. Captions: The captions of this Agreement are for convenience and reference only, are not a part of this Agreement, and in no way define, describe, extend, or limit the scope or intent of this Agreement.

5. Construction: This Agreement shall be construed in its entirety according to its plain meaning and shall not be construed against the party who provided or drafted it.
6. Mandatory and Permissive: "Shall," "will," and "agrees" are mandatory; "may" is permissive.
7. Governing Laws: The laws of the State of Alabama shall govern the validity of this Agreement, the construction of its terms, the interpretation of the rights, the duties of the parties, the enforcement of its terms, and all other matters relating to this Agreement.
8. Ownership of Contract Documents: The Contract Documents, and copies of parts thereof, are furnished and owned either by the City or the design professional. All portions of the Contract Documents, and copies of parts thereof, are the instruments of service for this Project. They are not to be used on other work and are to be returned to the City on request at the completion of the Project. Any reuse of these materials without specific written verification or adaptation by the City will be at the risk of the user and without liability or legal expense to the City or Engineer/Architect. Such user shall hold the City and Engineer/Architect harmless from any and all damages, including reasonable attorneys' fees, from any and all claims arising from any such reuse. Any such verification and adoption shall entitle the City to further compensation at rates to be agreed upon by the user and the City.

E. **Rules of Construction**: For the purposes of this contract, except as otherwise expressly provided or unless the context otherwise requires:

1. Words of masculine, feminine or neuter gender include the correlative words of other genders. Singular terms include the plural as well as the singular, and vice versa.
2. All references herein to designated "articles," "sections," and other subdivisions or to lettered exhibits are to the designated articles, sections and subdivisions hereof and the exhibits annexed hereto unless expressly otherwise designated in context. All article, section, other subdivision and exhibit captions herein are used for reference only and do not limit or describe the scope or intent of, or in any way affect this agreement.
3. The terms "include," "including," and similar terms shall be construed as if followed by the phrase, "without being limited to".
4. The terms "herein," "hereof," and "hereunder," and other words of similar import refer to this agreement as a whole and not to any particular article, section, other subdivision or exhibit.
5. All recitals set forth in, and all exhibits to, this agreement are hereby incorporated in this agreement by reference.
6. No inference in favor of or against any party shall be drawn from the fact that such party or such party's counsel has drafted any portion hereof.

7. All references in this agreement to a separate instrument are to such separate instrument as the same may be amended or supplemented from time to time pursuant to the applicable provisions thereof.

F. **Construction Manager - Multiple Trade Contracts:** If indicated in the Advertisement for Bids, the City has elected to engage the services of a Construction Manager for the work on this Project. If so, the same will be indicated in the bid packages and special supplemental conditions will be attached in regard to trade contracts. Contractor, as one of the multiple trade contractors on the Project shall adhere to all terms and conditions of the contract documents, particularly the supplemental conditions regarding multiple trade or multiple prime contractors. Any provision of the general conditions in direct conflict with the supplemental conditions is superseded to the extent of the conflict. If using a Construction Manager format, then this shall be a multiple trade or multiple prime contract agreement subject to the supervision and direction of a Construction Manager, in accordance with the terms and provisions of the Construction Manager's agreement with the City, which agreement is adopted herein by reference.

G. **Coordination of Plans, Specifications, etc.:** The specifications, the plans, drawings and all supplementary documents are essential parts of the Contract, and requirements occurring in one are as binding as though occurring in all. They are intended to be comprehensive to describe and provide a complete work. In case of discrepancy, figured dimensions shall govern.

H. **Corrections of Plans, etc.:** Should any portions of the plans, specifications or drawings be obscure or in dispute, they shall be referred to the Engineer/Architect and he shall decide as to the true meaning and intent. The Engineer/Architect shall also have the right to correct any errors or omissions at any time when such corrections are necessary for the proper fulfillment of said plans and specifications.

I. **Taxes and Charges:** Except to the extent the City and the Contractor are utilizing a "Purchasing Agent Appointment agreement," Contractor shall withhold and pay all sales and use taxes and all withholding taxes, whether local, state or federal and pay all Social Security taxes and also all State Unemployment Compensation taxes, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws. Pursuant to Ala. Code §39-1-3 (1975), Contractor shall be reimbursed for any additional severance, sales or uses taxes incurred as a result of an increase in such taxes during performance of the contract.

J. **Shop Drawings and Submittals.** The Contractor shall submit shop drawings, samples and submittals depicting or representing the construction of portions of the Project in accordance with the plans and specifications to the Engineer/Architect and if there is no Engineer or Architect on the Project, to the City representative. The Contractor shall pay for or the cost may be withheld from payments to the Contractor for more than two (2) reviews of the shop drawings, samples or submittals or similar element of work by the Engineer, Architect or City representative.

K. **Alabama Immigration Law.** By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom, to the extent allowed by Federal law.

L. **Compliance with Affordable Health Care Act.** By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal compliance laws pertaining to the Affordable Health Care Act. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom, to the extent allowed by Federal law.

M. **Compliance with Act 2016-312.** By signing this contract, the contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

## ARTICLE II. PAYMENTS, CLAIMS AND CHARGES, ETC.

A. **Contract Price:** The City will pay and the Contractor will accept in full consideration for the performance of the work/Project, subject to additions and deductions (including but not limited to liquidated damages) as provided in the contract documents and herein, the sum of \_\_\_\_\_ (\$ \_\_\_\_\_) and/or in unit prices as shown in Bidder's schedule for the base bid amount of \$ \_\_\_\_\_, being the amount of the Contractor's bid as awarded by the City.

B. **Estimated Quantities and Unit Prices:** If award was made in whole or in part based upon unit prices, the Contractor agrees that the prices given in the Proposal are unit prices. The estimated quantities as stated in the Advertisement for Bids and in the Proposal and as indicated on the plans or in other places are approximate only, are subject either to increase or decrease and are only for the purpose of comparing on uniform basis the bids offered for the Project under this contract. The Contractor further agrees that should the quantities of any of the items of the work be increased, he will do the additional work at the unit prices set out in the Proposal and should the quantities be decreased, payment will be made on actual quantities at the unit prices and he will make no claim for anticipated profits for any decrease in the quantities. Actual quantities will be determined upon completion of the Project.

C. **Overtime Work by Contractor:** If the Contractor for his convenience and at his own expense should desire to carry on his work at night or outside regular hours, he shall submit written notice to the Engineer/Architect and he shall allow ample time for satisfactory arrangements to be made for inspecting the work in progress. At no time shall the notice be given less than 24 hours before such overtime work is started. The Contractor must obtain,

through the Engineer/Architect, the City's approval for work at night, on Saturdays, Sundays or legal holidays. The Contractor shall light the different parts of the Project as required to comply with all applicable federal and state regulations and with all applicable requirements of the City.

Overtime hours shall be considered any hours worked by the Contractor on Saturday, Sunday and legal holidays, which in the Engineer/Architect's opinion requires the Engineer/Architect's resident observers' presence to observe such overtime work. Overtime hours requiring the presence of City inspectors shall be considered any hours worked by the Contractor in excess of eight (8) hours during any working day and/or in excess of forty (40) hours from Monday through Friday and/or any time on Saturday, Sunday or legal holiday. In general, it should be expected that the Engineer/Architect's resident observer(s) or City's inspectors will be present at all times that the Contractor is working.

If the Contractor elects to schedule and perform overtime work, the Contractor shall pay the City for the City's resident inspector salaries plus costs for each hour of overtime work. Overtime shall be rounded up to the nearest whole hour. This amount shall include the inspector's salary at overtime rate, labor additive, which includes insurance, social security, workmen's compensation, sick pay, paid holidays, vacation pay and his vehicle and equipment. Payment to the City shall be made by a deduction from the Contractor's monthly payment invoice for any overtime worked.

**D. Payments on Account/Payments Withheld/Retainage:** Upon presentation of a verified application for payment, which shall include a "Contractor's Affidavit of Payment of Debts and Claims," AIA Form G706 or equivalent, then usually by the fifteenth (15<sup>th</sup>) day of each calendar month or as soon thereafter as is practical, as the Project progresses, the City shall make partial payments to the Contractor of the billable work performed less payments already made and less deductions for any incomplete, unaccepted or defective work. In making partial payments to the Contractor, there shall be retained five (5%) percent of the estimated amount of work done and value of materials stored on the site or suitably stored and insured off-site. Provided; however, after fifty (50%) percent of the Project has been satisfactorily completed, no further retainage will be withheld.

Retainage shall be held until final completion and acceptance of all work covered by the Contract Documents unless escrow or deposit arrangements are agreed to by the City. When maintenance periods are included in the Contract Documents covering highways, bridges or similar structures, such period shall be considered a component part of the contract and retainage will be held until the expiration of such periods.

On completion and acceptance of each separate building, public work or other separately identifiable and complete division of the Project in regard to which a separate price has been stated in the Contract Documents or can be separately ascertained, payment may be made in full including retainage but less deductions. Provided; however, the City will not consider making such payment on any such item of work if it is an integral part of a complete project.

All materials and work covered by partial payments as provided for herein shall become the sole property of the City; provided, however, the Contractor shall not be relieved from the sole responsibility for the care and protection of materials and work upon which payments have been made and for the restoration of any damaged work.

The City may also withhold from time to time from payment to the Contractor such an amount or amounts as may be necessary to pay and fully satisfy all claims and demands for labor and services rendered in and about the Project, including any such amount or amounts due to be paid to or by any subcontractor or supplier, amounts for City's or Engineer/Architect's observers or inspectors for contractors' overtime as herein provided, or for engineering or design services associated with Contractor initiated change orders or submittals in excess of that permitted herein. The Contractor hereby authorizes the City as its agent, to apply such amounts so withheld to the payment of any amount so due to be paid and all other just and lawful claims other than claims for damages for tort. In case of disagreement with reference to any such claim or claims, the City may keep such amounts so withheld on account of such claim or claims until such disagreement is finally settled and determined.

In addition, the City may also withhold payment of the whole or any part of a verified or approved application for payment from the Contractor to such an extent as may be necessary to protect itself from loss on account of any of the following causes discovered subsequent to its verification or approvals:

1. Defective work.
2. Evidence indicating probable filing of claims by other parties against the Contractor.
3. Failure of the Contractor or subcontractor to promptly make payments to subcontractors or for materials, labor, food stuffs and supplies.
4. Damage to another contractor under separate contract with the City.
5. Assessment of liquidated damages.

When the above grounds are removed, applications for payment will then be verified and/or approved for amounts not previously verified and approved because of them.

The Contractor shall not attempt to withdraw at any time during the term of this contract or any extensions thereof, without the expressed written consent of the City, the whole or any part of the amounts so retained by the City from payments due the Contractor by the establishment of an escrow account or by depositing securities in lieu thereof, pursuant to Ala. Code §39-2-12(e) or (f), or any amendments thereto or any equivalent law, ordinance or regulation. It is expressly agreed between the parties hereto that should the City elect not to consent to the same, then the Contractor shall not elect to, attempt to or in any manner endeavor to withdraw such retained amounts.

**E. Claims for Extra Cost:** If the Contractor claims that any instructions by drawings or otherwise involve extra cost or any extension of time, he shall notify the City in writing within ten



(10) days after the receipt of such instructions and in any event before proceeding to execute the Project. Thereafter, the procedure shall be the same as that for change orders. No such claim shall be valid unless made in accordance with the terms of this section. There shall be no damages for delay. Except as otherwise herein provided, no charge for any extra work will be allowed unless the same has been duly authorized in writing by the City and the price stated in such order.

F. **Differing Site Conditions:** If, in the performance of the Contract, subsurface or latent conditions are found to be materially different from those indicated by the plans and specifications, or unknown conditions of an unusual nature are disclosed differing materially from conditions usually inherent in work of the character shown and specified, the Contractor shall immediately notify the Engineer/Architect in writing regarding such conditions but in no event later than forty-eight (48) hours after discovery of such conditions by the Contractor.

The written notice shall describe the conditions, and other pertinent information, in no event shall such notice be later than forty-eight (48) hours before such conditions are disturbed. Upon such notice, or upon such observation of conditions, the Engineer/Architect will promptly make such changes in the plans and/or Specifications as he finds necessary (if any are necessary) to conform to the different conditions, and any increase or decrease in the cost of the Project resulting from such changes may be adjusted as provided under Change Orders or Claims for Extra Cost as set forth in the Contract documents.

G. **Change Orders:** Change orders shall be allowed only under the following conditions: 1) Minor changes for a total monetary amount less than that required for competitive bidding; or 2) Changes for matters incidental to the original contract necessitated by unforeseeable circumstances arising in the course of work under the contract; or 3) Changes due to emergencies; or, 4) Changes provided for in the original bidding and original Contract Documents as alternates; 5) Changes of relatively minor items not contemplated when the plans and specifications were prepared and the Project was bid and which are in the public interest and generally do not exceed 10 percent of the Contract Price, subject to Alabama Bid Law exceptions.

The Contractor or successful bidder is expected to complete the Project as bid and specified within the financial parameters stated therein. However, if it shall be determined that a change order condition possibly exists in any given case during the performance of the contract, the Contractor shall promptly notify in writing the representative of the City and shall not implement such change until having notified the representative of the City. If the change is minor in the opinion of the representative of the City and does not involve, 1) an adjustment in the contract sum or construction bid price, or 2) result in extension of the contract time, or 3) a material change in the contract scope of services, then the City representative may authorize the change in writing to the Contractor. The Contractor shall not perform such change until receipt of such written change order.

In the event the change order requested by the Contractor involves, 1) an increase in the contract sum or construction bid price, 2) extend the contract time, or 3) materially change the

Contractor's scope of work or services, then the Contractor shall request a change order in writing and present the same to the City representative. The representative of the City, shall determine whether this is a change order which can be allowed and, if so, what exception it would fall under. The representative of the City shall then document the same, attach the same to the Contractor's request for a change order and submit the same with his recommendation to the City Council at its next or any subsequent regularly scheduled Council meeting for approval.

The City reserves the right to institute change orders as the Owner pursuant to the aforesaid terms and conditions. In no event is a change order to be executed by the Contractor prior to approval thereof by the City, except for emergencies.

H. **Determination of Adjustment of the Contract Sum:** The adjustment of the Contract Sum resulting from a change in the Work shall be determined by one of the following methods as determined by Owner:

1. By mutual agreement to a lump sum based on or negotiated from an itemized cost proposal from the Contractor.
2. Additions to the Contract Sum shall include the Contractor's direct costs plus a maximum 15% markup for overhead and profit. Where subcontract work is involved, the total mark-up for the Contractor and a subcontractor shall not exceed 25%. No allowance for overhead and profit shall be figured on a change which involves a net credit to the Owner. For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of bonds, superintendent and other job office personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

I. **Construction Schedule and Periodical Estimates:** Immediately after execution and delivery of the contract and before the first partial payment is made, the Contractor shall deliver to the City and Engineer/Architect and Construction Manager, a construction schedule in a form satisfactory to the City or Construction Manager, which may include CPM for all major trades, showing the proposed dates of commencement and completion of each of the various activities, of work required under the Contract documents, the interrelationship of each activity, sequences, resources for each and the anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule. The Contractor shall also furnish (1) a detailed estimate giving a complete breakdown on the contract price and (2) periodical itemized estimates of the work done for the purpose of making partial payments, however the same will not be considered as fixing a basis for additions to or deductions from the contract price. Scheduling is particularly critical if Contractor is a trade contractor and adherence to the Construction Manager progress schedule is required.

**NOTE:** Depending upon the complexity of the work the City may require CPM or equivalent meeting all criteria above.

J. **Sales and Use Tax Savings:** Pursuant to the invitation for bids, sales and use taxes are not to be included in the bid. The project will be administered in compliance with Alabama state law regarding sales and use taxes. The Contractor shall be responsible for obtaining a certificate of exemption from the Alabama Department of Revenue for purchases of materials and other tangible property made part of the project. Any subcontractors purchasing materials or other tangible personal property as part of the project shall also be responsible for obtaining a certificate of exemption. The estimate sales and use tax saving must be accounted for on the bid proposal. Failure to provide the estimated sales and use tax savings may render the bid as non-responsive. Other than determining responsiveness of the bid, sales and use tax accounting shall not affect the bid pricing nor shall be considered in the determination of the lowest responsible and responsive bidder.

### ARTICLE III. TIME

A. **Time for Completion/Delays:** The Contractor hereby agrees to commence work under this contract on the date to be specified in a written "Notice to Proceed" of the Engineer/Architect or thirty (30) days from the date of contract execution if no notice is issued, and to fully complete the Project within 480 consecutive calendar days thereafter. If this is a trade contract, then the Contractor shall perform within the time periods and at the times as established by the Construction Manager's approved construction schedule for the project. The Contractor further agrees to pay to the City, liquidated damages for each consecutive calendar day thereafter as hereinafter provided. Time is of the essence and a material element to this agreement.

**NOTE:** When maintenance periods are included in the contract for highways, bridges or similar structures, such periods shall be considered component parts of the contract. To the extent the construction schedule contains "float," the parties agree that the same belongs to the Project and may be utilized by either party.

**Delay:** If the Contractor is delayed at any time in the progress of work by any of the following causes, the Contractor may be entitled to a reasonable extension of time as determined by the City in which to complete the Project. Provided, however, no such delay nor the extension of time if granted shall be grounds for a claim by the Contractor for damages or for additional cost, expenses, overhead or profit or other compensation:

1. Fires, abnormal floods, tornadoes or other cataclysmic phenomenon of nature.
2. Strikes, embargoes, lockouts, war, acts of public enemy.
3. Change orders.
4. Acts of performance or delays in performance by other contractors employed by the City or their subcontractors.
5. Causes beyond the control of the Contractor.

Provided further, that the Contractor shall immediately give notice in writing to the City and follow extension of time procedures as provided for herein. The City expressly disclaims any

liability to Contractor for any cost, expense or damage caused by other contractors, subcontractors or suppliers, including those engaged by the City. The City shall not be liable for damages or cost to the Contractor sustained due to any interference from utilities or appurtenances or from the operations of relocating the same.

**B. Extensions of Time:** All written requests for extensions of time must be submitted to Engineer/Architect within ten (10) days after the occurrence of the cause for delay. The Engineer/Architect shall ascertain the facts and the extent of the delay and shall recommend to the City Council whether it should extend the time for completing the Project. Any extension of time shall be in writing and processed as a change order.

For change orders requesting extensions of time due to rain, wind, flood or other natural phenomenon, the Contractor's written request must be accompanied, at the City's request, by a detailed report of weather at this site for the last ten (10) years with averages showing means and statistical deviations from mean averages to support request for extension.

No extension shall be made for delays due to rain, wind, flood or other natural phenomenon of normal intensity for the locality.

In the event any material changes, alterations, or additions are made as herein specified, which in the opinion of the Engineer/Architect will require additional time for execution of any work under the contract, then in that case, the time of the completion of the Project may be extended through change order. No extensions of time shall be given for any minor changes, alterations or additions. The Contractor shall not be entitled to any reparation or compensation on account of such additional time or extensions of time. To the extent that the construction schedule contains "float," the parties agree that the same belongs to the Project and may be utilized by either party.

**C. Right of the City to Terminate Contract:** If the Contractor should be adjudged as bankrupt, or if it should make a general assignment for the benefit of its creditors, or if a receiver should be appointed for the Contractor or any of its property, or if it should persistently or repeatedly refuse or fail to supply enough properly skilled workmen or if it should refuse or fail to make prompt payment to persons supplying labor for the Project under the Contract, or persistently disregard instructions of the Engineer/Architect or fail to observe or perform any provisions of the Contract documents, or fail or neglect to promptly prosecute or perform the Project in accordance with the contract documents or otherwise be guilty of a substantial violation of any provision of the Contract documents, then the City may, on giving at least thirty (30) days' written notice to the Contractor, without prejudice to any other rights or remedies of the City in the premises, terminate the Contractor's right to proceed with the Project. In such event, the City may take over the Project and prosecute the same to completion, by contract or otherwise, and the Contractor and its sureties shall be liable to the City for any and all excess cost occasioned to the City thereby, including attorney's fees; and in any such case, the City may take possession of and utilize in completing the Project such appliances and plant of the Contractor or its subcontractors as may be on the site work and necessary or useful thereof. In the event of

termination, the same shall not relieve the Contractor nor any of its sureties of their obligation pursuant to this agreement. In the event it becomes necessary for the City to maintain any legal action against the contractor, to enforce its rights herein, the Contractor shall pay the City all expenses associated therewith including a reasonable attorney's fee.

Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement. Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as are permitted by the prime contract and approved by Owner; (3) plus ten percent (10%) of the cost of the work referred to in subparagraph (1) above for overhead and profit.

D. **Liquidated Damages:** Should the work under this contract not be completed within the time specified, scheduled or as extended, it is understood and agreed that there may be deducted by the City or Engineer/Architect from the partial and/or final payments to the Contractor or otherwise charged to the Contractor, a sum computed at the rate of Two Thousand Dollars (\$2,000.00) per day beginning from the stated or extended date of completion and continuing for so long as the Project remains incomplete. It is understood and agreed that the above deduction is not a penalty, but money due to reimburse the City/Owner for inconvenience and damage to the general public, due to the delay in the completion of the Project and is reasonable. The collection of liquidated damages by the City shall not constitute an election or waiver by the City of recovery of additional delay or non-delay related damages from the Contractor, and the City expressly reserves the right to recover actual damages for other harms resulting from delay. The provisions of the liquidated damage clause shall apply and continue to apply even if the Contractor terminates or abandons the Project prior to the scheduled completion dates.

The amounts of such liquidated damages and actual damages incurred by reason of failure to complete the work stipulated in the Contract are hereby agreed upon as reasonable estimates of the costs which may be accrued by the City. It is expressly understood and agreed that these amounts are not to be considered in the nature of penalties, but as damages which have accrued against the Contractor. The City shall have the right to deduct such damages from any amount due, or that may become due the Contractor, or the amount of such damages shall be due and collectible from the Contractor or Surety.

#### **ARTICLE IV. WORK AND MATERIALS**

A. **Cooperation of Contractor:** The Contractor shall have available on the job site, at all times, at least one (1) copy of the plans and specifications if prepared for the Project.

He shall give the Project the constant attention necessary to facilitate the progress thereof and shall cooperate with the City, Engineer/Architect and with other Contractors in every way

possible. The Contractor shall at all times have a superintendent, capable of acting as his agent on the Project, who shall receive communications from the Engineer/Architect or his authorized representatives or the City's authorized representative. The superintendent shall have full authority to give and execute orders relating to the Project without delay and to promptly supply such tools, plant equipment, materials and labor as may be required.

The City reserves the right to utilize its own forces on the site or those of another contractor and to communicate through its representative directly with the Contractor.

**B. Coordination - Trade Contractors:** If the supplemental conditions are attached to these general conditions indicating that this Project involves the use of multiple trade or multiple prime contractors under the supervision and direction of a Construction Manager employed by the City, then each such trade contractor shall cooperate and coordinate its construction activities and operations with those of other trade contractors and other entities involved in the Project and included under different sections of the specifications that are dependent upon each other in any manner for proper and correct installation, connection and operation, to assure efficient, prompt, orderly and proper installation of each part of the Project.

When utilizing trade contractors and/or multiple prime contractors under the supervision of Construction Manager cooperation and coordination of activities is extremely important. Refer to the provisions of the supplemental conditions for detailed requirements.

**C. Superintendence:** The Contractor shall assign to and keep at the Project site competent supervisory personnel. The Contractor shall designate, in writing, before starting work, an authorized representative who shall be an employee of the Contractor and shall have complete authority to represent, to receive notice for, and to act for the Contractor. The Contractor shall not permit or allow any work to be conducted upon the Project site without the presence of supervisory personnel. The Engineer/Architect shall be notified in writing prior to any change in superintendent assignment. Using his best skill and attention, the Contractor shall give efficient supervision to the Project. The Contractor shall be solely responsible for all construction means, methods, techniques, and procedures, for providing adequate safety precautions, and for coordinating all portions of the Project under the Contract. It is specifically understood and agreed that neither the Engineer/Architect nor the City shall not have control or charge of and shall not be responsible for the construction means, methods, techniques, or procedures, or for providing adequate safety precautions in connection with the Project under the Contract.

**D. Contractor's Tools and Equipment:** The Contractor's tools and equipment used on the Project shall be furnished in sufficient quantity and of a capacity and type that will adequately and safely perform the work specified, and shall be maintained and used in a manner that will not create a hazard to persons or property, or cause a delay in the progress of the Project.

**E. Furnishing Labor and Equipment:** The Contractor shall furnish and pay for all equipment, labor and supervision, and all such materials as required to be furnished in the Notice to Bidders

and as may other-wise be necessary to the completion of the Project and the operation of each construction crew required.

F. **Employees:** The Contractor shall employ only competent, skillful workers on the Project, and whenever any person shall appear to be incompetent or to act in a disorderly, unsafe improper manner, such person shall promptly be removed from the Project by the Contractor.

G. **Materials and Appliances:** Unless otherwise stipulated, the Contractor shall provide and pay for all other materials, water, heating, lighting, fuel, power, transportation, machinery, appliances, telephone, sanitary facilities, temporary facilities and other facilities and incidentals necessary for the execution and completion of the Project.

The Contractor warrants to the City and the Engineer/Architect that, unless otherwise specified, all materials and equipment furnished under this contract shall be new, and both workmanship and materials shall be of good quality, free of faults and defects, and in conformance with the Contract Documents. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials. In selecting and/or approving equipment for installation in the Project, neither the City nor Engineer/Architect assume responsibility for injury or claims resulting from failure of the equipment to comply with applicable federal, state, and local safety codes or requirements, or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials. Material and/or equipment damaged by flooding or other causes during the construction period shall be subject to rejection by the Engineer/Architect; reconditioning and/or repairing material and/or equipment is not acceptable.

H. **Asbestos and Hazardous Materials:** Unless specifically authorized and instructed to the contrary by the City, the Contractor shall not permit, allow, place, install or incorporate into the Project or upon the work site, any hazardous material(s), including, but not limited to, any products or materials that contain asbestos in any quantity. It shall be the responsibility of the Contractor to inspect all materials and products delivered for incorporation or installation in the Project to ensure that they contain no hazardous materials or asbestos. Where the Contractor or any subcontractor has or should have a reasonable suspicion that any product or material contains asbestos or other hazardous material, the Contractor shall immediately inspect the material or product, obtain a product or material data sheet, and notify the City's representative prior to installation or incorporation of the same into the Project. Any product or material determined to contain asbestos or other hazardous material shall be removed from the Project immediately and properly disposed of as required by law. Products or material to which the contractor should pay particular attention to avoid the presence of asbestos incorporated therein include, but are not limited to the following: concrete, batt insulation, roof insulation, building felts, mastics, water proofing products, adhesives, resilient flooring products, ceiling tiles, interior coatings, exterior coatings, roofing, pipe installation, duct installation and pre-assembled items of equipment. At the completion of the Project, the Contractor shall submit a duly executed Asbestos Affidavit in the form as attached hereto prior to final payment. The Contractor is

responsible for ensuring that all of its employees and subcontractors are adequately trained to handle hazardous materials in accordance with 49 CFR §172(g).

I. **Protection of Work and Property:** The Contractor shall furnish and install all necessary temporary works for the protection of the Project. The Contractor shall at all times adequately maintain, guard and protect his own work from damage, and safely guard and protect private, commercial, industrial, the City's and others' property from injury or loss arising in connection with this Contract. He shall make good any such damage, injury or loss, except such as may be directly due to errors in the plans or specifications or caused by agents or employees of the City.

The Contractor shall protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which are not required to be removed or do not unreasonably interfere with construction, as may be determined by the Engineer/Architect, and be responsible for all cutting or damaging of trees and shrubs or grassed areas, including damage due to careless operation of equipment, stockpiling of materials or equipment.

Care shall be taken by the Contractor in felling trees that are to be removed to avoid any unnecessary damage to vegetation or other trees that are to remain in place. Any limbs or branches unavoidably broken during such operations shall be trimmed with a clean cut and painted with an approved tree priming compound. The Contractor may be required to replace or restore at his own expense all vegetation not protected and preserved, as above required, that may be destroyed or damaged.

The Contractor shall provide and maintain all passageways, guard fences, lights, and other facilities required for protection by federal, state or municipal laws and regulations or local conditions.

The Contractor shall comply with local and state regulations governing the operation of premises which are occupied and shall perform the contract in such a manner as not to interrupt or interfere with the operation of other facilities.

The Contractor shall store his apparatus, materials, supplies, and equipment in such orderly fashion at the site of the Project as will not unduly interfere with the progress of his work or the work of any other contractor.

Necessary crossings of curbs, sidewalks, roadways or parkways shall be protected against damage and any damage shall be repaired by or at the expense of the Contractor.

The Contractor shall not place upon the Project or any part thereof, loads inconsistent with the design or safety of that portion of the Project.

The Contractor shall provide and maintain access to all public and private properties at all times and be responsible for any damage caused by his operation to existing driveways, yards, streets, parking lots, utilities, railroads, etc., and such damage shall be corrected at the Contractor's



expense. Roadways authorized closed by State or Local authorities shall be maintained to provide access to all fire, police, and other emergency vehicles and all individuals having private property in the closed area. The Contractor shall notify at least 24 hours in advance the Fire, Police, and Transportation Departments having local jurisdiction, the Owner and any other individuals, businesses, or agencies that may be affected.

J. **Protection of Existing Utilities.** Contractor shall be responsible for any damage to existing structures or the interruption of any utility services which shall be repaired or restored promptly by and at the expense of the Contractor.

To that extent, the Contractor shall provide whatever measures are necessary to properly protect and maintain all existing utilities encountered in the course of the work. The Contractor shall be exclusively responsible to the utility owner for any and all damages to the various utilities caused by the Contractor's actions or lack of actions to adequately protect the same.

The Contractor shall determine the exact location of all existing utilities before commencing work and agrees hereby to be fully responsible and liable for any and all damages which might occur by his failure to exactly locate and/or preserve the location of any and all underground or overhead utilities. The Contractor shall be solely and directly responsible to the utility owner for any and all damages to the various utilities, caused by the Contractor's actions or lack of actions to adequately protect such utilities. If any utilities are to be affected during the course of construction, the Contractor shall so notify the owners thereof at least seventy-two (72) hours prior to any such construction activity. The Contractor shall fully cooperate and coordinate with all utility owners in the event of an interruption to any utility service. The cost for locating, uncovering and protecting underground and/or overhead utilities is included within the Contractor's bid price for various other items of work.

The Contractor shall maintain all storm sewers, drains and/or ditches so that flow is not disturbed or impeded. The Contractor shall protect storm drains, inlets and/or ditches, lawns, landscaping and other facilities, from damage during the testing, and flushing.

K. **Limiting Exposures:** The Contractor shall prosecute the work on the Project to ensure that no part of the construction, complete or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to the following:

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| Excessive static or dynamic loading      | Rodent and insect infestation          |
| Excessive internal or external pressures | Combustion                             |
| Excessively high or low temperatures     | Electrical Current                     |
| Thermal shock                            | High speed operation                   |
| Excessively high or low humidity         | Improper lubrication                   |
| Air contamination or pollution           | Unusual wear or other misuse           |
| Water or ice                             | Contact between incompatible materials |
| Solvents                                 | Destructive Testing                    |

Chemicals  
Light  
Puncture  
Abrasions  
Heavy traffic  
Soiling, staining and corrosion  
Bacteria

Misalignment  
Excessive weathering  
Unprotected storage  
Improper shipping or handling  
Theft  
Vandalism

The Contractor shall minimize dust and air pollution through the use of water or other devices, require the use of properly operating combustion emission control devices and by encouraging the shutdown of construction vehicles when not in use.

L. **Safety:** The completed Project shall include all necessary permanent safety devices, such as machinery guards and similar ordinary safety items as may be appropriate or required by law. Further, any feature of the Project (including City-furnished or City-selected equipment) subject to such safety regulations shall be fabricated, furnished, and installed in compliance with these requirements. Contractors and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. Contractors shall notify all equipment suppliers and subcontractors of the provisions of this Article.

In selecting and/or accepting equipment for installation in the Project, neither the City nor Engineer/Architect assume responsibility for any personal injury, property damage, or any other damages or claims resulting from failure of the equipment to comply with applicable safety codes or requirements, or the safety requirements of a recognized agency, or failure due to manufacturer's faulty design concepts, or defective workmanship and materials. The Contractor shall indemnify and hold the City, Program Coordinator, and Engineer/Architect harmless against any and all liability, claims, suits, damages, costs, or expenses without limitation arising out of the installation or use of such equipment.

The Contractor shall take all necessary precautions for the safety of employees on the Project and shall comply with all applicable provisions of federal, state, and municipal safety laws and building codes to prevent accidents or injury to persons on or about or adjacent to the premises where the Project is being performed. He shall erect and properly maintain at all times, as required by conditions, and progress of the Project, all necessary safeguards for the protection of workmen and the public, and shall post danger signs warning against the hazards created by features of construction and the site.

Machinery, equipment and all hazards shall be guarded or eliminated in accordance with the State Accident Prevention in Construction provisions to the extent that such provisions are not in contravention with applicable laws.

The Contractor shall do whatever work is necessary for safety and be solely and completely responsible for conditions of the jobsite, including safety of all persons (including but by no means limited to the public, site personnel, visitors, or employees) and property during the

Contract period. The contract period shall include any subsequent warranty or other period associated with Project deficiency or repair and all hours including, and in addition to, normal working hours.

Safety provisions shall conform to the Federal and State Departments of Labor and the Occupational Safety and Health Act (OSHA), and all other applicable federal, state, county, and local laws, ordinances, codes, the requirements set forth herein, and any regulations that may be specified in other parts of these Contract Documents. Where any of these are in conflict, the more stringent requirement shall be followed. The Contractor's failure to thoroughly familiarize himself with the aforementioned safety provisions shall not relieve him from compliance with the obligations and penalties set forth therein.

The Contractor shall at all times provide proper facilities for safe access to the work by authorized government officials (federal, state, county and local) and representatives of the Owner.

M. **Traffic Control:** The Contractor shall be responsible for traffic control, including plan and devices to the extent the same is required due to work in, upon or in proximity to public right-of-way, streets, roads or vehicular traffic. The traffic control plan and all traffic control devices shall conform at a minimum to the Manual on Uniform Traffic Control Devices for Streets and Highways, Latest Edition, Federal Highway Administration. A copy of which is on file in the office of the City of Tuscaloosa Director of the Department of Transportation for examination. Copies may be obtained from the Alabama Department of Transportation. Should the appropriate public authority determine a greater degree of traffic control is required, then the Contractor shall promptly provide same. The Contractor shall submit a plan to the City Engineer for approval before commencing construction.

Reasonable means of ingress and egress by vehicular and/or pedestrian traffic to property adjacent to the Project shall be maintained at all times. The Contractor shall indemnify and hold the City harmless for any claims or causes of action including but not limited to those for inverse condemnation and/or lost profits arising out of or in any manner associated with access to or the restriction or prevention thereof to adjoining property. Traffic control and erosion control is of paramount importance during the construction of this Project and the terms and conditions in the contract documents in regard to these matters must be strictly adhered to.

N. **Responsibility to Act in Emergency:** In case of an emergency which threatens loss or damage to property, and/or safety, the Contractor shall act, without previous instructions from the City or Engineer/Architect, as the situation may warrant. The Contractor shall notify the Engineer/Architect thereof immediately thereafter. Any claim for compensation by the Contractor, together with substantiating documents in regard to expense, shall be submitted to the City through the Engineer/Architect. The claim will be handled in accordance with the provisions for extra work. However, if the emergency is created or aggravated by the Contractor, he shall be liable for the resulting damages. If the Contractor fails to take necessary action as required by such an emergency, the City may assign another Contractor or use his own forces to

perform the emergency work. Costs or damages arising from the failure of the Contractor to act in an emergency may be deducted from the Contractor's request for payment.

O. **Sanitary Regulations:** The Contractor shall provide and maintain such sanitary accommodations for the use of his employees and those of his subcontractors as may be necessary to comply with the requirements and regulations of the local and State Department of Health. At a minimum, necessary sanitary conveniences for the use of the laborers on the work shall be erected and maintained by the Contractor, in such a manner and at such points as shall be approved by the Engineer/Architect. Their use shall be strictly enforced. In the Construction Manager format, the City may provide sanitary accommodations through the Construction Manager.

P. **Cutting, Patching, etc.:** Unless otherwise stated in the contract documents, the Contractor shall do all necessary cutting, fitting and patching of the Project that may be required to properly receive the work, to make its several parts join together properly, receive and provide for the work of various trades, and be received by the work of other contractors, or as required by drawings and specifications to complete the Project. After such cutting, he shall replace or restore or repair and make good all defective or patched work as required by the Engineer/Architect. He shall not cut, excavate or otherwise alter any work in any manner or by a method or methods that will endanger the Project, adjacent property, workmen, the public or the work of any other contractor. The Contractor shall check the location of all sleeves, openings, slots, etc., for the piping, ducts, breeching, conduits, louvers, grills, fans, etc., as they are laid out on the job.

Provisions for openings, holes and clearances through walls, beams, floors, ceilings and partitions shall be made and checked by the Contractor and/or his subcontractor in advance of constructing such parts of the Project and unnecessary, superfluous or dangerous cutting shall be avoided. Pipes passing through concrete or masonry walls shall be protected by pipe sleeves two sizes larger than the pipe, plus its installation to provide free movement.

Under no condition shall structural, framing or other parts or members subjected to computed stress be cut or disturbed without the approval of the Engineer/Architect. Any plates, studs or joists, and/or rafters that are approved to be cut to execute necessary work shall be securely strapped and braced to restore their strength by approved methods.

Unless otherwise indicated in Supplemental Conditions, all road crossings and/or driveways cut by the Contractor during the performance of the Project shall be returned to service as soon as possible and replaced or repaired within seven (7) calendar days.

All major thoroughfares must be repaired the same day as cut. The Contractor shall be responsible for the safety and welfare of the traveling public while construction work is being done and until the City accepts the Project.

The Contractor will replace at his own expense, all pipe and accessories that may be broken, damaged, stolen or lost and all materials that may become damaged, lost, stolen or misused.

The Engineer/Architect's approval shall be obtained before cutting or drilling holes in concrete or masonry that tend to damage or weaken the load capacity.

Q. **Trailers:** With the approval of the City or Engineer/Architect, the Contractor may park trailers or other structures for housing men, tools, machinery and supplies, but they will be permitted only at approved places and their surroundings shall be maintained at all times in a sanitary and satisfactory manner by the Contractor. On or before the completion of the Project, all such trailers or structures shall be removed, unless the City authorizes their abandonment without removal, together with all rubbish and trash, at the expense of the Contractor.

R. **Construction Staking:** If necessary, the Engineer or the City will furnish initial lines and grades to establish the initial horizontal and vertical control points and define the beginning and ending points of the Project. The Contractor is responsible for engaging the services of a qualified Engineer or land surveyor to replace and/or re-establish in accordance with the construction plans and/or specs, all construction stakes that are disturbed, displaced or destroyed during construction. If the Contractor finds any errors or discrepancies with the construction staking or the criteria upon which it is based, he/she shall promptly notify the Owner's representative.

S. **Periodic Cleanup:** The Contractor shall periodically, at least weekly, or as requested during the progress of the Project, clean up and remove from the premises, all refuse, rubbish, scrap materials and debris caused by its employees or its subcontractors resulting from its work, to the end that all times the premises are sanitary, safe, reasonably clean, orderly and workmanlike. Trash and combustible materials shall not be allowed to accumulate inside buildings or elsewhere on the premises. At no time shall any rubbish be thrown from window openings, except during renovations with adequate precautions and into proper receptacles. The Contractor shall comply with all municipal litter and construction site ordinances.

Before the Project is considered as complete, all rubbish created by or in connection with the construction must be removed by the Contractor and the premises left in a condition by the Contractor satisfactory to the City. Street, curbs, crosswalks, pavements, sidewalks, fences and other public and private property disturbed shall be restored to their former condition or better, and final payment will be withheld until such work is finished by the Contractor.

Contractor shall conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws. No burning or burying of rubbish or waste materials is permitted on the Project site. The Contractor shall dispose of any hazardous material in a safe manner, off site, in accordance with applicable laws and regulations and shall not dispose of volatile or hazardous waste in storm or sanitary sewer drainage ditches, streams or waterways.

Contractor shall periodically wet down dry materials and rubbish to lay dust and prevent blowing dust; and shall provide adequate and approved containers for collection and disposal of waste

material, debris and rubbish, removing grease, dust, dirt, stains, labels, fingerprints and other foreign materials from exposed and semi-exposed surfaces.

T. **Termite Control.** If the Project involves construction of a building or if otherwise specifically required by the City, then the Contractor shall provide soil treatment for termite control under all interior slabs on grade and foundation walls, and as herein specified. Contractor shall also comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application and shall engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution and doing business in the state where the Project is located for a minimum of five (5) years.

Contractor shall not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations. To insure penetration, the soil treatment will not be applied to frozen or excessively wet soils or during inclement weather. Contractor shall comply with all handling and application instructions of the soil toxicant manufacturer. The type of materials to be used for soil poisoning shall first be submitted to the City for approval.

The soil treatment solution shall be an emulsible concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a dilutant.

Contractor shall strictly comply with the Environmental Protection Agency's (EPA) rules and regulations governing chemicals and their use. Only soil treatment solutions which are not injurious to planting shall be used. Other solutions may be used as recommended by Applicator when acceptable to the EPA, local governing authorities, and the Engineer/Architect.

Contractor shall comply with the following requirements when applying the soil treatment solution:

1. Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs if recommended by toxicant manufacturer.
2. Under slab-on-grade structures, treat soil before concrete slabs are placed using either power sprayer or tank type garden sprayer.
  - (A) Apply 4-gallons of chemical solution per 10 linear feet to soil in critical areas under slab, including entire inside perimeter inside of foundation walls, along both sides at interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footings.
  - (B) Apply one gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel.

Apply 1-1/2 gallons of chemical solution to areas where fill is washed gravel or other coarse absorbent material.

- (C) Apply 4 gallons of chemical solution per 10 linear feet of trench for each foot of depth from grade to footing, along outside edge of building. Dig a trench 6" to 8" wide along outside of foundation to a depth of not less than 12". Punch holes to top of footing at not more than 12" o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in trench.
- 3. Post signs in areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.
- 4. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

**U. Erosion Control.**

- 1. To the extent there has been issued by the City Engineer a land development permit in accordance with applicable ordinances, the Contractor shall conform to and abide by all terms and conditions of such permit.
- 2. Erosion control measures shall be performed on all disturbed areas in accordance with the Construction Best Management Practices Plan (CBMPP) included in the Notice of Intent for coverage under ALR1000000. The CONTRACTOR will perform all erosion control measures necessary to prevent silt and soil from leaving construction area and entering private property or the "Waters of the State." Erosion control measures shall be in strict accordance with Alabama Law.
- 3. In accordance with the CBMPP, temporary erosion control work shall involve the construction of temporary berms, dikes, drains, fences, dams, etc. with the use of temporary seeding, mulching, erosion control netting, hay bales, sandbags, check dams, etc., as necessary in order to prevent silt and soil from leaving rights-of-way and entering private property or from washing into drainage structures located on State or County rights-of-way. CONTRACTOR shall mow grassed areas as required during the construction phase of the contract.
- 4. Erosion control measures shall be maintained by the CONTRACTOR through the warranty period of the contract. If additional measures are required to correct problems which might occur, these shall be performed by the CONTRACTOR at no additional cost to the OWNER.
- 5. Materials used for erosion control measures shall be in accordance with the Alabama Handbook and the CBMPP shall include hay bales, sandbags, silt fencing rip rap, crushed stone, mulch or other materials necessary in order to accomplish erosion control.

**V. Wastewater Containment and Management Plan.** To the extent that construction activity by the Contractor involves any wastewater infrastructure or construction activities in close proximity to any wastewater infrastructure and/or to any City sanitary sewer assets the Contractor shall submit to the City Engineer, prior to commencing construction, a wastewater

containment and management plan (the "Plan"). The Plan shall adequately address the means, methods and techniques to be employed by the Contractor for containing and transporting wastewater in a sanitary manner without, at any time, permitting the discharge of wastewater into the environment or creating the necessity of a State required sanitary sewer overflow report. The Plan shall be submitted by the Contractor to the Office of City Engineer for review and approval before commencing any construction activity. The City Engineer may waive the requirement of submitting a Plan if he/ she determines that the construction activity to which the Plan would relate does not involve any potential for the discharge of wastewater into the environment or creating the potential for the necessity of a State required sanitary sewer overflow report.

**W. Environmental Clause/Covenant.** Contractor shall not allow any toxic, hazardous or contaminated substances or gases (including, but not limited to, asbestos and raw materials which include hazardous constituents or any other similar substances or materials which are included under or regulated by any local, state, or federal law, rule or regulation pertaining to environmental regulations, contamination, clean-up or disclosure such as, without limitation, the Comprehensive Environmental Response Compensation and Liability Act of 1980 ("CERCLA"); the Clean Air Act (42 U.S.C. Sec. 7401 et seq.); the Clean Water Act (33 U.S.C. §1251 et seq.); the Resource Conservation and Recovery Act (42 U.S.C. §6901 et seq.); and the Toxic Substances Control Act (42 U.S.C. §2601 et seq.) or state environmental clean-up or disclosure acts and statutes as all such acts and statutes exist now or are hereafter amended (such acts and statutes referred to herein as "Environmental Laws")(such substances or gases referred to herein as 'Hazardous Substances') to be stored, located, or discharged on the premises without specific prior written consent of the City. Contractor shall comply with all Environmental Laws affecting the premises. Contractor covenants to hold the City, its officers, agents and employees harmless from and against any loss, costs, damage or expenses (including attorney's fees and expenses) arising out of the presence of Hazardous Substances (as hereinbefore described) on or about the premises or the violation of any Environmental Laws with respect thereto, the occurrence of which Hazardous Substances on the premises or the violation of any Environmental Laws shall have arisen solely from the acts or omissions of Contractor, its subcontractors, agents, invitees and employees. This indemnity shall survive the termination of this contract and shall inure to the benefit of the City of Tuscaloosa, its successors and assigns.

## **ARTICLE V. INSURANCE, LIABILITY, ETC.**

### **A. Contractor's Insurance (Generally):**

1. Insurance Required. The Contractor shall not commence work under this contract until it has obtained all insurance required by the Contract documents and such insurance has been accepted by the City. The Contractor shall maintain the required insurance during the term of the contract including any extensions of the term.

Insurance shall be written in comprehensive form by insurance companies rated A- or better by A. M. BEST and shall protect the Contractor and the City against claims for injuries to



members of the public (including City employees) or damages to property of others (including City property) arising out of any act of the Contractor or any of its agents, employees or subcontractors and shall cover both on-site and off-site operations under this contract and insurance coverage shall extend to any motor vehicles or other related equipment, irrespective of whether the same is owned, non-owned or hired.

The obtaining and maintaining by Contractor and subcontractors of the insurance required herein does not relieve the Contractor of any responsibilities, obligations or duties to the City pursuant to this contract.

2. Additional Insurance. The Contractor shall have an insurance professional review the Contractor's activities in regard to the performance of this contract and the Contractor shall obtain any further or additional insurance or greater limits as recommended by the insurance professional.

3. Insurance Limits. Neither the setting of insurance limits or requirements nor the acceptance or approval of the same by the City imply or represent that the limits or the insurance carrier is sufficient or that such insurance actually has been obtained, that being the responsibility of the Contractor.

4. Subcontractors. The Contractor shall require all subcontractors to take out and maintain the type of insurance required herein to the extent of their involvement in the Project so as to be adequate to protect against liability. In the event any work under this Contract is performed by a subcontractor(s), the Contractor shall remain responsible for any liability directly or indirectly arising out of the work performed under this Contract, regardless of whether or not such work is covered by the subcontractor's insurance. The Contractor shall not allow any subcontractor to commence work on the project until all similar insurance required of the subcontractor has been obtained. All subcontractors shall maintain required insurance during the term of the contract including any extensions of the term.

5. City's Right to Review Coverage. The City shall have the right to inspect and approve Contractor's insurance coverage herein required. Should the City deem it advisable to modify the coverage in any way, it shall so request of the Contractor in writing and should the Contractor fail to modify the coverage, then the City may pay the cost of any increased coverage or take credit for any decreases as may be appropriate. Review or acceptance of insurance by the City or representatives of the City shall not relieve or decrease the responsibility of the Contractor hereunder.

6. Waiver of Subrogation. To the extent that the Contractor is required to maintain insurance coverage for loss or damage to property or bodily injury, including Builders Risk All Risk insurance, the insurance must waive and the Contractor hereby waives subrogation of claims against the City, its officers, agents and employees.

7. City as Additional Insured. The City shall be named as additional insured, for ongoing and completed operations for up to two (2) years, on the Contractor's and any subcontractor's policies for any claims arising out of work performed under this Contract. The Contractor shall provide the City with a Certificate of Insurance naming the City as an additional insured using ISO for CG 2010 1185 (or a substitute form providing equivalent coverage) or on the combination of ISO forms CG 20 10 07 04 or CG 20 33 07 04 and CG 20 37 07 04 (or a substitute or ISO form providing equivalent coverage) naming the City as an additional insured, giving all parties a 30 day notice of cancellation or intent not to renew the insurance, a waiver of subrogation and list any and all exclusions. The coverage available to the City as an additional insured shall not be less than \$1,000,000 Each Occurrence, \$2,000,000 General Aggregate (subject to a per project general aggregate applicable to the project,), \$2,000,000 Products/completed Operations Aggregate, and \$1,000,000 Personal and Advertising injury limits. Additional insured coverage shall apply as primary, non-contributory, insurance with any other insurance afforded to the City and the Contractor.

8. Elevators, Hoist and Cranes. If the Contractor or a subcontractor will utilize in connection with the performance of the work pursuant to this contract an elevator, material hoist, crane or other equipment, or conveyor, then the Contractor shall take out and maintain or require the subcontractor to take out and maintain insurance that shall protect the Contractor and the City against claims for injuries to members of the public (including City employees) or damages to property of others (including City property) arising out of any act of the Contractor or any of its agents, employees or subcontractors resulting from the operation of such elevator, material hoist, crane or other equipment, or conveyor.

**B. Insurance:**

1. Workmen's Compensation Insurance: The Contractor shall take out and maintain during the term or any extensions of this contract Workmen's Compensation Insurance as required by Alabama law for all of its employees employed at the site of the Project or off-sites related to the Project and, in case any work is sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor.

In case any class of employees engaged in any work under this contract at the site of the Project is not protected under the Workmen's Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide, adequate accident insurance for the protection of its employees not otherwise protected.

Water or Navigational Exposure; Where work under this contract may trigger the requirement for Federal Longshoreman's and Harbor worker's Act and Federal Jones Act or insurance required by other applicable law or regulations, the Contractor shall obtain the same if required.

2. Comprehensive Automobile and Vehicle Liability Insurance: The Contractor shall maintain during the term or any extensions of this contract, comprehensive automobile and

vehicle liability insurance. The limits of liability shall not be less than \$1,000,000 combined single limit or equivalent.

3. Commercial General Liability Insurance: The Contractor shall maintain during the term or any extensions of this contract, Commercial General Liability Insurance, including officers, agents and employees. The limits of liability shall not be less than \$1,000,000 Each Occurrence, \$2,000,000 General Aggregate (subject to a per project general aggregate applicable to the project), \$2,000,000 Products/Completed Operations Aggregate, and \$1,000,000 Personal and Advertising Injury Limits Combined Single Limit or equivalent.

4. Owner's Protective Insurance: For projects with a contract amount of \$500,000.00 or greater, an Owner's Protective Policy is required in the minimum amount of \$1,000,000 each occurrence. Provided; however, the City may require such insurance on projects of lesser amount if an insurance limit amount is stated herein.

5. Umbrella Excess Liability Over Primary Insurance: The Contractor shall take out and maintain during the term of this contract, and any extensions thereof, Umbrella Excess Liability Insurance. The minimum limits of coverage shall be as follows:

Each Occurrence	\$ <u>5,000,000.00</u>
Aggregate	\$ <u>5,000,000.00</u>

The coverage shall be over the required general liability insurance and automobile liability insurance as a minimum. There shall be no gaps or sublimit deductibles, etc.

6. Miscellaneous Insurance: The Contractor shall provide whatever insurance may be required of the City or the Contractor by permits or agreements, etc., with the railroad, highways, or other utilities. The Contractor shall familiarize himself with all insurance requirements contained in easements, permits, and agreements associated with this Project. The Contractor shall provide any Railroad Protective Liability and other General Liability Insurance in the amounts contained in the agreements, permits or easements or in greater amounts if higher limits are appropriate or required elsewhere. The Contractor shall bear the cost of all required insurance and shall include in his bid a sufficient amount to cover the cost of all required insurance. To the extent the City obtains permits or licenses for railroad or highway bores, crossings or other work involved in the Project, the Contractor shall obtain adequate insurance to protect itself and the City.

7. Builders Risk All Risk Insurance: To the extent applicable to the Project, the Contractor shall secure and maintain during the life of this Contract, Builder Risk All Risk Insurance coverage for 100 percent of the Contract Price. This insurance shall not exclude coverage for earthquake, landslide, tornado, flood, collapse or loss due to the result of faulty workmanship. Such insurance shall also provide for any damages caused by injury to, or destruction of, tangible property, including loss of use resulting therefrom, and shall pay all losses to the Contractor and the City as their interest may appear.

If this is a trade contract under a construction manager format, the provisions of this subsection shall not apply.

8. **Proof of Carriage of Insurance:** The Contractor shall furnish the City with satisfactory proof of carriage of the insurance required herein, in the form of an insurance certificate or if the City elects in the form of a policy. Insurance shall be in a form satisfactory to the City.

- (A) The Contractor's and any subcontractor's general liability and automobile liability insurance shall endorse the Owner (City of Tuscaloosa), its officers, agents and employees, as additional insured's for any claims arising out of work performed under this contract.
- (B) The Contractor's insurance endorsing the Owner and others as additional insured's shall be "primary" and non-contributory as to such endorsed insured's.
- (C) Cancellation: The certificate and policy, as the case may be, shall state that the City shall be given thirty (30) days' written notice of cancellation or any change in the insurance coverage.
- (D) There shall be a statement that the Contractor and any subcontractors waive subrogation as to the City, its officers, agents, employees and Program Coordinator.
- (E) There shall be a statement that full aggregate limits apply per job or contract.
- (F) Agents' verification of Contractor's insurance on form provided by the City or equivalent.
- (G) Insurance shall contain no exclusions for x, c or u.
- (H) Full aggregate limits must apply per job or contract.

C. **No Personal Liability of Public Officials:** In carrying out any of the provisions hereof in exercising any authority granted by the Contract, there will be no personal liability upon any public official.

D. **Indemnity:** To the maximum extent permitted by law, the Contractor shall save harmless, indemnify and defend the City, its officers, agents and employees from and against any and all claims and losses, cost, expense or liability including attorney's fees and litigation costs caused by, arising out of, resulting from, or occurring in connection with the performance of the work by the Contractor or any subcontractor, regardless of the fault, breach of contract, or negligence of the City, its officers, agents or employees excepting only such claims or losses that have been adjudicated to have been caused solely by the negligence of the City and regardless of whether or not the Contractor is or can be named a party in a litigation.

Contractor agrees to indemnify and/or reimburse the City for any fines, violations, charges, suits, or sums of money imposed by the Alabama Department of Environmental Management (ADEM), Environmental Protection Agency (EPA), or any administrative agency on the City of Tuscaloosa

for any sewage or contaminate discharged or Wetlands regulations violation as a result of or arising out of the work by the Contractor pursuant to this agreement.

E. **Errors and Omissions.** The Contractor does agree to release and hold harmless the City of Tuscaloosa or any of its officers, agents and employees and its Program Coordinator from any damages claimed by the Contractor or subcontractors resulting from or attributable in whole or in part to, errors in or omissions of the plans and specifications, including final drawings of the Engineer/Architect or other design professionals. As to plans, specifications or designs prepared by independent design professionals, the parties agree that any City review or approval thereof was only for overall suitability, maintenance and usability and there are no express or implied warranties by the City as to the adequacy, accuracy, correctness, or code compliance thereof.

F. **Exclusion of Contractor Claims:** In performing its obligations, the Engineer/Architect and its consultants may cause expense for the Contractor or its subcontractors and equipment or material suppliers. However, those parties and their sureties shall maintain no direct action against the City or its officers, employees, agents and program coordinator for any claim arising out of, in connection with, or resulting from the Engineering services performed or required to be performed where such services are performed in good faith to protect the City or the Public.

G. **Inadequate Surety/Insurance.** It is further mutually agreed between the parties hereto that if, at any time after the execution of this agreement, any of the surety bonds of the Contractor or subcontractors relating to the Project for its faithful performance shall be deemed by the City to be unsatisfactory, or if for any reason such bond(s) ceases to be adequate to cover the performance of the work or the surety ceases to do business by agent in Tuscaloosa County, Alabama, the Contractor shall, at its expense, within five (5) days after the receipt of notice from the City so to do, furnish an additional bond or bonds in such form and amount and with such surety or sureties as shall be satisfactory to the City. In such event, no further payment to the Contractor shall be deemed to be due under this agreement until such new or additional security for the faithful performance of the work shall be furnished in manner and form satisfactory to the City.

H. **Changes.** When changes in the scope of work by written order or change orders aggregate in amount equal to 10 percent of the total contract, including the change order or change orders, the insurance coverage included under this heading shall be increased accordingly by the Contractor. Proof of coverage shall be established by endorsement to the original policy or by re-issue of the original policy to include the added coverage, or in accordance with any other acceptable policy with the insuring company for increasing the coverage.

## ARTICLE VI. OBSERVATION OF THE PROJECT

A. **Generally:** The Contractor shall furnish the Engineer/Architect and/or the City's observer with every reasonable facility for ascertaining whether or not the work performed is in accordance with the requirements and intent of the Specifications and Contract Documents. No work shall be done without suitable inspection by the Engineer/Architect's Inspector or the City's observer. Payment for work or failure to reject any defective work shall not in any way prevent later rejection when such defect is discovered, nor obligate the City to final acceptance. All work done when not in accordance with the Plans, specifications and contract will be rejected and, without cost to the City, shall immediately be removed and other work done in accordance therewith by the Contractor. If the Contractor fails to remove the work as above ordered, then the Engineer/Architect shall have the right and authority to stop the Contractor and his work at once and the City may correct the work as herein provided at the cost and expense of the Contractor.

Inspection is not acceptance and shall not constitute acceptance by the City. The work shall also be subject to inspection by representatives of the City of Tuscaloosa Building Inspection Department.

B. **Observation of the Project:** The Engineer/Architect, the City and its observers, agents, any agency having jurisdiction, and their representatives shall have access at all times to the Project for inspection whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection. The City or the Engineer/Architect may appoint or assign observers, with designated duties and restricted authority, to inspect the Project as may be directed, or to make special observations requested in advance by the Contractor, and to report progress of the Project, and manner of procedure, quality of the material and workmanship, and compliance with the Contract Documents.

Inspection or observation is not acceptance and shall not constitute acceptance by the City.

All materials, workmanship, equipment, processes of manufacture, and methods of construction, shall be subject to inspection, examination, and test by such persons at any and all places where such manufacture and/or construction are being carried on. The Engineer/Architect shall have the right to reject material, workmanship and/or equipment that are defective or otherwise not in accordance with the drawings and Specifications and require its correction by the Contractor. Rejected workmanship shall be satisfactorily corrected, and rejected material shall be satisfactorily replaced with proper material by the Contractor without charge therefor, and the Contractor shall promptly segregate and remove the rejected material from the premises. Provided; however, neither the presence or absence of such observers nor the giving or failure to give such advice, direction or instruction shall in any manner relieve the Contractor from any contract requirement.

Upon rejection of material and/or workmanship by the Engineer/Architect or the City, there may be occasion where such deficiencies may be corrected more economically and timely through

modification of the design versus removal and replacement. In such instances, the Engineer/Architect shall provide design services on behalf of the City necessary for analysis and correction of the rejected work. Costs associated with hourly fees for these professional services shall be paid by the City and deducted from payment to the Contractor based on the actual costs incurred. Prior to beginning any analysis and accrual of associated professional service fees, the Engineer/Architect shall provide the Contractor and City notice in writing of the intent to begin, summary of the scope of work, estimated time to complete, and estimated total fees. Any costs associated with corrective work performed by the Contractor to remedy such deficiencies shall be the sole responsibility of the Contractor.

Neither the City observers nor the Engineer/Architect, will be authorized to revoke, alter, relax, or waive any requirements of the Contract Documents; to issue instructions contrary to the drawings and Specifications; nor shall they supervise and direct work for the Contractor, nor unreasonably interfere with the Contractor's operations beyond the extent necessary to make certain that the Project is being carried out according to the contract requirements.

Any advice which they may give the Contractor shall not be construed as binding the City in any way, nor as releasing the Contractor from any of the contract requirements.

If the Contractor considers any work demanded of it to be outside the contract requirements, or any ruling of the Engineer/Architect or an inspector to be unfair, it may immediately, upon such work being demanded or ruling made, request written instructions from the Engineer/Architect, or inspector, or within ten days file an appeal to the Engineer/Architect or the City, stating clearly and in detail the basis of its objections. However, pending the decision on such appeal no work shall be done in disregard of the rulings of the Engineer/Architect or inspector or his instructions on items of work affected by such appeal.

The Contractor shall furnish promptly, without extra compensation, all reasonable facilities, labor, and material necessary for safe and convenient access, inspection, and tests that may be required by the Engineer/Architect.

**C. Authority and Duties of Observers:** If City or consultant inspectors, whether for the Engineer/Architect or Construction Manager, are being utilized, they shall be authorized and permitted to inspect all work done. The Inspector shall not be authorized to alter or waive any requirements of the Specifications. He shall have authority to call the attention of the Contractor to failure of the work to conform to the specifications and Contract. He may suspend the Project until any questions at issue can be referred to and decided by the Engineer/Architect or the City.

Neither the Engineer/Architect, Inspector, the City or other representatives for the City shall be responsible in any way for construction means, methods or techniques, nor for the safety of the construction work, progress, or employees of the Contractor or any subcontractors, except as set forth in the Construction Manager contract, if applicable.

The presence of the Inspector shall not in any manner lessen the responsibility of the Contractor pursuant to this agreement.

D. **Defective Work/Correction of Work by the City:** The inspection of the work shall not relieve the Contractor of any of its obligations to fulfill its contract and defective work shall be made good, notwithstanding that such work has been previously inspected by the Engineer/Architect and accepted or estimated for payment. The failure of the Engineer/Architect or inspector to condemn improper workmanship shall not be considered as a waiver of any defect, whether known at the time or discovered later, or as preventing the City at any time subsequently from recovering damages for work actually defective. All work shall be guaranteed by the Contractor against defects in workmanship for a period of one year from date of final payment.

Upon failure and/or neglect by the Contractor to promptly prosecute or perform the work in accordance with the contract documents, including any requirements with respect to the construction schedule, plans or specifications, the City may, without prejudice to any other remedy it may have, correct such deficiencies and may deduct the actual cost thereof from payment, then or thereafter due to the Contractor.

E. **Disagreement:** Should any disagreement or difference arise as to the estimated quantities or classifications or as to the meaning of the drawings or specifications, or any point concerning the character, or acceptability or nature of the several kinds of work, or construction thereof, the decision of the Engineer/Architect shall be final and conclusive and binding on the Contractor.

F. **Stop Work Orders:** During unseasonable weather all work must stop when the Engineer/Architect so directs and all work must be suitably protected by Contractor at all times. However, the Engineer/Architect shall be under no obligation to stop work on the Project. If the Project is stopped, the Contractor shall not be entitled to extra compensation for delays or problems associated with the stoppage.

G. **Progress Meetings:** The Contractor shall conduct regular progress meetings during the course of the Project at least once a month or more often if requested by the City or Engineer/Architect. The meetings shall be held at a site convenient to all parties and if a site cannot be agreed upon, the City will designate a site.

The Contractor or designated representative, the Contractor's Superintendent, all subcontractors, engineers, inspectors, and the City's representative shall attend.

The Contractor shall keep accurate written minutes of the meetings and forward copies thereof to the Engineer/Architect and the City's representative before the next scheduled meeting.

If a trade contract, progress meetings will be conducted by the Construction Manager, who will keep minutes. All trade contractors shall attend unless excused by the Construction Manager.



## ARTICLE VII. PROJECT COMPLETION

A. **Substantial Completion:** "Substantial completion" shall be that degree of completion of the Project or a defined portion of the Project, as evidenced by the Engineer/Architect's written notice of Substantial Completion, sufficient to provide the City, at its discretion, the full-time use of the Project or defined portion of the work for the purposes for which it was intended. "Substantial Completion" of an operating facility or operating component of the Project shall be that degree of completion that has provided a minimum of seven (7) continuous days of successful, trouble-free operation in a "fully automatic" manner acceptable to the City and Engineer/Architect and with all redundant systems fully operational. All equipment contained in the Project, plus all other components necessary to enable the owner to operate the facility in the manner that was intended, shall be complete on the substantial completion date.

When the Contractor considers that the Project, or where acceptable to the City, a designated portion thereof is substantially complete, the Contractor shall prepare and submit to the Engineer/Architect a list of items to be completed or corrected and request an inspection for Substantial Completion. The failure by the Contractor to include any items on such list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents. After inspection and/or if an operating facility, after a minimum of seven (7) continuous days of successful, trouble free operation has been achieved during startup, the Engineer/Architect may, at his sole discretion, issue a written notice of substantial completion for the purpose of establishing the starting date for specific equipment guarantees or warranties, and to establish the date that the City will assume the responsibility for the cost of operating such equipment.

Said notice shall not be considered as final acceptance of any portion of the Project or relieve the Contractor from completing the remaining work, including any remaining performance or acceptance testing, within the specified time and in full compliance with the Contract Documents. Specifically, the issuance of a written notice of Substantial Completion shall not relieve the Contractor of his obligation to promptly remedy any omissions and latent or unnoticed defects in the Project covered by the written Notice of Substantial Completion.

B. **Final Inspection:** Upon notice from the Contractor that its work is complete, the Engineer/Architect and/or other representatives of the City shall make a final inspection of the work or Project and conduct test or tests if applicable. The Engineer/Architect shall notify the Contractor of all apparent and/or visible instances where the Project fails to comply with the plans and specifications and contract documents, as well as any defects he may discover (punch list). The Contractor shall immediately make such alterations as are necessary to make the Project comply with the plans and specifications and to the satisfaction of the Engineer/Architect.

Upon completion of all such repairs in a satisfactory manner, and when the Engineer/Architect has determined that the work or Project is acceptable under the contract, including this provision and after publication of final completion and all other requirements of final payment as provided

for in this agreement, then he shall issue a final certificate of payment to the City stating that the balance is due the Contractor, less such amounts as may have been withheld by the City from time to time as provided in the contract documents. In recommending to the City that it make such final payment to the Contractor, the Engineer/Architect shall also issue a certificate of final acceptance wherein he shall recommend to the City that it accept the Project and/or work as final and complete pursuant to the contract documents.

Verification, approval, inspection, final inspection, issuance of final acceptance, issuance of final certificate of payment, action or approval by the City upon the final certificate of payment or final acceptance shall not in any way relieve the Contractor of responsibility for faulty materials or workmanship.

All warranty or guarantee periods shall commence and start to run from the date of substantial completion.

C. **"As Built" Drawings:** Unless waived by the City representative, the Contractor must provide to the City a set of "as built" drawings acceptable to the City as a component part of the Project prior to final payment.

D. **Final Cleanup:** Before final completion and final acceptance, the Contractor shall remove from the City's property or rights-of-ways and from all public and private property, all tools, scaffolding, false work, temporary structures and/or utilities, including the foundations thereof (except such as the City permits in writing to remain); rubbish and waste materials resulting from its operation or caused by its employees; and shall remove all surplus materials, leaving the site clean and true to line and grade, and the Project in a safe and clean condition ready for use and operation. In addition to the above, the Contractor shall be responsible for the following special cleaning for all trades as the Project shall have been completed:

1. Cleaning of all painted, enameled, stained or baked enamel work: removal of all marks, stains, fingerprints and splatters from such surfaces.
2. Cleaning of all glass: cleaning and removing of all stickers, labels, stains and paint from all glass and the washing and polishing of the same on interior and exterior.
3. Cleaning or polishing of all hardware.
4. Cleaning all tile, floor finishing of all kinds; removal of all splatters, stains, paint, dirt, and dust, the washing and polishing of all floors as recommended by the manufacturer or required by the Engineer/Architect.
5. Cleaning of all manufactured articles, materials, fixtures, appliances and equipment; removal of all stickers, rust stains, labels (except instructional and/or safety labels) and temporary covers and cleaning and conditioning of all manufactured articles, materials, fixtures, appliances, electrical, heating and air conditioning equipment as recommended or directed by the manufacturers, unless otherwise required by the Engineer/Architect; blowing out or flushing out of all foreign matter from all dust pockets, piping, tanks, pumps, fans, motors,

devices, switches, panels, fixtures, boilers, similar features; and freeing identification plates on all equipment or excess paint and the polishing thereof.

In the case of failure to comply with the above requirements for any part of the Project within the time specified by the Engineer/Architect, he may cause the work to be done and deduct the cost thereof from the contract price on the next or succeeding application for payment, or in the event that the cost exceeds the balance due the Contractor, bill the Contractor for the excess.

E. **Notice of Completion:** The Contractor shall, immediately after the completion of the Project and acceptance by the Owner as provided for herein, give notice as required by Ala. Code §39-1-1.

**NOTE:** When maintenance periods are included in the contract for highways, bridges or similar structures, such periods shall be considered component parts of the contract.

F. **Final Payment:** Upon completion of the Project by the Contractor and acceptance by the City's representatives of all work required of the Contractor for the Project, but not until thirty (30) days after completion of the notice, the amount due the Contractor pursuant to the Contract Documents shall be paid upon the presentation by the Contractor to the City's representative of the following:

1. A properly executed and duly certified voucher for payment, verified by architect, engineer or other City representative, including therewith evidence that all payrolls and all amounts due for labor and materials, other than claims for damages due to tort, have been fully paid and satisfied and there are no outstanding claims or demands associated with the work on the Project.
2. A release of all claims and claims of lien against the City from the Contractor and all major subcontractors (the City may waive the requirement for subcontractor releases) arising under and by virtue of the contract, on the form attached, duly executed by the Contractor and with the consent of the surety. The Contractor may specifically except claims of the Contractor from the operation of the release if specifically excepted therefrom in stated amounts and the reason therefor. The Contractor may with the consent of the City representative, if any subcontractor refuses to furnish such a release, furnish a bond with surety satisfactory to the City representative to indemnify against such claims.
3. Proof of publication of notice of completion including affidavit of publisher and a printed copy of the notice so published, as provided by law.
4. In accordance with Ala. Code §39-2-12(c), a non-resident contractor shall satisfy the City that he or she has paid all taxes due and payable to the State, the City and all applicable political subdivisions.

G. **Acceptance of Final Payment Constitutes Release:** The acceptance by the Contractor of the final payment shall release the City, the Engineer/Architect, as representatives of the City,

and their officers, employees, agents, and subconsultants from all claims and all liability to the Contractor for all things done or furnished in connection with the Project, and every act of the City and others relating to or arising out of the work except claims previously made in writing and still unsettled. No payment, however, final or otherwise, shall operate to release the Contractor or his Sureties from obligations under this Contract and the Performance Bond, Payment Bond, and other bonds, warranties and guarantees as herein provided.

## ARTICLE VIII. WARRANTY AND GUARANTEES

### A. Warranty and Guarantee:

1. Warranty: The Contractor warrants to the City and the Engineer/Architect that all materials and equipment furnished under this Contract will be new unless otherwise specified and that all work, materials and equipment will be of good quality, free from fault and defects and in conformance with the contract documents. The work must be safe, substantial and durable construction in all respects. All work, materials and equipment not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. Warranties shall commence to run from the date of substantial completion.

The work furnished must be of first quality and the workmanship must be the best obtainable in the various trades. The Contractor hereby guarantees the Project and the work on the Project against defective materials or faulty workmanship for a minimum of one (1) year after final payment by the City and shall replace or repair any defective materials or equipment or faulty workmanship during the period of guarantee at no cost to the City.

2. Guarantee: If, within the designated warranty period or if not designated, within one (1) year from the date of substantial completion, any of the work, materials or equipment is found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of written notice from the City to do so, unless the City has previously specifically given the Contractor a written acceptance of such specific condition. This obligation shall survive termination of the Contract. The City shall give such notice promptly after discovery of the condition.
3. Roofing Guarantee: If the Project involves a roof on a building or other structure, then the Contractor shall execute and provide the Roofing Guarantee in the form attached hereto. The guarantee shall be delivered to the City and Engineer/Architect prior to final payment.
4. Termite Warranty: If the Project involves termite treatment as required in Article IV, then the Contractor shall furnish to the City a written warranty certifying that

the applied soil poisoning treatment will prevent the infestation of subterranean termites and that if subterranean termite activity is discovered during the warranty period, Contractor shall re-treat the soil and repair or replace any damage caused by termite infestation. The warranty shall be for a period of five (5) years from the date of treatment signed by Applicator and Contractor.

**B. Correction of Defective Work During Warranty/Guarantee Period:** The Contractor hereby agrees to make, at his own expense and no cost to the City, all repairs or replacements necessitated by defects in materials or workmanship, provided under the terms of this Contract, and pay for any damage to other works resulting from such defects, which become evident within 1 year after the date of substantial completion unless substantial completion is established by the Engineer/Architect only for specified items of equipment, or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents unless the City has previously given the Contractor a written acceptance of such defects. The Contractor shall promptly correct such defects upon receipt of a written notice from the City to do so. This obligation shall survive the termination of the Contract.

Unremedied defects identified for correction during the warranty period described herein before, but remaining after its expiration, shall be considered as part of the obligations of the warranty. Defects in material, workmanship, or equipment which are remedied as a result of obligations of the warranty shall subject the remedied portion of the Project to an extended warranty period of 1 year after the defect has been remedied.

Repetitive malfunction of equipment shall be cause for equipment replacement and an extension of the guarantee period for the equipment to a date 1 year following acceptable replacement.

The Contractor further assumes responsibility for a similar guarantee for all work and materials provided by subcontractors or manufacturers of packaged equipment components.

The Contractor also agrees to hold the City and the Engineer/Architect and employees harmless from liability or damages, including the Engineer/Architect's and attorneys' fees, and cost and expenses of litigation of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written order for same from the City. If the Contractor fails to make the repairs and replacements promptly, or in an emergency where delay would cause serious risk, or loss, or damage, the City may have the defective work corrected or the rejected work removed and replaced, and the Contractor and his Surety shall be liable for the cost thereof. The Contractor during the warranty period shall repair/replace as rapidly as possible any and all equipment, materials, etc., which are found to be defective. Should any items not be repaired/replaced within thirty (30) days from the time it is reported to the Contractor by the City, then the warranty period shall be extended on that item for a period equal to the time that the item has remained defective, incomplete, or inoperable as determined by the City. The Contractor must certify that the item has been corrected.

The City's rights under this Article shall be in addition to, and not a limitation of, any other rights and remedies available by law.

#### **ARTICLE IX. LAWS, PERMITS, ETC.**

**A. Laws and Regulations/Royalties, Patents, Copyrights and Permits and Rights-of-Way:**  
The Contractor shall comply with and keep itself fully informed of all laws, ordinances and regulations of federal, state, City and county in any manner effecting those engaged or employed in the Project, or the materials used in the Project, or in any way affecting the conduct of the Project, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. The Contractor shall possess all permits and licenses required by applicable law, rule or regulation for the performance of the Project. If any discrepancy or inconsistency should be discovered in this contract, or in the drawings or specifications herein referred to, in relation to any law, ordinance, regulation, order or decree, it shall forthwith report the same in writing to the Engineer/Architect. It shall at all times, itself, observe and comply with all such existing and future laws, ordinances and regulations.

The Contractor shall protect and indemnify the City, Engineer/Architect, and their respective employees, officers, subconsultants, and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, or regulations. All permits, licenses, and inspection fees necessary for prosecution and completion of the Project shall be secured and paid for by the Contractor, unless otherwise specified.

The Contractor shall obtain and pay for all licenses and permits and shall pay all fees and charges for connection to outside service and the use of property required for the execution and completion of the Project.

The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations, and code requirements applicable in or bearing on the conduct of the Project unless in conflict with contract requirements. If the Contractor ascertains at any time that any requirements of the Contract is at variance with applicable laws, ordinances, regulations, or building code requirements, it shall promptly notify the Engineer/Architect and any necessary adjustment of the Contract will be made as herein specified under change in orders.

The Contractor shall pay all applicable federal, state and local taxes and assessments on the Project. Wherever the law of the place of building requires a special tax, consumer, use, occupation, or other tax, the Contractor shall pay such tax.

The Contractor shall pay all royalties and license fees. The Contractor shall hold and save the City and its agents and employees harmless from liability of any nature or kind, including costs and expenses, for or on account of any patented or unpatented invention, process, article or appliance manufactured or used in the performance of the contract, including its use by the City.

To the extent that the Project has not been permitted or registered by the Engineer or City, the Contractor shall register or obtain any and all necessary National Pollutant Discharge Elimination System (NPDES) Permits required by USEPA or the Alabama Department of Environmental Management (ADEM) as well as any applicable storm water permits or registration for the construction of the improvements specified in the Contract Documents. The Contractor shall abide by all regulations and conditions relative to the permit or registration and attachments to the permit or registration, including but not limited to sampling and monitoring. The Contractor shall fulfill for the City all the requirements made upon the City by the permit(s) or registration.

The Contractor shall be fully responsible for all aspects of erosion and sediment control. The Contractor shall utilize whatever measures are necessary to prevent pollution or siltation due to his activities. As a minimum, the Contractor shall strictly comply with the CBMPP and methods referenced in the Alabama Soil and Water Conservation Committee "Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas," latest edition (referred to as the "Alabama Handbook").

If the Contractor has information that any process, article or item specified or delineated by the Engineer/Architect is an infringement of a patent or a copyright, it shall promptly give such information to the Engineer/Architect.

**B. Alabama Department of Transportation Rights-of-Way:** If any portion of the Project involves work upon State right-of-way, the Contractor agrees to provide the Alabama Department of Transportation with a bond or certified check in the amount required, made payable to the Alabama Department of Transportation, to guarantee the faithful performance of the provisions of a permit and to guarantee that the Contractor shall maintain the work in a manner suitable to the Alabama Department of Transportation for a period of one (1) year. The Alabama Department of Transportation Bond Form must be used. At the end of one (1) year from the completion of this work, the Department of Transportation will return the certified check or bond to the applicant provided all provisions of this permit have been complied with. Otherwise, the Department of Transportation shall apply the certified check or bond to the cost of repairing the rights-of-way with State forces.

**C. Tuscaloosa County Right-of-Way:** If any portion of the Project involves work upon County right-of-way, the Contractor agrees to execute an application and file with Tuscaloosa County a bond or certified check in the amount required, made payable to Tuscaloosa County to guarantee the faithful performance of this provision of this work suitable to the County for a period of one (1) year. At the end of one year from the completion of this work, the County will return the certified check or bond to the applicant provided all provisions of this permit have been complied with. Otherwise, the County shall apply the certified check or bond on the cost of repairing the right-of-way with the County forces.

**D. Storm Water Permit and Monitoring:**

1. To the extent that the Project has not been permitted or registered by the Engineer or the City, and the Project is defined as an NPDES Construction Site per ADEM Admin. Code Chapter 335-6-12 (the Rule), the Contractor shall submit to the Alabama Department of Environmental Management (ADEM) a Notice of Intent (NOI) for coverage under ADEM General NPDES Permit No. ALR1000000. The Contractor shall strictly adhere to all requirements of ALR1000000 and the rule regardless of which party has obtained coverage.
2. Compliance with all provisions of ADEM Admin. Code Chapter 335-6-12 and coverage under ALR1000000 is required, including but not limited to, the preparation and implementation of a Construction Best Management Practices Plan (CBMPP) and any other plans as may be required, the regular maintenance of the Best Management Practices (BMPs) to the maximum extent practicable and the submittal of required reports. As required by ALR1000000, the Contractor shall retain a Qualified Credentialed Professional (QCP) to prepare the CBMPP and to certify that it was prepared in accordance with the requirements of the "Alabama Handbook" and ALR1000000.
3. Coverage under ALR1000000 neither precludes nor negates an operator's responsibility or liability to apply for, obtain, or comply with other ADEM, federal, state, or local government permits, certifications, licenses, or other approvals.
4. The Contractor, unless application for permit coverage has already been made, will be furnished a Storm Water NOR application package when the contract is awarded. The Storm Water NOR application package will include the following:
  - a. Typical transmittal letter to ADEM.
  - b. NOR applications filled out with Project information.
  - c. Project area map.
  - d. Other data as required by the NOR for Tier 1 waters if applicable.
5. The Contractor will complete or furnish the following items and submit to ADEM within five working days of the receipt of the Notice to Proceed by the Owner.
  - a. The Electronic Notice of Intent (eNOI) process shall be used to obtain coverage under ALR1000000. The eNOI shall be signed by a responsible official who is the operator, owner, the sole proprietor of a sole proprietorship, a general/controlling member or partner, or an executive officer of at least the level of vice-president for a corporation. Additionally, the QCP is required to sign the CBMPP certification part of the eNOI process.
  - c. Determine applicable fee per ADEM Fee Schedule D and make payable through the eNOI process.
6. The Contractor shall not commence any construction activities until ADEM has issued the authorization number for the Project.
7.
  - a. Payment will be made to the Contractor for obtaining coverage under ALR1000000 as specified herein for the lump sum amount as shown in the



bid schedule. If there is no line item for registration, obtaining permit coverage shall be considered a subsidiary obligation of mobilization.

- b. Individual erosion and sediment control items shall be paid for at the unit prices as shown in the bid schedule. Routine inspections will be performed by the Owner's representative or Engineer to verify compliance with the CBMPP and ALR1000000 shall be the Contractor's responsibility and shall be incidental to the storm water permit coverage.
- c. If no individual erosion and sediment control items are included in the bid schedule the cost of these items shall be incidental to the lump sum amount as shown in the bid schedule for Storm Water Monitoring and Temporary Erosion and Sediment Control and payment shall be made pro rata as the Project progresses.

**E.** The Contractor shall perform all work in compliance with and as required by any State, Federal or Local registration, permit or license, the terms and conditions of which are adopted herein by reference. The Contractor agrees to indemnify and hold harmless the City, Engineer, and their respective officers, agents and employees from any fines, penalties, damages, claims, liability or judgment arising out of or in any manner associated with the Contractor's failure to perform work on the Project in strict accordance with all storm water registration, permit or license requirements.

## **ARTICLE X. MISCELLANEOUS CLAUSES**

### **A. Notice and Service Thereof:**

- 1. All notices, demands, requests, change orders, instructions, approvals and claims shall be in writing. Unless expressly otherwise provided elsewhere in this agreement, any election, notice or other communication required or permitted to be given under this agreement shall be in writing and deemed to have been duly given if provided in accordance with the provisions hereof.
- 2. Any notice to or demand upon the Contractor shall be in writing and shall be sufficiently given if addressed to the Contractor at the address stated herein and deposited in the United States mail in a sealed envelope with sufficient postage prepaid or delivered with charges prepaid. It shall also be sufficient if such notice or demand be served upon the Contractor personally or its local representative in charge of the Project or delivered at his local office. The Contractor shall, from time to time, designate to the City in writing any change of address to which such notice or demand shall be sent.
- 3. Any notice to or demand upon the City shall be in writing and shall be sufficiently given if delivered to the office of the City's representative or if addressed to the City representative and deposited in the United States mail in a sealed envelope with sufficient postage prepaid.
- 4. Addresses for Notice to Parties

a. For the City, Notice shall be delivered as follows:

(1) To the **City Representative**

The City's representative on this Project is hereby designated as Bryan Gurney, P.E., City of Tuscaloosa  
P.O. Box 2089, Tuscaloosa, Alabama 35403-2089

\*All references to Engineer or Architect shall be to the City representative if no Engineer or Architect is involved in the Project.

(2) To the **City Attorney**

Scott Holmes, City Attorney  
City of Tuscaloosa  
2201 University Boulevard  
Tuscaloosa, Alabama 35401

b. For the Contractor, Notice shall be delivered as follows:

(1) To the **Contractor Representative:**

The Contractor's representative on this Project is hereby designated as \_\_\_\_\_ and whose address is \_\_\_\_\_.

**D. Capacity:** Each party to this agreement represents and warrants to the other as follows:

1. That it is an individual of the age of majority or otherwise a legal entity duly organized and in good standing pursuant to all applicable laws, rules and regulations.
2. That each has full power and capacity to enter into this agreement, to perform and to conclude the same including the capacity, to the extent applicable, to grant, convey and/or transfer; areas, assets, facilities, properties, (both real and personal), permits, consents and authorizations and/or the full power and right to acquire and accept the same.
3. That to the extent required, each party has obtained the necessary approval of its governing body or board and a resolution or other binding act has been duly and properly enacted by such governing body or board authorizing this agreement and said approval has been reduced to writing and certified or attested by the appropriate official of the party.
4. That each party has duly authorized and empowered a representative to execute this agreement on their respective behalf and the execution of this agreement by such representative fully and completely binds the party to the terms and conditions hereof.

5. That absent fraud, the execution of this agreement by a representative of the party shall constitute a certification that all such authorizations for execution exist and have been performed and the other party shall be entitled to rely upon the same. To the extent a party is a partnership, limited liability company or joint venture, the execution of this agreement by any member thereof shall bind the party and to the extent that the execution of agreement is limited to a manager, managing partner or specific member then the person so executing this agreement is duly authorized to act in such capacity for the party.
6. That each party represents and warrants to the other that there is no litigation, claim or administrative action threatened or pending or other proceedings to its knowledge against it which would have an adverse impact upon this transaction or upon either's ability to conclude the transaction or perform pursuant to the terms and conditions of this agreement.
7. That each party has obtained any and all required permits, approvals and/or authorizations from third parties to enable it to fully perform pursuant to this agreement.
8. Under the provisions of the Constitution and laws of the State of Alabama, each party has the power to consummate the transactions contemplated by this agreement.
9. Each party represents and warrants that the execution and delivery of this agreement and the consummation of the transactions contemplated herein will not conflict with, be in violation of, or constitute (upon notice or lapse of time, or both) a default under the laws of the State of Alabama, any resolution, agreement, or other contract agreement, or instrument to which a party is subject, or any resolution, order, rule, regulation, writ, injunction, decree or judgment of any governmental authority or court having jurisdiction over the party.
10. This agreement constitutes the legal, valid and binding obligation of each party and is enforceable against each party in accordance with its terms, except in so far as the enforceability thereof may be limited by:
  - (a) Bankruptcy, insolvency or other similar laws affecting the enforcement of creditors' rights
  - (b) General principles of equity, regardless of whether such enforceability is considered as a proceeding at equity or at law.
11. Neither party will enter into any agreement to do anything prohibited in this agreement or enter into any agreement or take any action which would in any way impair the ability of the other party to faithfully and fully perform its obligations hereunder.
12. Under the provisions of the Constitution and laws of the State of Alabama, each party has the power to consummate the transactions contemplated by this agreement.

**E. Ownership of Contract Documents:** The Contract Documents, and copies of parts thereof, are furnished and owned either by the City or the Engineer/Architect. All portions of the Contract Documents, and copies of parts thereof, are the instruments of service for this Project.

They are not to be used on other work and are to be returned to the City on request at the completion of the Project. Any reuse of these materials without specific written verification or adaptation by the City will be at the risk of the user and without liability or legal expense to the City or Engineer/Architect. Such user shall hold the City, its officers, agents and employees harmless from any and all damages, including reasonable attorneys' fees, from any and all claims arising from any such reuse. Any such verification and adoption shall entitle the City to further compensation at rates to be agreed upon by the user and the City.

**F. No Waiver of Rights:** Neither the inspection by the City or the Engineer/Architect or any of their officers, employees, agents, or subconsultants, nor any order by the City for payment of money, nor any payment for, or acceptance of, the whole or any part of the Project by the City or Engineer/Architect, nor any extension of time or change order, nor any possession taken by the City or its employees, or non enforcement of any provision of this agreement by either party shall operate as a waiver of any provision of this agreement, or any power herein reserved to the City, or any right to damages, nor shall any waiver of any breach in this agreement be held to be a waiver of any other or subsequent breach. Acceptance or final payment shall not be final and conclusive with regards to latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the City's rights under any warranty.

**G. Subletting or Assigning of Contract:**

1. Limitations: The Contractor shall not sublet, assign, transfer, convey, sell or otherwise dispose of any portion of the agreement, his obligations, right, or interest therein, or its power to execute such agreement, to any person, firm or corporation without written consent of the City and such written consent shall not be construed to relieve the Contractor of any duty or responsibility for the fulfillment of the agreement. A sale, conveyance or transfer of 50% or more of the stock or ownership of the Contractor shall be considered an assignment. Provided; however, in no event shall any portion of this agreement be assigned to an unsuccessful bidder whose bid was rejected because he or she was not a responsible or responsive bidder. Use of subcontracts up to a combined (total) value of 50 percent of the value of all work will not be construed as an assignment. Unless otherwise stipulated in the proposal or general conditions, the Contractor shall perform, with its own organization, work with the value not less than fifty (50) percent of the value of all work embraced in the contract.
2. Subcontractor's Status: A subcontractor shall be recognized only in the capacity of an employee or agent of the Contractor.

**H. Third Party Beneficiaries:** It is the intent of the parties hereto that there shall be no third party beneficiaries to this agreement.

**I. Final Integration:** This Agreement constitutes the entire agreement of the parties, as a complete and final integration thereof with respect to its subject matter. All written or oral

understandings and agreements heretofore had between and among the parties are merged into this Agreement, which alone fully and completely expresses their understandings. No representation, warranty, or covenant made by any party which is not contained in this Agreement or expressly referred to herein has been relied on by any party in entering into this Agreement.

**J. Force Majeure:** Neither party to this Agreement shall hold the other party responsible for damages or delay in performance caused by acts of God, strikes, lockouts or other circumstances beyond the reasonable control of the other or the other party's employees, agents or contractors.

**K. Amendment in Writing:** This Agreement may not be amended, modified, altered, changed, terminated, or waived in any respect whatsoever, except by a further agreement in writing, properly executed by all of the parties.

**L. Binding Effect:** This agreement shall bind the parties and their respective personal representatives, heirs, next of kin, legatees, distributees, successors, and assigns.

**M. Captions:** The captions of this Agreement are for convenience and reference only, are not a part of this Agreement, and in no way define, describe, extend, or limit the scope or intent of this Agreement.

**N. Construction:** This Agreement shall be construed in its entirety according to its plain meaning and shall not be construed against the party who provided or drafted it.

**O. Mandatory and Permissive:** "Shall", "will", and "agrees" are mandatory; "may" is permissive.

**P. Governing Laws:** The laws of the State of Alabama shall govern the validity of this Agreement, the construction of its terms, the interpretation of the rights, the duties of the parties, the enforcement of its terms, and all other matters relating to this Agreement.

**Q. Liability of the City or City Officials.** Notwithstanding any provision hereof to the contrary, the parties agree and acknowledge that the liability and obligations of the City, City officials or City employees as set forth herein are subject to the limitations imposed on municipalities by the Constitution and laws of the State of Alabama. No present or future official, officer or employee of the City shall ever be personally liable for the performance of any obligations hereunder.

**R. Non Discrimination:** The Contractor agrees that in performing the work and services as required herein under this agreement, not to discriminate against any person on the basis of race color, religion, sex, age or disability. (The Contractor shall fully comply with the Americans with Disabilities Act), the Fair Labor Standards Act and all other applicable laws and regulations).

**S. Fines and Penalties:** The Contractor shall be solely liable for any and all fines or penalties which may be levied by any governmental authority against the Owner and/or Contractor which

are related to the Contractor's operations. The Owner shall deduct the amount of the levied fine or penalty from the Contract amount.

**T. Agreement Date/Counterparts:** The date of this Agreement is intended as and for a date for the convenient identification of this Agreement and is not intended to indicate that this Agreement was necessarily executed and delivered on said date. This instrument may be executed in any number of counterparts, each of which so executed shall be deemed an original, but all such counterparts shall together constitute but one and the same instrument.

**U. Use of Words and Phrases.** The following words and phrases, where used in this document, shall be given the following and respective interpretations: "Herein," "hereby," "hereunder," "hereof," and other equivalent words refer to this document as an entirety and not solely to the particular portion hereof in which any such word is used.

The definitions set forth in any portion of this Agreement unless the text or context indicates differently shall be deemed applicable whether the words defined are herein used in the singular or the plural. Wherever used herein any pronoun or pronouns shall be deemed to include both singular and plural and to cover all genders.

**V. Severability.** Each provision of this agreement shall be considered to be severable and, if for any reason, any such provision or any part thereof, is determined to be invalid and contrary to any existing or future applicable law, such invalidity shall not impair the operation of or affect those portions of this agreement that are valid, but this agreement shall be construed and enforced in all respects as if the invalid or unenforceable provision or part thereof had been omitted.

**SIGNATURE PAGE TO FOLLOW:**

**IN WITNESS WHEREOF**, the parties have caused this Agreement to be executed by their undersigned duly authorized representative on the dates set forth below:

**CITY OF TUSCALOOSA, A Municipal Corporation**

**CONTRACTOR:**

**BY:** \_\_\_\_\_  
**Walter Maddox, Mayor**

**BY:** \_\_\_\_\_  
**TITLE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**DATE:** \_\_\_\_\_

**ATTEST:**

\_\_\_\_\_  
**Clerk, City of Tuscaloosa**

**[END OF SECTION FIVE- CONTRACT]**

**CITY OF TUSCALOOSA  
SECTION SIX- PERFORMANCE BONDS**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements

**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

STATE OF ALABAMA                      )  
TUSCALOOSA, COUNTY                    )

**KNOWN ALL MEN BY THESE PRESENTS**, that we, \_\_\_\_\_  
as principal and \_\_\_\_\_ (hereinafter called the  
"Surety"), as surety, do hereby acknowledge ourselves indebted and firmly bound and held unto  
the City of Tuscaloosa, Alabama, (hereinafter called the "City") a municipal corporation existing  
under and by virtue of the laws of the State of Alabama, for the use and benefit of those entitled  
thereto, in the penal sum of \_\_\_\_\_  
for the payment of which well and truly be made in lawful money of the United States, we do  
hereby bind ourselves, our successors and assigns and personal representatives, jointly and  
severally, firmly by the presents.

**BUT THE CONDITION OF THE FOREGOING OBLIGATION OR BOND IS THIS:**

**WHEREAS**, the City has entered into a certain written contract with said Contractor for the \_\_\_\_\_  
\_\_\_\_\_ in accordance with contract documents  
therefore on file in the Office of the \_\_\_\_\_ at the price of, to-wit:  
\_\_\_\_\_ (\$\_\_\_\_\_ ) as  
more fully appears in said written contract bearing the date of \_\_\_\_\_  
20\_\_\_, which contract is hereby referred to and made a part hereof to the same extent as if set  
out herein in full.

**NOW, THEREFORE**, if the Contractor shall fully and faithfully perform all the undertakings and  
obligations under the said agreement or contract herein before referred to and shall fully  
indemnify and save harmless the said City from all costs and damages whatsoever which it may  
suffer by reason of any failure on the part of said Contractor so to do, and shall fully reimburse  
and repay the said City any and all outlay and expense which it may incur in making good any  
such default, and shall guarantee all workmanship against defects for a period of one year, this  
obligation or bond shall be null and void, otherwise it shall remain in full force and effect.

And, for value received it is hereby stipulated and agreed that no change, extension of time,  
alteration or addition to the terms of said agreement or contract or in the work to be performed  
thereunder or the specifications accompanying the same shall in any wise affect the obligations  
of the principal or of the surety under this bond, and notice is hereby waived of any such change,  
extension of time, alternative of or addition to the terms of the agreement or contract or to the  
work or to the specifications.



**IN WITNESS WHEREOF**, the said Contractor has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers on the \_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
Principal

\_\_\_\_\_  
Title

\_\_\_\_\_  
Surety

ATTEST:

By \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
Title

**[END OF SECTION SIX- PERFORMANCE BONDS]**

**CITY OF TUSCALOOSA**  
**SECTION SEVEN- LABOR AND MATERIAL BOND**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

**KNOWN ALL MEN BY THESE PRESENTS**, that we, \_\_\_\_\_  
(hereinafter called the "Contractor") of \_\_\_\_\_  
as principal and \_\_\_\_\_ (hereinafter  
called the "Surety"), as surety, do hereby acknowledge ourselves indebted and firmly bound and  
held unto the City of Tuscaloosa, Alabama, (hereinafter called the "City"), a municipal  
corporation, existing under and by virtue of the Laws of the State of Alabama, for the use and  
benefit of those entitled thereto, in the penal sum of \_\_\_\_\_  
\_\_\_\_\_ (\$ \_\_\_\_\_) for  
the payment of which well and truly to be made in lawful money of the United States, we do  
hereby bind ourselves, or successors, assigns and personal representatives, jointly and severally,  
firmly by these presents.

**BUT THE CONDITION OF THE FOREGOING OBLIGATION OR BOND IS THIS:**

**WHEREAS:** the City has entered into a certain written contract with said Contractor for the  
\_\_\_\_\_, in accordance with contract documents  
therefore on file in the Office of the \_\_\_\_\_  
at the price of, to-wit: \_\_\_\_\_  
(\$ \_\_\_\_\_) as more fully appears in said written contract bearing date of \_\_\_\_\_,  
20\_\_\_, which contract is hereby referred to and made a part hereof to the same extent as if set  
out herein in full.

**NOW, THEREFORE**, if said Principal and all subcontractors to whom any portion of the work  
provided for in said contract is sublet and all assignees of said Principal and of such  
subcontractors shall promptly make payment to all persons supplying him or them with labor,  
foodstuffs, or supplies for or in the prosecution of the work provided for in such contract, or in  
any amendment or extension of or addition to said contract, and for the payment of reasonable  
attorney fees, incurred by the claimant or claimants in suits on said bond, then the above  
obligation shall be void; otherwise, it shall remain in full force and effect.

**PROVIDED**, however, that this bond is subject to the following conditions and limitations:

(a) Any person, firm or corporation that has furnished labor, foodstuffs, or supplies  
for or in the prosecution of the work provided for in said contract, payment for which has not  
been made, shall have a direct right of action in his or their name or names against the principal  
and surety on this bond, which right of action shall be asserted in a proceeding, instituted in the  
county in which the work provided for in said contract is to be performed and in any county in  
which said Principal or Surety does business. Such right of action shall be asserted in a proceeding

instituted in the name of the claimant or claimants for his or their use and benefit against said Principal and Surety or either of them (but not later than one year after the final settlement of said Contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.

(b) In addition to any other legal mode of service, service of summons and other process in suits on this bond brought in Tuscaloosa County may be had on the Principal or the Surety in accordance with Title 27, Chapter 3, Section 24 of the Ala. Code (1975) by serving a copy of the summons and complaint or other pleading or process, with the Commissioner of Insurance of the State of Alabama or his/ her designee and the Principal and Surety agree to be bound by such mode of service above described and consents that such service shall be the same as personal service on the Principal or Surety.

(c) The Surety shall not be liable hereunder for any damages or compensation recoverable under any workmen's compensation or employer's liability statute.

(d) In no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action or proceeding thereon that is instituted later than one year after the final settlement of said contract.

(e) This bond is given pursuant to the terms of Title 39, Chapter 1, Section 1 of the Ala. Code (1975), and all the provisions of law with reference to this character of bond as set forth in said section or as may hereinafter be enacted are hereby made a part hereof to the same extent as if set out herein in full.

**IN WITNESS WHEREOF**, the said Contractor has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers on the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
Principal

By: \_\_\_\_\_

\_\_\_\_\_  
Title

\_\_\_\_\_  
Surety

By: \_\_\_\_\_

ATTEST:

\_\_\_\_\_

\_\_\_\_\_  
Title

**[END SECTION SEVEN-LABOR AND MATERIAL BOND]**

**CITY OF TUSCALOOSA  
CONTRACTOR'S RELEASE OF LIENS AND CLAIMS**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

**THIS** Contractor's Release of Liens and Claims is made in accordance with that certain contract between the CITY OF TUSCALOOSA, ALABAMA, a Municipal Corporation, (hereinafter the "City") and \_\_\_\_\_ (hereinafter the "Contractor" or undersigned), for a project known as \_\_\_\_\_ in regard to which the undersigned warrants and certifies to the City as follows:

1. That there are no amounts owed by the undersigned or any tier of subcontractor or supplier of the undersigned which could become the basis for a lien or suit against the properties of the Contractor or the property of the City or any funds held by or in the possession of the City in regard to the Project.

2. That the undersigned has satisfied all claims and indebtedness of every nature in any way connected with the work, including (but not limited to) all payrolls, amounts due to subcontractors, accounts for labor performed and materials furnished, incidental services, liens and judgments.

3. In consideration of the receipt by the undersigned from the City of final payment under the above mentioned contract, the undersigned hereby waives and relinquishes all liens and claims of lien which the undersigned may have against the aforesaid property or funds; and further, undersigned also hereby remises, releases and forever discharges the City, its officers, agents and employees, of any and all claims, demands and causes of action whatsoever which the undersigned has, might have or could have against the City by reason of or arising out of the above-mentioned contract. The undersigned further agrees to indemnify and hold the City, its officers, agents and employees harmless against any and all claims or demands from subcontractors or suppliers arising out of the aforementioned contract.

**IN WITNESS WHEREOF**, the undersigned has duly executed this release this the \_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

CONTRACTOR:  
\_\_\_\_\_

BY: \_\_\_\_\_  
TITLE: \_\_\_\_\_

I, \_\_\_\_\_, after being duly sworn, depose and say as follows:  
That I am the \_\_\_\_\_ of the \_\_\_\_\_

Corporation and hereby certify that I am duly authorized to execute this Contractor's Release of Liens and Claims.

STATE OF ALABAMA )  
TUSCALOOSA COUNTY )

\_\_\_\_\_  
CONSENT OF SURETY:

Sworn to and subscribed before me on this \_\_\_\_\_  
the \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
SURETY

\_\_\_\_\_  
Notary Public

BY: \_\_\_\_\_  
ATTORNEY-IN-FACT FOR SURETY

\_\_\_\_\_

**CITY OF TUSCALOOSA  
ROOFING GUARANTEE**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements

**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

Address of Project: \_\_\_\_\_

Owner City of Tuscaloosa

General Contractor \_\_\_\_\_

Address \_\_\_\_\_

Date of Acceptance \_\_\_\_\_ Date of Expiration \_\_\_\_\_

1. The General Contractor does hereby certify to the City of Tuscaloosa that the roofing work included in this contract was installed in strict accordance with all requirements of the plans and specifications.

2. The General Contractor does hereby guarantee the roofing and associated work including all flashing, both composition and metal, against leaks due to faulty workmanship for a period of five (5) years and against leaks due to faulty or defective materials for twenty (20) years, starting on the date of acceptance of the Project by the City.

3. Subject to the terms and conditions listed below, the General Contractor guarantees that during the Guarantee Period he will at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, as are necessary to correct faulty and defective work and materials as are necessary to maintain said work in watertight conditions, and further, to respond on or within three (3) calendar days upon proper notification of leaks or defects by the City or Architect.

A. Specifically excluded from this Guarantee are damages to the work, other parts of the building and building contents caused by: Lightning, windstorm, hail storm and other unusual phenomena of elements; and, Fire. When the work has been damaged by any of the foregoing causes, the Guarantee shall be null and void until such damage has been repaired by the General Contractor, and until the cost and expense thereof has been paid by the City or by the responsible party so designated.

B. During the Guarantee Period, if the City allows alteration of the work by anyone other than the General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything on the roof, this Guarantee shall become null and void upon the date of said alterations. If the City engages the General Contractor to perform said alterations, the Guarantee shall not become null and void, unless the General Contractor, prior to proceeding with said work, shall have notified the City in writing, showing reasonable cause for claim that said alterations would likely damage or deteriorate the work, thereby reasonably justifying a termination of this Guarantee.

C. Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of

the roof areas, and any damage caused by such addition. If this contract is for roofing of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing roof.

D. During the Guarantee Period, if the original use of the roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use of service more severe than originally specified, this Guarantee shall become null and void upon the date of said change.

E. The City shall promptly notify the General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

**IN WITNESS THEREOF**, this instrument has been duly executed this the \_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
General Contractor's Authorized Signature  
NAME \_\_\_\_\_  
TITLE \_\_\_\_\_

**CITY OF TUSCALOOSA  
ASBESTOS AFFIDAVIT**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

**DATE:** \_\_\_\_\_

**BUILDING OWNER:** CITY OF TUSCALOOSA, ALABAMA

**TO WHOM IT MAY CONCERN:**

The undersigned certifies that to the best of his knowledge, no products containing asbestos have been included in the construction of the captioned Project. Special care was exercised to avoid asbestos-containing products, including reviewing product data sheets, reviewing product labels, and visually verifying products in the field. Special care to avoid asbestos has been used in the selection, purchase, and installation of products, including, but not limited to, the following: concrete, batt insulation, roof insulation, building felts, mastics, waterproofing products, adhesives, resilient flooring products, ceiling tiles, interior coatings, exterior coatings, roofing, pipe insulation, duct insulation, and pre-assembled items of equipment.

Respectfully submitted,

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Typed Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Firm Name

\_\_\_\_\_  
Address

\_\_\_\_\_

Sworn to and subscribed before me on this the \_\_\_\_  
day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
County, State

**My Commission Expires:**  
\_\_\_\_\_



**CITY OF TUSCALOOSA  
AGENT'S VERIFICATION OF CONTRACTOR'S INSURANCE**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043      **Engineering Project Number:** 2024.702.001

This is to certify to the City of Tuscaloosa, Alabama, a Municipal Corporation, that the Contractor in the above referenced Project does possess a policy or policies of insurance reflected on the Certificate of Insurance issued for the Project by the undersigned agency of which I am an authorized representative. I have read the contract document as it relates to insurance requirements and said Contractor's insurance is effective as of the dates stated in the certificate and meets or exceeds all ratings, limits, and amounts as required by the same.

This the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

**AGENCY:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**BY:** \_\_\_\_\_  
**ITS:** \_\_\_\_\_

**CITY OF TUSCALOOSA  
NOTICE OF CONDITIONAL BID AWARD**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

**TO:** \_\_\_\_\_:

You are here notified pursuant to Ala. Code §39-2-6 (1975), that the City of Tuscaloosa has made a conditional bid award to you in regard to the above-referenced Project based upon your proposal of \$\_\_\_\_\_.

The above bid award  Does  Does Not include the following additive and/or deductive alternates as requested in the bid documents:

<b>Additive Alternates</b>	<b>Deductive Alternates</b>
1. _____ (\$_____)	1. _____ (\$_____)
2. _____ (\$_____)	2. _____ (\$_____)
3. _____ (\$_____)	3. _____ (\$_____)

Pursuant to Ala. Code §39-2-8 (1975), you are required to enter into a written contract on the form included in the proposal, plans and specifications, furnish a performance bond and a payment bond executed by a surety company authorized and qualified to make such bonds in the State of Alabama, in the amount required in the bid documents, and present evidence of insurance also as required by the bid documents, within the period of time stated therein or, if no period of time is stated, within thirty (30) days after the prescribed forms have been presented to you for signature.

Pursuant to Ala. Code §39-2-11 (1975), if you fail to execute the contract and furnish acceptable contract securities and evidence of insurance as required by the bid documents within the period of time as set forth, the awarding authority may retain all or a part of the proposal guarantee and may award the contract to the second lowest responsible responsive bidder. Under such circumstances, the owner will be entitled to consider all rights arising out of its acceptance of your proposal as abandoned.

DONE this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

**CITY OF TUSCALOOSA, ALABAMA  
A MUNICIPAL CORPORATION**

**By:** \_\_\_\_\_  
**City's Representative**

**By:** \_\_\_\_\_  
**City's Engineer/Architect**

**ACCEPTANCE OF NOTICE**

I, on behalf of the above named contractor, do hereby accept receipt of the above notice of conditional bid award and acknowledge the contents of the same on this the \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_.

**CONTRACTOR:**

\_\_\_\_\_  
**By its:** \_\_\_\_\_

**CITY OF TUSCALOOSA  
NOTICE TO PROCEED**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043      **Engineering Project Number:** 2024.702.001

**TO:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Pursuant to Ala. Code §39-2-10 (1975), you are hereby notified to immediately commence work in full accordance with the terms and conditions of the Contract Documents in the above referenced Project, dated \_\_\_\_\_, 20\_\_, on or before \_\_\_\_\_, 20\_\_ and you are to complete the work within the time specified therein.

**CITY OF TUSCALOOSA, ALABAMA  
A MUNICIPAL CORPORATION  
Post Office Box 2089  
Tuscaloosa, Alabama 35403-2089**

**By:** \_\_\_\_\_  
City's Representative

**By:** \_\_\_\_\_  
City's Engineer/Architect

**ACCEPTANCE OF NOTICE**

I, on behalf of the above named contractor, do hereby accept receipt of the above notice to proceed with the referenced Project and acknowledge the contents of the same on this the \_\_ day of \_\_\_\_\_ 20\_\_\_\_\_.

**CONTRACTOR:**  
\_\_\_\_\_

**By Its:** \_\_\_\_\_



**CONSENT OF SURETY**

\_\_\_\_\_  
(Company)

By: \_\_\_\_\_

**RECOMMENDED**

By: \_\_\_\_\_

\_\_\_\_\_  
(Design Engineer or Architect)

**CONTRACTING PARTIES**

\_\_\_\_\_  
(Contractor)

By: \_\_\_\_\_  
(Authorized Representative)

**CITY OF TUSCALOOSA**

By: \_\_\_\_\_  
(Mayor)

**CITY OF TUSCALOOSA  
CHANGE ORDER REQUEST**

Project Name: Hilliard N. Fletcher WRRF Phase II Improvements  
 File Number: OCA-23-1043 Engineering Project Number: 2024.702.001

OWNER: CITY OF TUSCALOOSA

ARCHITECT/ENGINEER: Garver, LLC

CONTRACTOR: \_\_\_\_\_

CHANGE ORDER REQUEST NO. \_\_\_\_\_ DATE: \_\_\_\_\_

**1. DESCRIPTION OF CHANGE:**

**2. CHANGE ORDER COSTS:** \_\_\_\_\_

Proposal Attached \_\_\_\_\_ Cost Estimated/Proposal Required

<i>Item</i>	<i>Quantity</i>	<i>Material Unit Price</i>	<i>Labor (Hours)</i>	<i>Labor Unit Price</i>	<i>Sub-Total Cost</i>
a.					
b.					
c.					
d.					
e.					
f.*					
<b>TOTAL:</b>					

\*If more than 6 items, provide attachments.

**3. INSTITUTED BY:**

**4. JUSTIFICATION OF NEED:**

**5. JUSTIFICATION OF CHANGE ORDER VERSUS COMPETITIVE BIDDING:**

---

**6. COSTS REVIEW:**

---

**7. THIS CHANGE ORDER IS SUBMITTED FOR REVIEW AND APPROVAL AND IS CLASSIFIED AS THE FOLLOWING TYPE:**

- Minor change of a total monetary value less than required for competitive bidding.
  - Changes for matters relatively minor and incidental to the original contract necessitated by unforeseeable circumstances arising during the course of work.
  - Emergencies arising during the course of work.
  - Change or alternates provided for in the original bidding where there is no difference in price of the Change Order from the original best bid on the Alternate.
  - Change of relatively minor terms not contemplated when the plans and specifications were prepared and the Project was bid and which are in the public interest and do not exceed 10% of the Contract Price.
- 

**8. EXTENSION OF TIME REQUESTED: Calendar Days:**

---

**RECOMMENDED:**

**APPROVED:**

BY: \_\_\_\_\_  
Tuscaloosa's Consulting Engineer/Architect

BY: \_\_\_\_\_  
Contractor

BY: \_\_\_\_\_  
City Representative

BY: \_\_\_\_\_  
Owner's Legal Advisor

BY: \_\_\_\_\_  
Owner's Authorized Representative



STATE OF ALABAMA )  
COUNTY OF TUSCALOOSA )  
CITY OF TUSCALOOSA )

**LEGAL NOTICE  
NOTICE OF COMPLETION OF PUBLIC WORKS PROJECT  
(Over \$100,000)**

Pursuant to Ala. Code §39-1-1 (1975), notice is hereby given that

\_\_\_\_\_ has completed its contract with  
(Name of Company)

the City of Tuscaloosa, Alabama, for the Hilliard N. Fletcher WRRF Phase II Improvements  
(Name of Project)

located at Hilliard N. Fletcher WRRF, Tuscaloosa, Alabama. This notice will be  
(Location of the Project)

published for a period of three (3) successive weeks beginning: \_\_\_\_\_  
(Date)

or shall otherwise comply with Ala. Code §39-1-1.

A final settlement will not be made upon the contract until the expiration of thirty (30) days after completion of notice. Any person or firm having claims on said Project for materials or labor should contact the above contractor at:

\_\_\_\_\_  
\_\_\_\_\_  
(Address of Contractor)

in the time and manner as required by law.

**CITY OF TUSCALOOSA  
OFFICE OF THE CITY ATTORNEY  
P. O. BOX 2089  
TUSCALOOSA, ALABAMA 35403**

DATED: \_\_\_\_\_

**CITY OF TUSCALOOSA**  
**SPECIAL CONDITIONS FOR FEDERALLY FUNDED CONTRACTS**

**I. DEFINITIONS**

“Construction Contract” means a contract for construction, rehabilitation, alteration, and/or repair, including painting and decorating.

“Contractor” means an entity that has entered into an agreement with the local government for the performance of specific work on a project or activity, the provision of professional services, or for the supply of equipment and/or materials.

“ \_\_\_\_\_ ” means \_\_\_\_\_ (Federal Agency).

“Local Government” means the City of Tuscaloosa.

“Program” means the \_\_\_\_\_  
\_\_\_\_\_ (Federal Program) operated under the provisions of \_\_\_\_\_  
\_\_\_\_\_

“Projects/Activities” means those undertakings that are included in the Program and are funded wholly or in part by \_\_\_\_\_  
\_\_\_\_\_

“Project Area” means the corporate limits of the City of Tuscaloosa.

“Subcontractor” means a person, firm or corporation supplying services or labor and materials or only labor or only materials for work at the site of the project, for and under contract or agreement with the Contractor.

**II. CONFLICT OF INTEREST**

A. Interest of Members of the Local Government. No officer, employee or agent of the local government who exercises any function or responsibilities in connection with the planning and carrying out of the program, or any other person who exercises any functions or responsibilities in connection with the program, shall have any personal financial interest, direct or indirect, in this contract, and the Contractor shall take appropriate steps to assure compliance.

B. The Contractor agrees that it will incorporate into every subcontract required in writing the following provision: Interest of Contractor and Employees. The Contractor agrees that no person who presently exercises any functions or responsibilities in connection with the program, has any personal financial interest, direct or indirect, in this contract. The Contractor further covenants that he presently has no interest and shall not acquire any interest, direct or indirect, which would conflict in any manner or degree with the performance of his services hereunder.

The Contractor further covenants that in the performance of this contract no person having any conflicting interest shall be employed. Any interest on the part of the Contractor or

his employees must be disclosed to the City. Provided, however, that this paragraph shall be interpreted in such a manner so as not to unreasonably impede the statutory requirement that maximum opportunity be provided for employment of and participation by low income residents of the area.

C. Provisions of the Hatch Act. Neither the funds provided by this agreement nor the personnel employed in the administration of the agreed upon work shall be in any way or to any extent engaged in the conduct of political activities in contravention of Chapter 15 of Title 5, U. S. Code.

**III. EQUAL OPPORTUNITY REQUIREMENTS:** During the performance of this contract, the Contractor agrees as follows:

A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, age, or disability. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, age, or disability. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment, or recruitment advertising; layoff or termination; rates of pay or other forms of compensations; and selection of training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this non-discrimination clause.

B. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, age, or disability.

C. The Contractor will send to each labor union or representative of workers with which he has collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

D. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

E. The Contractor will furnish to the local government all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the local government, HUD, other federal agencies and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules regulations, and orders.

F. In the event of the Contractor's non-compliance with the nondiscrimination clauses of this agreement or with any of the said rules, regulations, or orders, this agreement may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further local government contracts in accordance with procedures authorized in Executive Order 11246 of September 24 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the City, Secretary of Labor, or as otherwise provided by law.

G. The Contractor will include the provisions of paragraph 1 through 6 above in every subcontract or purchase order unless exempted by rules, regulations, or orders of the local government or the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246

of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed as a means of enforcing such provisions, including sanctions for noncompliance: Provided however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the City, the Contractor may request the local government to enter into such litigation to protect the interests of the local government.

H. The Contractor agrees that it will assist and cooperate actively with the local government and the Secretary of Labor in obtaining the compliance of subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the local government and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the local government in the discharge of its primary responsibility for securing compliance.

I. The Contractor further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a Contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order. In addition, the agency agrees that if it fails or refuses to comply with these undertakings, the local government may take any or all of the following actions: terminate or suspend in whole or in part this contract; refrain from extending any further assistance to the Contractor under the program with respect to which the failure or refusal occurred until satisfactory assurance of future compliance has been received from such Contractor.

J. Non-segregated Facilities. The Contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The Contractor covenants that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. As used in this paragraph, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise.

K. No person in the United States shall, on the ground of race, color, religion, sex, or national origin, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity made possible by or resulting from this contract. The agency and each employer will comply with all requirements imposed by or pursuant to Title VI of the Civil Rights Act of 1964.

L. The Contractor shall maintain data which records its affirmative action in equal opportunity employment, including but not limited to employment, upgrading, demotions, transfers, recruitment or recruitment advertising, layoffs or terminations, pay or other compensation, and selection for training.

**IV. LABOR STANDARDS PROVISIONS - CONSTRUCTION CONTRACTS ONLY**

**A. Contract Work Hours and Safety Standards Act**

1. Overtime Requirements. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any laborer or mechanic in any work-week in which he is employed on such work to work in excess of forty hours in any work-week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times his basic rate of pay for all hours worked in excess of forty hours in any work-week.
2. Violations; Liability for Unpaid Wages; Liquidated Damages. In the event of any violation of the clause set forth in subparagraph 1, the Contractor and any subcontractor responsible therefore shall be liable to any affected employee for his unpaid wages. In addition, such Contractor and subcontractor shall be liable to the City for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the clause set forth in subparagraph 1 in the sum of \$10 for each calendar day on which such employee was required or permitted to work in excess of the standard work-week of forty hours without payment of the overtime wages required by the clause set forth in subparagraph 1.
3. Withholding for Unpaid Wages and Liquidated Damages. The local government may withhold or cause to be withheld, from any monies payable on account of work performed by the Contractor or subcontractor, such sums as may administratively be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages.

**B. Employment of Certain Persons Prohibited.** No person under the age of sixteen years and no person who at the time, is serving sentence in a penal or correctional institution shall be employed on the work covered by this contract.

**C. Complaints, Proceedings, or Testimony by Employees.** No laborer or mechanic to whom the labor standards provisions of this contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceedings or has testified or is about to testify in any proceedings under or relating to the labor standards applicable under this contract.

**D. Questions Concerning Certain Federal Statutes and Regulations.** All questions arising under this contract which relate to the application or interpretation of the aforesaid Contract Work Hours and Safety Standards Act, the regulations issued by the Secretary of Labor, United States Department of Labor, pursuant to said Act, or the labor standards provisions of any other pertinent Federal statute, shall be referred, through the City of Tuscaloosa and the Secretary of Housing and Urban Development, to the Secretary of Labor, United States Department of Labor, for said Secretary's appropriate ruling or interpretation which shall be authoritative and may be relied upon for the purpose of this contract.

## **V. ENVIRONMENTAL PROTECTION REQUIREMENTS**

A. The Contractor hereby agrees that any facility to be utilized in the performance of any nonexempt contract or subcontract shall not be a facility included on the list of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 15.20.

B. The Contractor also agrees to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.

C. As a condition of the award of the contract, the Contractor agrees to give prompt notice to the City of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized or to be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

D. The Contractor agrees that it will include or cause to be included the criteria and requirements in subparagraph A through D of this section in every nonexempt subcontract and that it will take such action as the City or the EPS may direct as a means of enforcing such provisions.

**VI. FINANCIAL MANAGEMENT:** The Contractor shall maintain effective control over and accountability for all funds, property, and other assets that are provided for by this agreement. The Contractor shall adequately safeguard all such assets and shall assure that they are used solely for authorized purposes.

A. Ineligible Costs. In addition to any costs that are ineligible under other criteria included herein the following costs are specifically ineligible:

1. Bad Debts. Any losses arising from uncollected accounts and other claims, and related costs.
2. Contingencies. Contributions to a contingency reserve or any similar provisions for unforeseen events.
3. Contributions and Donations.
4. Entertainment. Costs of amusements, social activities, and incidental costs, such as meals, beverages, lodgings, and gratuities, relating to entertainment.
5. Fines and Penalties. Costs resulting from violations of or failure to comply with Federal, State, and local laws and regulations.
6. Interest and Other Financial Costs. Interest on borrowing (however represented), bond discounts, cost of financing and refinancing operations, and legal and professional fees paid in connection herewith.
7. Legislative Expenses. Salaries and other expenses of local government bodies such as county supervisors, city councils, school boards, etc., whether incurred for purposes of legislation or executive direction.
8. Membership Expenses. Cost of membership in an organization which devotes a substantial part of its activities to influencing legislation.
9. Travel. Costs in excess of those allowed by the Contractor for its equivalent employees. In any case, the difference in cost between first-class air

accommodations and less-than-first-class air accommodations are not available and is so documented.

10. Meeting Attendance. Costs of attending meetings which are not open for attendance on a non-segregated basis.

B. Property Management Standards. The Contractor's property management standards for non-expendable personal property acquired under this contract shall include the following procedural requirements:

1. Property records shall be maintained accurately and provide for: a description of the property; manufacturer's serial number or other identification number; acquisition data, cost, and source of property; percentage of Federal funds used in the purchase of property; location, use and condition of the property; and ultimate disposition data including sales price or the method used to determine current fair market value.
2. A physical inventory of property shall be taken and the results reconciled with the property records at least once each year to verify the existence, current utilization, and continued need for the property.
3. A control system shall be in effect to ensure adequate safeguards to prevent loss, damage, or theft to the property. Any loss, damage, or theft of non-expendable property shall be investigated and fully documented.
4. Adequate maintenance procedures shall be implemented to keep the property in good condition.

C. Procurement Standards

1. The Contractor shall maintain a code or standard of conduct which shall govern the performance of its officers, employees, or agents in contracting with and expending grant funds. Local government officers, employees, or agents shall neither solicit nor accept gratuities, favors, or anything of monetary value from Contractors or potential Contractors.
2. All procurement transactions regardless of whether negotiated or advertised and without regard to dollar value shall be conducted in a manner so as to provide maximum open and free competition.

## VII. GENERAL REQUIREMENTS

A. Retention of Records. All records maintained by the Contractor that pertain to this agreement shall be retained by the Contractor for a period of three years or such longer period as the local government, HUD, or other federal agencies may require in specific cases.

B. Reports and Information. The Contractor, at such times as the local government may require, shall furnish such statements, reports, records, data and information, as may be requested pertaining to matters covered by this agreement.

C. Audit Requirements. The local government, the Comptroller General of the United States, and/or \_\_\_\_\_ (Federal Agency), or any of the duly authorized representatives shall have access to all tasks, accounts, records, reports, files and other papers or property of the Contractor pertaining to funds provided under this agreement for the purpose of making surveys, audits, examinations, excerpts, and transcripts. The Contractor's financial management system shall be audited at least once a year. Audits may be made at less frequency considering the nature, size and complexity of the activity. The Contractor

shall implement a systematic method to assure timely and appropriate resolution of audit findings and recommendations.

D. Breach of Contract Terms and Conditions. In the event of the Contractor's noncompliance with the terms and conditions of this contract or with any of the said rules, regulations or orders, this contract may be canceled, terminated or suspended in whole or in part. Provided, that the right of the Contractor to proceed with this contract shall not be terminated or the Contractor charged with liquidated damages because of delays in the completion of the work due to unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted, to acts of God, or of the public enemy, acts of the Government, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather or delays of subcontractors due to such causes, if the Contractor shall within ten days from the beginning of any such delay notify the City in writing of the cause of the delay. The City shall ascertain the facts and the extent of the delay and extend the time for completing the work when, in the City's judgment, the findings of fact justify such an extension, and the City's findings of fact thereon shall be final and conclusive on the parties hereto, subject only to appeal, within thirty days, by the Contractor to the City whose decision on such appeal as to the facts of delay and the extension of time for completing the work shall be final and conclusive on the parties hereto.

E. Safety Standards. No Contractor or subcontractor contracting for any part of a construction contract shall require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety, as determined under construction safety and health standards promulgated by the Secretary of Labor.

F. Lead-based Paint Regulations. The construction or rehabilitation of residential structures with assistance provided under this contract is subject to the HUD Lead-based Paint regulations, 24 CFR part 35. Should this contract include activities involving the construction or rehabilitation of residential structures, the Contractor hereby agrees to comply with the regulations of 24 CFR part 35.

G. Subcontracts. The Contractor shall insert in any subcontracts all of the terms and conditions set forth in this contract and also a clause requiring the subcontractors to include these terms and conditions in any lower tier subcontracts which they may enter into, together with a clause requiring this insertion in any further subcontracts that may in turn be made.

H. Davis-Bacon. As applicable, Contractors shall comply with the Davis-Bacon Act (40 U.S.C. 276a to 276a-7) as supplemented by Department of Labor regulations (29 CFR Part 5), the provisions of which are incorporated by reference into this contract as if contained herein.

I. Debarment of contactors/subcontractors / City's right to monitor. All contracting and subcontracting agencies shall be actively registered in the sam.gov system and have a non-debarred status to perform work. The City of Tuscaloosa shall have all rights to any and all documentation related to the project. Periodic monitoring visits will be performed by City of Tuscaloosa staff to ensure all federal and contract requirements are followed.

J. Green Building Standard for Replacement and New Construction of Residential Housing. Contractors must meet the Green Building Standard in this subparagraph for: (i) all new construction of residential buildings; and (ii) all replacement of substantially-damaged residential buildings. Replacement of residential buildings may include reconstruction (i.e., demolishing and re-building a housing unit on the same lot in substantially the same manner) and may include changes to structural elements such as flooring systems, columns or load bearing interior or



exterior walls. For purposes of this Notice, the Green Building Standard means the contractor will require that all construction covered by subparagraph, above, meet an industry-recognized standard that has achieved certification under at least one of the following programs (i) ENERGY STAR (Certified Homes or Multifamily High Rise); (ii) Enterprise Green Communities; (iii) LEED (NC, Homes, Midrise, Existing Buildings O&M, or Neighborhood Development); (iv) ICC-700 National Green Building Standard; (v) EPA Indoor AirPlus (ENERGY STAR a prerequisite); or (vi) any other equivalent comprehensive green building program, including regional programs. Standards for rehabilitation of non-substantially-damaged residential buildings: For rehabilitation other than that described in subparagraph, above, contractors must follow the guidelines specified in the HUD CPD Green Building Retrofit Checklist, available on the CPD Disaster Recovery Web site. Contractors must apply these guidelines to the extent applicable to the rehabilitation work undertaken, including the use of mold resistant products when replacing surfaces such as drywall. When older or obsolete products are replaced as part of the rehabilitation work, rehabilitation is required to use ENERGY STAR- labeled, WaterSense labeled, or federal Energy Management Program (FEMP)- designated products and appliances. Implementation: For construction projects completed under construction, or under contract prior to the date that federal assistance was approved for the project the contractor is encouraged to apply the applicable standards to the extent feasible but the Green Building Standard is not required; (ii) for specific which an ENERGY STAR-or-WaterSense-labeled or FEMP-designated product does not exist, the requirement to use such products does not apply. The City encourages contractors to implement green infrastructure policies to the extent practicable.

**VIII. ADECA-FUNDED CONTRACTS:** The Contractor shall include the following provisions in all construction contracts funded by the Alabama Department of Economic and Community Affairs (ADECA). For all ADECA-funded construction contracts, in the event the provisions contained in this section conflict with provisions contained elsewhere in this document, the provisions contained in this section shall prevail.

A. Section 109 Clause, Housing and Community Development Act of 1974. No person in the United States shall on the grounds of race, color, national origin or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

B. Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) (applicable to contract/subcontracts exceeding \$10,000). Contractor’s attention is called to the “Equal Opportunity Clause” and the “Standard Federal Equal Employment Opportunity Construction Contract Specifications” set forth herein.

The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor’s aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for Minority Participation (Insert Goals)	Goals for Female Participation (Insert Goals)
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These goals are applicable to all the Contractor’s construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the Contractor performs construction work in a geographic area located outside of the covered area, it shall apply the goals established for such geographic area where the work is actually performed. With regard to

this second area, the Contractor also is subject to the goals for both its Federally involved and non-Federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the Contract, the Executive Order and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

C. "Section 3" Compliance in the Provision of Training, Employment and Business Opportunities.

1. The work to be performed under this Contract is a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12, U.S.C. 1701u. Section 3 requires that to the greatest extent feasible, opportunities for training and employment be given lower income residents of the project area and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by, persons residing in the area of the project.
2. The parties to this Contract will comply with the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary of Housing and Urban Development set forth in 24 CFR 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of this Contract. The parties to this Contract certify and agree that they are under no contractual or other disability which would prevent them from complying with these requirements.
3. The Contractor will send to each labor organization or representative of workers with which he has a collective bargaining agreement or other contract or understanding, if any, a notice advising the said labor organization or workers' representative of this commitment under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.
4. The Contractor will include this Section 3 clause in every subcontract for work in connection with the project and will, at the direction of the applicant for or recipient of Federal financial assistance, take appropriate action pursuant to the subcontract upon a finding that the Subcontractor is in violation of regulations issued by the Secretary of Housing and Urban Development, 24 CFR Part 135. The Contractor will not subcontract with any Subcontractor where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR Part 135 and will not let any subcontract unless the Subcontractor has first provided it with a

preliminary statement of ability to comply with the requirements of these regulations.

5. Compliance with the provisions of Section 3, the regulations set forth in 24 CFR Part 135, and all applicable rules and orders of the Department issued hereunder prior to the execution of the Contract, shall be a condition of the Federal financial assistance provided to the project, binding upon the applicant or recipient for such assistance, its successors and assigns. Failure to fulfill these requirements shall subject the applicant or recipient, its contractors and subcontractors, its successors and assigns to those sanctions specified by the grant or loan agreement or contract through which Federal assistance is provided, and to such sanctions as are specified in 24 CFR Part 135.

D. Section 402 Veterans of the Vietnam Era (if \$10,000 or over). Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era.

1. The Contractor will not discriminate against any employee or applicant for employment because he or she is a disabled veteran or veteran of the Vietnam era in regard to any position for which the employee or applicant for employment is qualified. The Contractor agrees to take affirmative action to employ, advance in employment and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based on their disability or veteran status in all employment practices such as the following: employment upgrading, demotion or transfer, recruitment, advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.
2. The Contractor agrees that all suitable employment openings of the Contractor which exist at the time of the execution of this Contract and those which occur during the performance of this Contract, including those not generated by this Contract and including those occurring at an establishment of the Contractor other than the one wherein the Contract is being performed but excluding those of independently operated corporate affiliates, shall be listed at an appropriate local office of the State employment service system wherein the opening occurs. The Contractor further agrees to provide such reports to such local office regarding employment openings and hires as may be required. State and local government agencies holding Federal contracts of \$10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service, but are not required to provide those reports set forth in paragraphs 4 and 5.
3. Listing of employment openings with the employment service system pursuant to this clause shall be made at least concurrently with the use of any other recruitment source or effort and shall involve the normal obligations which attach to the placing of a bona fide job order, including the acceptance of referrals of veterans and non-veterans. The listing of employment openings does not require the hiring of any particular job applicant or from any particular group of job applicants, and nothing herein is intended to relieve the Contractor from any requirements in

Executive Orders or regulations regarding nondiscrimination in employment.

4. The reports required by paragraph 2 of this clause shall include, but not be limited to, periodic reports which shall be filed at least quarterly with the appropriate local office or, where the Contractor has more than one hiring location in a State, with the central office of that State employment service. Such reports shall indicate for each hiring location (1) the number of individuals hired during the reporting period, (2) the number of nondisabled veterans of the Vietnam era hired, (3) the number of disabled veterans of the Vietnam era hired, and (4) the total number of disabled veterans hired. The reports should include covered veterans hired for on-the-job training under 38 U.S.C.1787. The Contractor shall submit a report within 30 days after the end of each reporting period wherein any performance is made on this Contract identifying data for each hiring location copies of the reports submitted until the expiration of one year after final payment under the Contract, during which time these reports and related documentation shall be made available, upon request, for examination by any authorized representatives of the contracting officer or of the Secretary of Labor. Documentation would include personnel records respecting job openings, recruitment and placement.
5. Whenever the Contractor becomes contractually bound to the listing provisions of this clause, it shall advise the employment service system in each State where it has establishments of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these provisions and has so advised the State system, there is no need to advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by the contract clause.
6. This clause does not apply to the listing of employment openings which occur and are filled outside of the 50 states, the District of Columbia, Puerto Rico, Guam and the Virgin Islands.
7. The provisions of paragraphs 2, 3, 4 and 5 of this clause do not apply to openings which the Contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer-union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of his own organization or employer-union arrangement for that opening.
8. As used in this clause:
  - a. "All suitable employment openings" includes, but is not limited to, openings which occur in the following job categories: production and nonproduction; plant and office; laborers and mechanics; supervisory and nonsupervisory; technical; and executive, administrative, and professional openings that are compensated on a salary basis of less than \$25,000 per year. This term includes full-time employment, temporary employment of more than three days' duration, and part—time employment. It does not include

openings which the Contractor proposes to fill from within his own organization or to fill pursuant to a customary and traditional employer—union hiring arrangement nor openings in an educational institution which are restricted to students of that institution. Under the most compelling circumstances an employment opening may not be suitable for listing, including such situations where the needs of the Government cannot reasonably be otherwise supplied, where listing would be contrary to national security, or where the requirement of listing would otherwise not be for the best interest of the Government.

- b. “Appropriate office of the State employment service system” means the local office of the Federal-State national system of public employment offices with assigned responsibility for serving the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico and the Virgin Islands.
  - c. “Openings which the Contractor proposes to fill from within his own organization” means employment openings for which no consideration will be given to persons outside the Contractor’s organization (including any affiliates, subsidiaries, and the parent companies) and includes any openings which the Contractor proposed to fill from regularly established “recall” lists.
  - d. “Openings which the Contractor proposes to fill pursuant to customary and traditional employer-union hiring arrangements” means employment openings which the Contractor proposes to fill from union halls, which is part of the customary and traditional hiring relationship which exists between the Contractor and representatives of his employees.
- 9. The Contractor agrees to comply with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.
  - 10. In the event of the Contractor’s non-compliance with the requirements of this clause, actions for non-compliance may be taken in accordance with the rules, regulations and relevant orders of the Secretary of Labor issued pursuant to the Act.
  - 11. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices in a form to be prescribed by the Director, provided by or through the contracting officer. Such notice shall state the Contractor’s obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era for employment, and the rights of applicants and employees.
  - 12. The Contractor will notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Vietnam Era Veterans Readjustment Assistance Act, and is committed to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era.

13. The Contractor will include the provisions of this clause in every subcontract or purchase order of \$10,000 or more unless exempted by rules, regulations or orders of the Secretary issued pursuant to the Act, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any subcontractor or purchase order as the Director of the Office of Federal Contract Compliance Programs may direct to enforce such provisions, including action for non-compliance.

E. Certification of Compliance with Air and Water Acts (applicable to Federally assisted construction contracts and related subcontracts exceeding \$100,000). Compliance with Air and Water Acts. During the performance of this Contract, the Contractor and all Subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR Part 15, as amended. In addition to the foregoing requirements, all nonexempt Contractors and Subcontractors shall furnish to the Owner, the following:

1. A stipulation by the Contractor or Subcontractors that any facility to be utilized in the performance of any nonexempt contract or subcontract is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 15.20.
2. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.
3. A stipulation that as a condition for the Contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, or EPA indicating that a facility utilized, or to be utilized for the Contract, is under consideration to be listed on the EPA List of Violating Facilities.
4. Agreement by the Contractor that he will include, or cause to be included, the criteria and requirements in paragraphs A through D of this section in every nonexempt subcontract and requiring that the Contractor will take such actions as the Government may direct as a means of enforcing such provisions.

F. Compliance with Copeland Act Requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.

G. Drug-Free Workplace Requirements. The Drug-Free Workplace Act of 1988 (42 U.S.C. 701) requires grantees (including individuals) of federal agencies, as a prior condition of being awarded a grant, to certify that they will provide drug-free workplaces. Each potential recipient must certify that it will comply with drug-free workplace requirements in accordance with the Act and with the federal agency in question or HUD's rules at 24 CFR part 24, subpart F.

H. Byrd Anti-Lobbying Amendment (31 U.S.C. 1352). Contractors who apply or bid for an award of \$100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a

member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.

**IV. DISASTER RECOVERY FUNDED CONTRACTS:** The Contractor shall include the following provisions in all Disaster Recover (DR) funded construction contracts. For all DR-funded construction contracts, in the event the provisions contained in this section conflict with provisions contained elsewhere in this document, the provisions contained in this section shall prevail.

A. The Contractor agrees to abide by all applicable Federal regulations in receiving, disbursing and accounting for Community Development Block Grant funds including, but not limited to all applicable sections of 24 CFR 570.

B. ADA Compliance. The Contractor hereby covenants and agrees that, in performing its responsibilities and obligations hereunder, the Contractor, its officers, agents or employees will not, on the grounds of race, color, sex, religion, national origin, disability or age, discriminate or permit discrimination against any person or groups of persons in any manner. The Contractor further agrees to comply with all applicable State and Federal ordinances and regulations, including but not limited to, the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA), the Civil Rights Act of 1964 and any regulations promulgated there under.

C. Section 3 Compliance. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing. The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations. Contractor agrees to send to each labor organization or representative of workers with which the Contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the Contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin. Contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. Contractor will not subcontract with any subcontractor where the Contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135. Contractor will certify that any vacant employment positions, including training positions, that are filled (1) after Contractor is selected by before the contract is executed, and

(2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the Contractor's obligations under 24 CFR part 135. Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

D. Section 109 Compliance. No person in the United States will, on the ground of race, color, national origin, religion, or sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity administered or provided under this Agreement, pursuant to Section 109 of title I of the Housing and Community Development Act of 1974 (Title I) (42 U.S.C. 5309).

E. Section 402 Compliance. Contractors and subcontractors shall take affirmative action to employ and advance in employment qualified covered veterans. Disabled veterans, recently separated veterans (veterans within 3 years of their discharge or release from active duty), veterans who served on active duty during a war or in a campaign or expedition for which a campaign badge has been authorized (referred to as "other protected veterans"), and Armed Forces service medal veterans are covered veterans under VEVRAA, pursuant to the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended (VEVRAA).

F. Copeland Anti-Kickback Act Compliance. Pursuant to The Copeland "Anti-Kickback" Act, 40 USC §3145 and 18 USC §874, no contractor or subcontractor operating under this agreement shall induce an employee to give up any part of the compensation to which he or she is entitled under his or her contract of employment. Contractors and subcontractors shall submit a weekly statement of the wages paid to each employee performing on covered work during the preceding payroll period.

G. Affirmative Action. During the performance of this contract, the contractors and subcontractors operating under this agreement shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Contractors and subcontractors operating under this agreement shall comply with Affirmative Action laws and regulations to ensure equal employment opportunities, including, but not limited to 41 CFR Part 60-1; 41 CFR Part 60-2; 41 CFR Part 60-250; 41 CFR Part 60-741; compliance with E.O. 11246, "Equal Employment Opportunity," as amended by E.O. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity."

H. Compliance with Goals for Minority and Female Participation. The City of Tuscaloosa has voluntarily adopted a Minority / Disadvantaged Business Enterprise ("MBE/DBE/WBE") Program designed to encourage the participation and development of minority and disadvantaged business enterprises and to promote equal business opportunities to the fullest extent allowed by state and federal law. It is the intent of the City to foster competition among contractors, suppliers, and vendors that will result in better quality and more economical services rendered to the City. Under this policy, the City of Tuscaloosa has established a goal of ten to twenty percent (10-20%) inclusion of minority and disadvantaged business enterprises for all services required to deliver City projects. In no case shall the stated percentage be the determining factor in contract awards. Rather, contractors must demonstrate a good faith effort to attain the desired percentage goal. The Developer is encouraged to adopt



corresponding goals to those of the City's Minority / Disadvantaged Business Enterprise ("MBE/DBE/WBE") Program.

I. Compliance with Environmental Laws; including The Clean Air Act and Clean Water Act. Contractors and subcontractors operating under this agreement shall be responsible for ensuring compliance with Federal, State, or local pollution control laws and related requirements, including but not limited to the Clean Air Act (42 U.S.C. 7401 et seq.) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251 et seq.). If a contracting officer becomes aware of noncompliance with clean air or water standards in facilities used in performing nonexempt contracts, that contracting officer shall notify the agency head, or a designee, who shall promptly notify the EPA Administrator or a designee in writing.

J. Byrd Anti-Lobbying Agreement. Contractors operating under this agreement shall file the required certification under the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352). Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.

K. HUD Form 4010 See next page.

## Federal Labor Standards Provisions

## U.S. Department of Housing and Urban Development Office of Labor Relations

### Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) **Minimum Wages.** All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

**2. Withholding.** HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract in the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

**3. (l) Payrolls and basic records.** Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section I(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section I(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been

communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

Previous editions are obsolete

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form HUD-4010 (06/2009)  
ref. Handbook 1344.1

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### 4. Apprentices and Trainees.

(i) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who

is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

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the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

**5. Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

**6. Subcontracts.** The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

**7. Contract termination; debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

**8. Compliance with Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

**9. Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

**10. (i) Certification of Eligibility.** By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be

awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

**11. Complaints, Proceedings, or Testimony by Employees.** No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

**B. Contract Work Hours and Safety Standards Act.** The provisions of this paragraph B are applicable where the amount of the prime contract exceeds \$100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

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**(3) Withholding for unpaid wages and liquidated damages.** HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

**(4) Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

**C. Health and Safety.** The provisions of this paragraph C are applicable where the amount of the prime contract exceeds \$100,000.

**(1)** No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

**(2)** The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

**(3)** The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

L. Davis Bacon-Wage Rates

"General Decision Number: AL20230119 01/06/2023

Superseded General Decision Number: AL20220119

State: Alabama

Construction Type: Heavy

Counties: Hale, Pickens and Tuscaloosa Counties in Alabama.

HEAVY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658.

Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

<p>If the contract is entered into on or after January 30 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:</p>	<p>.Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.</p>
<p>If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:</p>	<p>. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all</p>

	hours spent performing on that contract in 2023.
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The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number    Publication Date  
0                            01/06/2023

SUAL2015-047 08/02/2017

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 20.26	8.59
CEMENT MASON/CONCRETE FINISHER, Includes Water Sewer Lines.....	\$ 13.71 **	0.00
ELECTRICIAN.....	\$ 19.98	5.53
LABORER: Common or General, Includes Water Sewer Lines.....	\$ 11.48 **	0.00
LABORER: Pipelayer, Includes Water Sewer Lines.....	\$ 13.91 **	2.04
OPERATOR: Backhoe/Excavator/Trackhoe, Includes Water Sewer Lines.....	\$ 19.31	0.00
OPERATOR: Bulldozer, Includes Water and Sewer Lines.....	\$ 12.00 **	0.00



OPERATOR: Loader, Includes  
Water Sewer Lines..... \$ 17.64 2.14

TRUCK DRIVER: Dump Truck,  
Includes Water Sewer Lines..... \$ 12.25 \*\* 2.58

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WELDERS - Receive rate prescribed for craft performing  
operation to which welding is incidental.

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\*\* Workers in this classification may be entitled to a higher  
minimum wage under Executive Order 14026 (\$16.20) or 13658  
(\$12.15). Please see the Note at the top of the wage  
determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave  
for Federal Contractors applies to all contracts subject to the  
Davis-Bacon Act for which the contract is awarded (and any  
solicitation was issued) on or after January 1, 2017. If this  
contract is covered by the EO, the contractor must provide  
employees with 1 hour of paid sick leave for every 30 hours  
they work, up to 56 hours of paid sick leave each year.  
Employees must be permitted to use paid sick leave for their  
own illness, injury or other health-related needs, including  
preventive care; to assist a family member (or person who is  
like family to the employee) who is ill, injured, or has other  
health-related needs, including preventive care; or for reasons  
resulting from, or to assist a family member (or person who is  
like family to the employee) who is a victim of, domestic  
violence, sexual assault, or stalking. Additional information  
on contractor requirements and worker protections under the EO  
is available at  
<https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within  
the scope of the classifications listed may be added after  
award only as provided in the labor standards contract clauses  
(29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

#### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

#### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the

wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

#### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

-----

#### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
Wage and Hour Division  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION"

M. Sales and Use Tax:

The project will be administered in compliance with Alabama state law regarding sales and use taxes. The Contractor shall be responsible for obtaining a certificate of exemption from the Alabama Department of Revenue for purchases of materials and other tangible property made part of the project. Any subcontractors purchasing materials or other tangible personal property as part of the project shall also be responsible for obtaining a certificate of exemption.

<https://www.revenue.alabama.gov/wp-content/uploads/2017/05/ST-EXC-01.pdf>

## Exhibit A

### THE CITY OF TUSCALOOSA MINORITY ENTERPRISE/DISADVANTAGED BUSINESS ENTERPRISE (MBE/DBE/WBE) POLICY FOR PUBLIC WORKS PROJECTS OVER \$100,000

#### General Mission Statement

THE CITY OF TUSCALOOSA (hereinafter, "City") has voluntarily adopted a Minority/Disadvantaged Business Enterprise (MBE/DBE/WBE) Program designed to encourage the participation and development of minority and disadvantaged business enterprises and to promote equal business opportunities in the City to the fullest extent allowed by state and federal law.

It is the intent of the City to foster competition among contractors, suppliers, and vendors that will result in better quality and more economical services rendered to the City. Under this policy, the City of Tuscaloosa has established a goal of ten to twenty percent (10-20%) inclusion of minority and disadvantaged business enterprise (hereinafter sometimes "MBE/DBE/WBE") for all services required to deliver City projects. In no case shall the stated percentage be the determining factor in contract awards. Rather, contractors must demonstrate a good faith effort to attain the desired percentage goal.

#### Program Goals

It is the goal of this program:

- To ensure non-discrimination in the award and administration of City contracts.
- To help to remove barriers to the participation of DBE/MBE/WBE's in competing for City contracts.
- To ensure a level playing field exists on which DBE/MBE/WBE's can compete fairly for City contracts.

#### Definition

1. "Minority Business Enterprise" ("MBE") means a business which is an independent and continuing enterprise for profit, performing a commercially useful function and is at least fifty-one percent (51%) owned and controlled by an African American, or Black American.

2. "Women-owned Business Enterprise" ("WBE") means a business which is an independent and continuing enterprise for profit, performing a commercially useful function and is at least fifty-one percent (51%) owned, operated and controlled on a daily basis by one or more female American citizens.

3. "Disadvantaged Business Enterprise" (DBE") means a business which is an independent and continuing enterprise for profit, performing a commercially useful function and is owned by a majority of persons who are United States citizens or permanent resident aliens (as defined by the Immigration and Naturalization Service) of the United States, and who are Asian, Black, Hispanic or Native Americans, according to the following definitions:

"Asian" – means persons having origins in any of the original people of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands.

"African American" or "Black American" means persons having origins in any black racial group of Africa.

"Hispanic" means persons of Spanish or Portuguese culture with origins in Mexico, South of Central America, or the Caribbean Islands regardless of race.

"Native American" means persons having origins in any of the original people of North America, including American Indians, Eskimos and Aleuts.

#### Equal Business Opportunity

It is the policy of the City to promote full and equal business opportunities for all persons doing business with the City, regardless of race, sex or national origin. It is the ultimate goal of this policy to promote an equitable business climate district. The City will seek to increase minority and women participation for contracts that require formal bids. These efforts will be for contracts above \$100,000 as allowed by the Alabama Public Works law. These efforts are designed to help prevent discrimination against minorities and disadvantaged businesses and promote more completion among vendors, suppliers, and contractors of the City of Tuscaloosa.

The City has established a goal of ten to twenty percent (10-20%) of the total construction related expenditures to be provided by minority and disadvantaged business enterprises. While the policy provides for voluntary participation by the City and is dependent upon race-neutral and gender-neutral considerations, contractors are encouraged to comply with the City's policy. The City of Tuscaloosa shall periodically review the policy, including race/gender-neutral remedies, to determine its effectiveness.

#### Good Faith Effect

The City require contractors to demonstrate a good faith effort to attain the goal of 10-20% participation of MBE/DBE/WBE's in all levels of the Public Works contracting process. Contractors shall document their efforts to obtain minority and disadvantaged business participation in the bid documents. Contractors should note that failure to document a good

faith effort to the satisfaction of the City may subject the contractor to bid rejection for non-responsiveness.

The following process shall constitute a good faith effort under the City's policy:

(1) Contractors deciding to bid on a City project shall submit the MBE/DBE/WBE Documentation Statement and Acknowledgement (Form 1). Submission of Form 1 confirms the commitment of the contractor to participate in the inclusion effort for the project. Form 1 must be submitted to the City of Tuscaloosa Community Development Program Manager with Infrastructure and Public Services/Tuscaloosa Builds no later than seven (7) days prior to the bid, or at the pre-bid conference, whichever is earlier. The City reserves the right to modify the submittal deadline as-needed.

(2) Contractors shall submit MBE/DBE/WBE Bid Solicitation Notice (Form 2). Form 2 must be submitted to the City of Tuscaloosa Community Development Program Manager with Infrastructure and Public Services/Tuscaloosa Builds no later than seven (7) days prior to the bid, or at the pre-bid conference, whichever is earlier. The City reserves the right to modify the submittal deadline as-needed.

(3) Contractors shall submit a brief plan for achieving the stated MBE/DBE/WBE Participation Goal for his/her trade (Form 3). Form 3 must be submitted in the contractor's sealed bid.

(4) Contractor shall submit a listing of all MBE/DBE/WBE contractors that submitted bids (Form 4). Form 4 must be submitted in the contractor's sealed bid. (Note: In the event a MBE/DBE/WBE contractor submits a bid after the general contractor has sealed the bid, contractors should write on the envelope the name(s) and scope of work of the MBE/DBE/WBE contractor who submitted the bid.)

(5) Contractor shall submit a list of all MBE/DBE/WBE firms the contractor proposes to utilize during the execution of the contract (Form 5). In addition, the contractor shall include on Form 5 all firms that the major subcontractors propose to utilize. Form 5 must be submitted in the contractor's sealed bid.

(6) Contractors shall be required to work in cooperation with the City's consultant in the implementation of this program. Failure to do so, in the discretion of the City, may result in a rejection of bid due to non-responsiveness.

Following compliance with item (6) above, submission of Form 1, Form 2, Form 3, Form 4, and Form 5 at the above-prescribed times shall satisfy the good faith effort requirement. Failure to do so may result in rejection of bid due to non-responsiveness.

#### Additional Administrative Requirements/Procedure

(1) If the successful contractor will be subcontracting less than the started percentage goal, the Contractor must complete a "MBE/DBE/WBE Unavailability Certification" (Form 6). Form 6 is due once a tentative contract award has been made.



(2) Contractors shall obtain the listing of certified MBE/DBE/WBE business by contacting the City of Tuscaloosa Community Development Program Manager with Infrastructure and Public Services/Tuscaloosa Builds to assist in soliciting MBE/DBW/WBE participation for the project.

(3) Contractors shall not be required to use a MBE/DBE/WBE subcontractor who cannot display reasonable technical and financially qualifications to perform the work in question.

(4) In addition to the above requirements, contractors should note that the City reserves the right to periodically audit payroll records to ensure compliance with the program. The City employs the services of a Compliance Director.

(5) Upon completion of the project and prior to release of retainage or final payment, the contractor shall submit a Project Closeout Report (Form 7) that includes final accounting of all MBE/DBE/WBE firms utilized on the project.

(6) On a monthly basis, contractors shall submit updated MBE/DBE/WBE reports (Monthly Report Form) to identify any changes in MBE/DBE/WBE firm utilization (Form 8). Contractors shall submit Form 8 directly to the City of Tuscaloosa Community Development Program Manager with Infrastructure and Public Services/Tuscaloosa Builds.

#### **Race/Gender – Neutral Remedies**

The City recognizes that race/gender – neutral remedies may be effective tools used to increase MBE/DBE/WBE participation. Therefore, the City will continue to explore these remedies. The remedies will include, but will not be limited to, the following:

1. Technical assistance techniques to identify and increase the participation of MBE/DBE/WBE's in the City's contracting, subcontracting and purchasing opportunities.
2. Continuation of the certification process.

The City will periodically review the success of these measures in order to determine the extent to which the measures provide equitable access to the City's contracting, subcontracting and purchasing opportunities.

The City has determined that this policy complies with all applicable local, state and national laws concerning the contracting and purchasing process. The City shall not sacrifice product quality for lower pricing, but shall make all awards in accordance with applicable law. It shall be the primary responsibility of the City to insure that this policy is followed, and that all actions regarding the contracting and purchasing process comply with all applicable statutes as well as the defined goals relative to MBE/DBE/WBE participation on all construction projects.

#### **Contact Information:**

Caramyl Drake  
Community Development Program Manager  
Community & Neighborhood Services  
City of Tuscaloosa  
Phone: (205) 248-5725  
cdrake@tuscaloosa.com

**Form 1 (one page)**  
**Documentation Statement and Acknowledgement**

**(Due no later than seven (7) days prior to the bid, or at the pre-bid  
conference, whichever is earlier)**

**Project Name:** Hilliard N. Fletcher WRRF Phase II Improvements  
**File Number:** OCA-23-1043                      **Engineering Project Number:** 2024.702.001

The City of Tuscaloosa has adopted a program to encourage the participation of Minority Business Enterprises/Disadvantaged Business Enterprises (MBE/DBE/WBE) on its public works construction projects. The signed statement serves as a commitment by the undersigned company to comply with this program as outlined by the City, relative to the involvement of MBE/DBE/WBE firm in City guidelines.

The undersigned Company will adhere to City program guidelines set forth to utilize MBE/DBE/WBE businesses in all construction projects, and all program forms (1-8) have been reviewed and understood.

\_\_\_\_\_  
Company Representative (Signature)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Company Representative (Printed)

\_\_\_\_\_  
Title

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Telephone Number

\_\_\_\_\_  
City, State, Zip

\_\_\_\_\_  
Fax Number

**Form 2 (6 pages)  
Bid Solicitation Notice**

**(Due no later than seven (7) days prior to the bid, or at the pre-bid  
Conference, whichever is earlier)**

**BID DATA**

1. GENERAL CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_  
\_\_\_\_\_

CONTACT (S): \_\_\_\_\_

PHONE: \_\_\_\_\_

FAX: \_\_\_\_\_

E-MAIL: \_\_\_\_\_

2. OWNER: \_\_\_\_\_

3. NAME OF PROJECT: \_\_\_\_\_

4. FILE NO.: \_\_\_\_\_ ENGINEERING PROJECT NO.: \_\_\_\_\_

5. SCHEDULE PRE-BID MEETING

DATE/TIME: \_\_\_\_\_

LOCATION: \_\_\_\_\_

6. DATE/TIME FOR RECEIPT OF BIDS: \_\_\_\_\_

7. SCHEDULE BID OPENING

DATE/TIME: \_\_\_\_\_

LOCATION: \_\_\_\_\_

8. ESTIMATED JOB START DATE: \_\_\_\_\_

9. ESTIMATED COMPLETION DATE: \_\_\_\_\_

PROJECT: \_\_\_\_\_

LOCATION: \_\_\_\_\_

BID DATE: \_\_\_\_\_

GENERAL CONTRACTOR CONTACT:

NAME \_\_\_\_\_

ADDRESS: \_\_\_\_\_

TELEPHONE: ( ) \_\_\_\_\_

FAX: ( ) \_\_\_\_\_

EMAIL: ( ) \_\_\_\_\_

**DEADLINE FOR PROPOSALS**

**DATE/TIME**

\* Estimated Contract Opportunity Value:  
{1} 0-25,000 {2} 25,000-50,000 {3} 50,000-100,000 {4}  
100,000 - 500,000 {5} over 500,000

**DIVISION 02 – EXISTING CONDITIONS**  
{1} {2} {3} {4} {5} \*

- 02 21 SURVEYS
- 02 32 GEOTECHNICAL INVESTIGATIONS
- 02 41 DEMOLITION
- 02 42 REMOVAL and SALVAGE of CONSTRUCTION MATERIALS
- 02 43 STRUCTURE MOVING
- 02 56 SITE CONTAINMENT
- 02 85 UNDERGROUND STORAGE TANK REMOVAL
- 02 81 TRANSPORTATION and DISPOSAL of HAZARDOUS MATERIALS
- 02 82 ASBESTOS REMEDIATION
- 02 83 LEAD REMEDIATION
- 02 85 MOLD REMEDIATION
- 02 91 CHEMICAL SAMPLING, TESTING and ANALYSIS

02 \_\_\_\_\_  
(Please fill-in other opportunity)

**DIVISION 3 - CONCRETE {1} {2} {3} {4} {5}**

- 03 01 MAINTENANCE OF CONCRETE
- 03 11 CONCRETE FORMING
- 03 15 CONCRETE ACCESSORIES
- 03 21 REINFORCING STEEL
- 03 22 WELDED WIRE FABRIC REINFORCING

- 03 30 CAST-IN-PLACE CONCRETE
- 03 31 STRUCTURAL CONCRETE
- 03 35 CONCRETE FINISHING
- 03 37 SPECIALTY PLACED CONCRETE
- 03 39 CONCRETE CURING
- 03 41 PRECAST STRUCTURAL CONCRETE
- 03 45 PRECAST ARCHITECTURAL CONCRETE
- 03 47 SITE-CAST CONCRETE
- 03 62 NON-SHRINK GROUTING
- 03 63 EPOXY GROUTING
- 03 81 CONCRETE CUTTING
- 03 82 CONCRETE BORING
- 03 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 4 - MASONRY {1} {2} {3} {4} {5}**

- 04 21 CLAY UNIT MASONRY
- 04 22 CONCRETE UNIT MASONRY
- 04 25 UNIT MASONRY PANELS
- 04 30 MULTIPLE-WYTHE MASONRY
- 04 43 STONE MASONRY
- 04 67 MASONRY FIREPLACES
- 04 71 MANUFACTURED BRICK MASONRY
- 04 73 MANUFACTURED STONE MASONRY
- 04 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 5 - METALS {1} {2} {3} {4} {5}**

- 05 12 STRUCTURAL STEEL FRAMING
- 05 14 STRUCTURAL ALUMINUM FRAMING
- 05 15 WIRE ROPE ASSEMBLIES
- 05 21 STEEL JOIST FRAMING
- 05 31 STEEL DECKING
- 05 35 RACEWAY DECKING ASSEMBLIES
- 05 41 STRUCTURAL METAL STUD FRAMING
- 05 42 COLD-FORMED METAL JOIST FRAMING
- 05 44 COLD-FORMED METAL TRUSSES
- 05 61 METAL STAIRS
- 05 62 METAL RAILINGS
- 05 63 METAL GRATINGS
- 05 65 METAL STAIR TREADS & NOSING
- 05 68 METAL CASTINGS
- 05 68 FORMED METAL FABRICATIONS
- 05 71 DECORATIVE METAL STAIRS
- 05 73 DECORATIVE METAL RAILINGS
- 05 75 DECORATIVE FORMED METAL
- 05 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 6 – WOODS, PLASTICS & COMPOSITES**  
{1} {2} {3} {4} {5}

- 06 11 WOOD FRAMING

- 06 12 STRUCTURAL PANELS
- 06 15 WOOD DECKING
- 06 16 SHEATING
- 06 17 SHOP FABRICATED STRUCTURAL WOOD
- 06 22 MILLWORK
- 06 25 PREFINISHED PANEL
- 06 26 PANELING
- 06 43 WOOD STAIRS & RAILINGS
- 06 44 ORNAMENTAL WOODWORK
- 06 48 WOOD FRAMES
- 06 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 7 – THERMAL & MOISTURE PROTECTION**  
 {1} {2} {3} {4} {5}

- 07 11 DAMPPROOFING
- 07 12 BUILT-UP BITUMINOUS WATERPROOFING
- 07 13 SHEET WATERPROOFING
- 07 16 CEMENTIOUS & REACTIVE WATERPROOFING
- 07 19 WATER REPELLANTS
- 07 21 THERMAL INSULATION
- 07 22 ROOF & DECK INSULATION
- 07 24 EXTERIOR INSULATION & FINISH SYSTEMS
- 07 25 WEATHER BARRIERS
- 07 26 VAPOR RETARDERS
- 07 31 SHINGLES & SHAKES
- 07 32 ROOF TILES
- 07 33 NATURAL ROOF COVERINGS
- 07 41 ROOF PANELS
- 07 42 WALL PANELS
- 07 46 SIDING
- 07 51 BUILT-UP BITUMINOUS ROOFING
- 07 52 MODIFIED BITUMINOUS MEMBRANE ROOFING
- 07 53 ELASTOMETRIC MEMBRANE ROOFING
- 07 54 THERMOPLASTIC MEMBRANE ROOFING
- 07 56 FLUID APPLIED ROOFING
- 07 58 ROLL ROOFING
- 07 61 SHEET METAL ROOFING
- 07 65 FLEXIBLE FLASHING
- 07 71 ROOF SPECIALTIES
- 07 72 ROOF ACCESSORIES
- 07 81 APPLIED FIREPROOFING
- 07 84 FIRESTOPPING
- 07 91 PREFORMED JOINT SEALS
- 07 92 JOINT SEALANTS
- 07 95 EXPANSION CONTROL
- 07 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 8 - OPENINGS {1} {2} {3} {4} {5}**

- 08 11 METAL DOORS & FRAMES
- 08 12 METAL FRAMES
- 08 13 METAL DOORS
- 08 14 WOOD DOORS
- 08 16 COMPOSITE DOORS
- 08 17 INTEGRATED DOOR OPENING ASSEMBLIES
- 08 31 ACCESS DOORS & PANELS
- 08 32 SLIDING GLASS DOORS
- 08 33 COILING DOORS & GRILLES
- 08 34 SPECIAL FUNCTION DOORS
- 08 36 PANEL DOORS
- 08 38 TRAFFIC DOORS
- 08 41 ENTRANCES & STOREFRONTS
- 08 42 ENTRANCES
- 08 43 STOREFRONTS
- 08 44 CURTAIN WALL & GLAZED ASSEMBLIES
- 08 51 METAL WINDOWS
- 08 52 WOOD WINDOWS
- 08 53 PLASTIC WINDOWS
- 08 54 COMPOSITE WINDOWS
- 08 56 SPECIAL FUNCTION WINDOWS
- 08 62 UNIT SKYLIGHTS
- 08 63 METAL-FRAMED SKYLIGHTS
- 08 71 DOOR HARDWARE
- 08 74 ACCESS CONTROL HARDWARE
- 08 75 WINDOW HARDWARE
- 08 79 HARDWARE ACCESSORIES
- 08 81 GLASS GLAZING
- 08 83 MIRRORS
- 08 84 PLASTIC GLAZING
- 08 88 SPECIAL FUNCTION GLAZING
- 08 91 LOUVERS
- 08 95 VENTS
- 08 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 9 - FINISHES {1} {2} {3} {4} {5}**

- 09 21 PLASTER & GYPSUM ASSEMBLIES
- 09 22 SUPPORTS FOR PLASTER & GYPSUM
- 09 23 GYPSUM PLASTERING
- 09 24 CEMENT PLASTERING
- 09 26 VENEER PLASTERING
- 09 28 BACKING S & UNDERLAYMENTS
- 09 29 GYPSUM
- 09 30 TILING
- 09 51 ACOUSTICAL CEILINGS
- 09 54 SPECIALTY CEILINGS
- 09 62 SPECIALTY FLOORING
- 09 63 MASONRY FLOORING
- 09 64 WOOD FLOORING

- 09 65 RESILIENT FLOORING
- 09 66 TERRAZZO FLOORING
- 09 68 CARPETING
- 09 72 WALL COVERINGS
- 09 77 SPECIAL WALL SURFACING
- 09 91 PAINTING
- 09 93 STAINING & TRANSPARENT FINISHING
- 09 96 HIGH PERFORMANCE COATINGS
- 09 97 SPECIAL COATINGS
- 09 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 10 - SPECIALTIES {1} {2} {3} {4} {5}**

- 10 11 VISUAL DISPLAY UNITS
- 10 14 SIGNAGE
- 10 22 PARTITIONS
- 10 26 WALL & DOOR PROTECTION
- 10 28 TOILET, BATH & LAUNDRY ACCESSORIES
- 10 44 FIRE PROTECTION SPECIALTIES
- 10 51 LOCKERS
- 10 71 EXTERIOR PROTECTION
- 10 74 MANUFACTURED EXTERIOR SPECIALTIES
- 10 75 FLAGPOLES
- 10 81 PEST CONTROL DEVICES
- 10 88 SCALES
- 10 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 11 - EQUIPMENT {1} {2} {3} {4} {5}**

- 11 11 VEHICLE SERVICE EQUIPMENT
- 11 12 PARKING CONTROL EQUIPMENT
- 11 13 LOADING DOCK EQUIPMENT
- 11 14 PEDESTRIAN CONTROL EQUIPMENT
- 11 24 MAINTENANCE EQUIPMENT
- 11 31 RESIDENTIAL APPLIANCES
- 11 33 RETRACTABLE STAIRS
- 11 41 FOODSERVICE STORAGE EQUIPMENT
- 11 42 FOOD PREPARATION EQUIPMENT
- 11 43 FOOD DELIVERY CARTS AND CONVEYORS
- 11 44 FOOD COOKING EQUIPMENT
- 11 46 FOOD DISPENSING EQUIPMENT
- 11 47 ICE MACHINES
- 11 48 CLEANING & DISPOSAL EQUIPMENT
- 11 52 AUDIO-VISUAL EQUIPMENT
- 11 53 LABORATORY EQUIPMENT
- 11 66 ATHLETIC EQUIPMENT
- 11 67 RECREATIONAL EQUIPMENT
- 11 82 SOLID WASTE HANDLING
- 11 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 12 - FURNISHINGS {1} {2} {3} {4} {5}**

- 12 21 WINDOW BLINDS
- 12 22 CURTAINS & DRAPES
- 12 23 INTERIOR SHUTTERS
- 12 24 WINDOW SHADES
- 12 32 MANUFACTURED CASEWORK
- 12 35 SPECIALTY CASEWORK
- 12 36 COUNTERTOPS
- 12 46 FURNISHING ACCESSORIES
- 12 48 RUGS & MATS
- 12 51 OFFICE FURNITURE
- 12 52 SEATING
- 12 54 HOSPITALITY FURNITURE
- 12 56 INSTITUTIONAL FURNITURE
- 12 61 FIXED AUDIENCE SEATING
- 12 63 STADIUM & ARENA SEATING
- 12 67 PEWS & BENCHES
- 12 92 INTERIOR PLANTERS & ARTIFICIAL PLANTS
- 12 93 SITE FURNISHINGS
- 12 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 13 - SPECIAL CONSTRUCTION {1} {2} {3} {4} {5}**

- 13 11 SWIMMING POOLS
- 13 17 TUBS & POOLS
- 13 18 ICE RINKS
- 13 21 CONTROLLED ENVIRONMENT ROOMS
- 13 24 SPECIAL ACTIVITY ROOMS
- 13 28 ATHLETIC & RECREATIONAL SPECIAL CONSTRUCTION
- 13 31 FABRIC STRUCTURES
- 13 34 FABRICATED ENGINEERED STRUCTURES
- 13 36 TOWERS
- 13 42 BUILDING MODULES
- 13 48 SOUND, VIBRATION, & SEISMIC CONTROL
- 13 49 RADIATION PROTECTION
- 13 \_\_\_\_\_

(Please fill-in for other opportunity)

**DIVISION 14 - CONVEYING SYSTEMS {1} {2} {3} {4} {5}**

- 14 11 MANUAL DUMBWAITERS
- 14 12 ELECTRIC DUMBWAITERS
- 14 21 ELECTRIC TRACTION ELEVATORS
- 14 24 HYDRAULIC ELEVATORS
- 14 27 CUSTOM ELEVATOR CABS & DOORS
- 14 28 ELEVATOR EQUIPMENT & CONTROLS
- 14 31 ESCALATORS

- 14 32 MOVING WALKS
  - 14 42 WHEELCHAIR LIFTS
  - 14 51 CORRESPONDENCE & PARCEL LIFTS
  - 14 91 FACILITY CHUTES
  - 14 92 PNEUMATIC TUBE SYSTEMS
  - 14 \_\_\_\_\_
- (Please fill-in for other opportunity)

- DIVISION 21 –FIRE SUPPRESSION {1} {2} {3} {4} {5}**
- 21 11 FIRE-SUPPRESSION WATER SERVICE PIPING &METHODS
  - 21 12 FIRE SUPPRESSION STANDPIPES
  - 21 13 FIRE SUPPRESSION SPRINKLER SYSTEMS
  - 21 21 CARBON-DIOXIDE FIRE EXTINGUISHING SYSTEMS
  - 21 22 CLEAN AGENT FIRE EXTINGUISHING SYSTEMS
  - 21 31 CENTIFUGAL FIRE PUMPS
  - 21 \_\_\_\_\_
- (Please fill-in for other opportunity)

- DIVISION 22-PLUMBING {1} {2} {3} {4} {5}**
- 22 07 PLUMBING INSULATION
  - 22 11 FACILITY WATER DISTRIBUTION
  - 22 13 FACILITY SANITARY SEWERAGE
  - 22 14 FACILITY STORM DRAINAGE
  - 22 41 COMMERCIAL PLUMBING FIXTURE
  - 22 42 COMMERCIAL PLUMBING FIXTURES
  - 22 45 EMERGENCY PLUMBING FIXTURES
  - 22 47 DRINKING FOUNTAINS & WATER COOLERS
  - 22 51 SWIMMING POOL PLUMBING SYSTEMS
  - 22 66 CHEMICAL-WASTE SYSTEMS FOR LAB & HEALTHCARE FACILITIES
  - 22 \_\_\_\_\_
- (Please fill-in for other opportunity)

- DIVISION 23-HEATING VENTILATION AIR CONDITIONING {1} {2} {3} {4} {5}**
- 23 07 HVAC INSULATION
  - 23 09 INSTRUMENTATION & CONTROL FOR HVAC
  - 23 13 FACILITY FUEL-STORAGE TANKS
  - 23 21 HYDRONIC PIPING & PUMPS
  - 23 22 STEAM & CONDENSATE PIPING & PUMPS
  - 23 31 HVAC DUCTS & CASINGS
  - 23 33 AIR DUCT ACCESSORIES
  - 23 34 HVAC FANS
  - 23 37 AIR OUTLETS & INLETS
  - 23 38 VENTILATION HOODS

- 23 41 PARTICULATE AIR FILTRATION
  - 23 52 HEATING BOILERS
  - 23 54 FURNACES
  - 23 56 SOLAR ENERGY HEATING EQUIP.
  - 23 57 HEAT EXCHANGES FOR HVAC
  - 23 62 PACKAGED COMPRESSOR & CONDENSOR UNITS
  - 23 63 REFRIGERANT CONDENSORS
  - 23 64 PACKAGED WATER CHILLERS
  - 23 65 COOLING TOWERS
  - 23 73 INDOOR CENTRAL-STATION AIR-HANDLING UNITS
  - 23 74 PACKAGED OUTDOOR HVAC EQUIP
  - 23 82 CONVECTION HEATING & COOLING UNITS
  - 23 84 HUMIDITY CONTROL EQUIPMENT
  - 23 \_\_\_\_\_
- (Please fill-in for other opportunity)

- DIVISION 26-ELECTRICAL {1} {2} {3} {4} {5}**
- 26 09 INSTRUMENTATION & CONTROL FOR ELECTRICAL SYSTEMS
  - 26 12 MEDIUM VOLTAGE TRANSFORMERS
  - 26 22 LOW VOLTAGE TRANSFORMERS
  - 26 24 SWITCHES & PANELS
  - 26 25 ENCLOSED BUS ASSEMBLIES
  - 26 27 LOW VOLTAGE DISTRIBUTION EQUIPMENT
  - 26 28 LOW VOLTAGE CIRCUIT PROTECTIVE DEVICES
  - 26 29 LOW VOLTAGE CONTROLLERS
  - 26 32 PACKAGED GENERATOR ASSEMBLIES
  - 26 35 POWER FILTERS & CONDITIONERS
  - 26 42 CATHODIC PROTECTION
  - 26 51 INTERIOR LIGHTING
  - 26 52 EMERGENCY LIGHTING
  - 26 53 EXIT SIGNS
  - 26 54 CLASSIFIED LOCATION LIGHTING
  - 26 55 SPECIAL PURPOSE LIGHTING
  - 26 56 EXTERIOR LIGHTING
  - 26 61 LIGHTING SYSTEMS & ACCESSORIES
  - 26 71 ELECTRICAL MACHINES
  - 26 \_\_\_\_\_
- (Please fill-in for other opportunity)

- COMMUNICATIONS- 27 {1} {2} {3} {4} {5}**
- 27 13 COMMUNICATIONS BACKBONE CABLING
  - 27 41 AUDIO-VIDEO SYSTEMS
  - 27 51 DISTRIBUTED AUDIO VIDEO
  - 27 52 HEALTHCARE COMMUNICATIONS & MONITORING SYSTEMS
  - 27 53 DISTRIBUTED SYSTEMS



27 \_\_\_\_\_  
(Please fill-in for other opportunity)

**ELECTRONIC SAFETY & SECURITY- 28 {1} {2} {3} {4} {5}**

28 13 COMMUNICATIONS BACKBONE CABLING  
 28 16 INTRUSION DETECTION  
 28 23 VIDEO SURVEILLANCE  
 28 31 FIRE DETECTION  
 28 33 FUEL-GAS DETECTION  
 28 39 MASS NOTIFICATION SYSTEMS  
 28 \_\_\_\_\_  
(Please fill-in for other opportunity)

**EARTHWORK-31 {1} {2} {3} {4} {5}**

31 06 SCHEDULES FOR EARTHWORK  
 31 11 CLEARING & GRUBBING  
 31 13 SELECTIVE TREE & SHRUB REMOVAL & TRIMMING  
 31 14 EARTH STRIPPING & STOCKPILING  
 31 22 GRADING  
 31 23 EXCAVATION & FILL  
 31 25 ERSION & SEDIMENTATION  
 31 31 SOIL TREATMENT  
 31 32 SOIL STABILIZATION  
 31 33 ROCK STABILIZATION  
 31 36 GABIONS  
 31 37 RIPRAP  
 31 41 SHORING  
 31 43 CONCRETE RAISING  
 31 45 VIBROFLORATION & DENSIFICATION  
 31 46 NEEDLE BEAMS  
 31 48 UNDERPINNING  
 31 52 COFFERDAMS  
 31 56 SHURRY WALLS  
 31 62 DRIVEN PILES  
 31 63 BORED PILES  
 31 \_\_\_\_\_  
(Please fill-in for other opportunity)

**EXTERIOR IMPROVEMENTS- 32 {1} {2} {3} {4} {5}**

32 11 BASE COURSES  
 32 12 FLEXIBLE PAVING  
 32 13 RIGID PAVING  
 32 16 CURBS, GUTTERS SIDEWALKS & DRIVEWAYS  
 32 17 PAVING SPECIALTIES  
 32 18 ATHLETIC & RECREATIONAL SURFACING  
 32 31 FENCES & GATES  
 32 32 RETAINING WALLS  
 32 34 FABRICATED BRIDGES  
 32 35 SCREENING DEVICES  
 32 84 PLANTING IRRIGATION  
 32 91 PLANTING PREPARATION  
 32 92 TURF & GRASSES

32 93 PLANTS  
 32 94 PLANTING ACCESSORIES  
 32 96 TRANSPLANTING  
 32 \_\_\_\_\_  
(Please fill-in for other opportunity)

**UTILITIES-33 {1} {2} {3} {4} {5}**

33 11 WATER UTILITY DISTRIBUTION PIPING  
 33 12 WATER UTILITY DISTRIBUTION EQUIPMENT  
 33 16 WATER UTILITY STORAGE TANKS  
 33 21 WATER SUPPLY WELLS  
 33 31 SANITARY UTILITY SEWERAGE PIPING  
 33 36 UTILITY SEPTIC TANKS  
 33 41 STORM UTILITY DRAINAGE PIPING  
 33 42 CULVERTS  
 33 44 STORM UTILITY WATER DRAINS  
 33 46 SUBDRAINAGE  
 33 49 STORM DRAINAGE STRUCTURES  
 33 51 NATURAL GAS DISTRIBUTION  
 33 52 LIQUID FUEL DISTRIBUTION  
 33 71 ELECTRICAL UTILITY TRANSMISSION & DISTRIBUTION  
 33 81 COMMUNICATIONS & STRUCTURES  
 33 \_\_\_\_\_  
(Please fill-in for other opportunity)

**TRANSPORATION-34 {1} {2} {3} {4} {5}**

34 11 RAIL TRACKS  
 34 41 ROADWAY SIGNALING AND CONTROL EQUIPMENT  
 34 71 ROADWAY CONSTRUCTION  
 34 72 RAILWAY CONSTRUCTION  
 34 \_\_\_\_\_  
(Please fill-in for other opportunity)

**MATERIAL PROCESSING & HANDLING**

**EQUIPMENT-41 {1} {2} {3} {4} {5}**  
 41 21 CONVEYORS  
 41 22 CRANES & HOISTS  
 41 \_\_\_\_\_  
(Please fill-in for other opportunity)

**POLLUTION CONTROL EQUIP-44 {1} {2} {3} {4} {5}**

44 11 PARTICULATE CONTROL EQUIPMENT  
 44 \_\_\_\_\_  
(Please fill-in for other opportunity)

**WATER & WASTEWATER EQUIPMENT-46**

{1} {2} {3} {4} {5}  
 46 07 PACKAGED WATER & WASTEWATER TREATMENT EQUIPMENT  
 46 \_\_\_\_\_  
(Please fill-in for other opportunity)

FORM 3 (1page)

PARTICIPATION GOAL

(Must be submitted inside the contractor's sealed bid)

General Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_

Name of Project: \_\_\_\_\_

File No.: \_\_\_\_\_ Engineering Project No. \_\_\_\_\_

Date Submitted: \_\_\_\_\_

The project has a goal of ten to twenty percent (10-20%) MBE/DBE/WBE participation. Provide a brief summary of how this goal will be achieved. Failure to submit this form may result in a bid being rejected for non-responsiveness.

My goal for this project is \_\_\_\_\_%.

I plan on achieving this goal by: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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\_\_\_\_\_

**Form 4**  
**Contractors Submitting Bids**  
**(Must be submitted inside the contractor's sealed bid)**

General Contractor: \_\_\_\_\_

Contact: \_\_\_\_\_

Name of Project: \_\_\_\_\_

File No.: \_\_\_\_\_ Engineering Project No.: \_\_\_\_\_

Date Submitted: \_\_\_\_\_

All MBE/DBE/WBE Firms Submitting Bids

Scope of Work

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**FORM 5**  
**CONTRACTORS SUBMITTING BIDS**  
**(Must be submitted inside the contractor's sealed bid)**

General Contractor: \_\_\_\_\_  
Contact: \_\_\_\_\_  
Name of Project: \_\_\_\_\_  
File No.: \_\_\_\_\_ Engineering Project No.: \_\_\_\_\_  
Total Contract Amount: \$ \_\_\_\_\_  
Total Amount of All Subcontractors: \$ \_\_\_\_\_  
Date Submitted: \_\_\_\_\_

<u>All MBE/DBE/WBE firms to be utilized</u> <u>Amount</u>	<u>Scope of Work</u>	<u>Contract</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

(Use additional pages if necessary)

**Form 6**  
**Unavailability Certification**  
**(Must be submitted following tentative bid award)**

I, \_\_\_\_\_(Name/Title),  
of \_\_\_\_\_ (Company) certify  
that on \_\_\_\_\_ (Date) I contacted the following Minority/Disadvantaged  
Business Enterprise to obtain proposals/bids for the following work items:

<u>MDE/DBE/WBE Firm</u>	<u>Work Items Sought</u>	<u>Form of Proposal Sought</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

To the best of my knowledge and belief, said Minority/Disadvantaged Business Enterprises were unavailable for work on this project, or unable to prepare a proposal/bid for the following reason(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(This form to be completed by each MBE/DBE/WBE listed, which was contacted, but did not submit a bid/proposal)  
\_\_\_\_\_  
(Name of MBE/DBE/WBE) was offered an  
opportunity to submit a proposal on the above identified work on \_\_\_\_\_  
(Date) by \_\_\_\_\_ (Company  
Name).

(Use additional pages if necessary)

The above statement is a true and accurate account of why I did not submit a proposal/bid on this project.

\_\_\_\_\_  
(Signature of MBE/DBE/WBE)  
\_\_\_\_\_  
(Date)  
\_\_\_\_\_  
(Title)

**Form 7**  
**Project Closeout Report**  
**(To be submitted upon completion of project)**

General Contractor: \_\_\_\_\_  
Contact: \_\_\_\_\_  
Name of Project: \_\_\_\_\_  
File No.: \_\_\_\_\_ Engineering Project No.: \_\_\_\_\_  
Total Contract Amount: \$ \_\_\_\_\_  
Final Contract Amount: \$ \_\_\_\_\_  
Date Submitted: \_\_\_\_\_

<u>All MBE/DBE/WBE firms verified</u>	<u>Original subcontract amount</u>	<u>Final subcontract amount</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**Form 8**  
**Monthly Report Form**  
**(To be submitted monthly directly to the City's consultant)**

General Contractor: \_\_\_\_\_  
 Contact: \_\_\_\_\_  
 Name of Project: \_\_\_\_\_  
 File No.: \_\_\_\_\_ Engineering Project No.: \_\_\_\_\_  
 Total Contract Amount: \$ \_\_\_\_\_  
 Date Submitted: \_\_\_\_\_

**Billings**

Each MBE/DBE/WBE Contractor utilized	Original subcontract amount	Previous amount	This period amount	Total Amount

(Use additional pages if necessary)

DIVISION 1  
GENERAL REQUIREMENTS





## SECTION 01 10 00 - SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Project information.
  - 2. Summary of Work.
  - 3. Work by Owner or others.
  - 4. Owner-furnished products.
  - 5. Contractor's use of Site and premises.
  - 6. Future work.
  - 7. Owner's product Purchase contracts.
  - 8. Work restrictions.
  - 9. Owner occupancy.
  - 10. Permits.
  - 11. Specification conventions.
  - 12. Project Design Criteria
  
- B. Related Requirements:
  - 1. Section 01 20 00 – Price and Payment Procedures.
  - 2. Section 01 32 16 – Construction Progress Schedule.
  - 3. Section 01 50 00 – Temporary Facilities and Controls.
  - 4. Section 01 70 00 – Execution Requirements.

#### 1.2 PROJECT INFORMATION

- A. Name: Hilliard N Fletcher WRRF Phase II Improvements.
  - 1. Project Location: Tuscaloosa, Alabama.
  
- B. Owner: City of Tuscaloosa.
  - 1. Owner's Representative: Bryan Gurney, P.E., Director of Capital Projects, Water & Sewer.
  
- C. Project Engineer: Garver.
  - 1. Engineer's Representative: Wes Cardwell, P.E., Project Manager.
  
- D. Work of the Project generally includes anaerobic digester improvements, digester control building improvements, digester gas conditioning. More specifically, the Work includes, but is not limited to, construction of the following:
  - 1. Improvements to Anaerobic Digester Nos. 1 – 3 including:
    - a. Cleanout of existing anaerobic digester units.
    - b. Miscellaneous repairs to existing brick façade on exterior of each digester tank.
    - c. Demolition of existing internal gas piping, sludge transfer piping, and associated support structure.
    - d. Demolition of existing draft tube mixers and associated internal support structures.
    - e. Installation of new digester pumped mixing systems for each anaerobic digester.
    - f. Installation of new gas safety equipment on digester covers.
    - g. Installation of new exterior digester gas piping and associated support system.
    - h. Installation of new digested sludge gravity transfer boxes.
  - 2. Improvements to Digester Control Building including:
    - a. Rehabilitation of existing roofing system.
    - b. Electrical room modifications including HVAC improvements, replacement of the existing MCC, and room isolation upgrades to comply with current electrical code requirements.

- c. Installation of a new stair system to access roof.
- d. Installation of platform system at each anaerobic digester to access digested sludge gravity transfer box and cover.
- 3. Improvements to Digester Gas Conditioning System including:
  - a. Installation of a new hydrogen sulfide removal system with one vessel on concrete slab.
- 4. Improvements to the North Aeration Basins including:
  - a. Demolition of existing fixed grid fine bubble diffused aeration system including PVC air distribution piping.
  - b. Installation of an above grade air piping system from the existing blower building to the existing aeration basins.
  - c. Installation of a new fixed grid fine bubble diffused aeration system including PVC air distribution piping.
  - d. Repair of existing nitrate recycle valves.
  - e. Miscellaneous repairs to existing stainless steel air piping.

### 1.3 WORK BY OWNER OR OTHERS

- A. Owner, utilities, and others may perform activities within the project site and premises while the Work is in progress. Schedule the Work with Owner, utilities, and others to minimize interference or delays. Owner, utilities, and others may perform activities within the project site and premises while the Work is in progress. Schedule the Work with Owner, utilities, and others to minimize interference or delays.
- B. If Owner-awarded contracts interfere with each other due to Work being performed at the same time or at the same Site, Owner will determine the sequence of Work under all contracts according to WORK SEQUENCE and CONTRACTOR'S USE OF SITE AND PREMISES Articles in this Section.

### 1.4 OWNER-FURNISHED PRODUCTS

- A. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples to Contractor.
  - 2. Arrange and pay for delivery to Site.
  - 3. Upon delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
  - 1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
  - 2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
  - 3. Repair or replace items damaged after receipt.
  - 4. Handle, store, install, and finish products.

### 1.5 SUBSURFACE UTILITY CONDITIONS

- A. Coordinate Work with utilities of Owner and public or private agencies. Verify locations of utilities and facilities which may exist by contacting the utility locating service for the state where Work is performed. Provide advance notice to and utilize services of Alabama 811 for location and marking of underground utilities operated by utility agencies other than the Owner.
  - 1. Contact information: Alabama 811
    - a. Address: 3104 Bates Lane, Fultondale, AL 35067
    - b. Phone number: 800-292-8525 or 205-731-3200

- c. Website: [www.al1call.com](http://www.al1call.com)
  - 2. In addition, the contractor shall notify the plant superintendent at least two working days prior to excavation in order to allow for proper marking of existing utilities
  - 3. Maintain electrical, telephone, water, gas, sanitary facilities, and other utilities within existing facilities in service. Provide temporary utilities when necessary.
- B. Exercise reasonable care to verify location of existing subsurface facilities and utilities.
  - C. Areas immediate and adjacent to planned excavations shall be thoroughly checked by means of visual examination and with electronic metal and pipe detection equipment for indications of underground utilities and facilities.
  - D. Make exploratory excavation where existing underground facilities or utilities may potentially conflict with proposed excavations and facilities, or where there is reasonable cause to verify the presence or absence of underground facilities or utilities. Expose sanitary and storm sewers, water, gas, electric, communication lines, and other underground facilities to permit survey location prior to commencement of Work in affected area:
    - 1. Conduct exploratory excavations prior to proceeding with major excavation in the area, and sufficiently in advance of construction to avoid possible delays to the Work. Promptly take measurements, photographs, and obtain survey data.
    - 2. Notify the Owner when Work will be in progress. Make arrangements for potential emergency repairs in accordance with standards of utility owners, including individual or residential facilities.
    - 3. Assume responsibility for repair of facilities damaged by performance of the Work.
  - E. Relocation of Existing Utilities: During construction it is expected that minor relocations of existing utilities, beyond those explicitly indicated on drawings, will be necessary as part of the Work.
    - 1. When relocation of utilities is required as part of the Work, perform in accordance with the standards of affected utility owner. Match materials of existing utilities unless otherwise directed.
    - 2. Adjustment to contract price and contract time for concealed conditions, if any, will be made as stipulated in conditions of the Contract.
  - F. Construction Plan: Before start of construction, post electronic file to web-based project management software of construction plan regarding access to Work, use of Site, and utility outages for acceptance by Owner. After acceptance of plan, construction operations shall comply with accepted plan unless deviations are accepted by Owner in writing.

#### 1.6 OWNER OCCUPANCY

- A. Schedule and substantially complete designated portions of the Work, as designated in Section 01 14 00, WORK RESTRICTIONS, for Owner's use and occupancy before Substantial Completion of the entire Work.
  - 1. Owner's use and occupancy of designated areas before Substantial Completion of entire Project do not relieve Contractor of responsibility to maintain specified insurance coverages on a 100 percent basis until date of final payment.
- B. Owner will occupy Site during entire period of construction for conduct of normal operations. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule Work to accommodate Owner occupancy.

## 1.7 PERMITS

- A. Secure and pay for all necessary permits for construction of Work, including but not limited to the following:
  - 1. Building permits including plumbing, mechanical, and electrical.
  - 2. Stormwater permit. It is the Contractor's responsibility to maintain the required controls and record keeping complying with the SWPPP and associated stormwater permit.
  - 3. OSHA excavation permit.
  - 4. Department of Transportation permits.
- B. Comply with codes, ordinances, regulations, orders, and other legal requirements of public authorities having bearing on the performance of the Work.

## 1.8 SPECIFICATION CONVENTIONS

- A. Specification Arrangement: Specification section numbers and formatting are in CSI Three-Part Section format, and in accordance with CSI MasterFormat™, except where departures have been deemed necessary.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
  - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
  - 4. "Provide" means to manufacture, fabricate, deliver, furnish, install, complete, assemble, erect in place, test, render ready for use or operation, including necessary related material, labor, appurtenances, services, and incidentals.
  - 5. Related documents and sections: the Contract Documents are complementary; what is called for by one is as binding as if called for by all.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
  - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

## 1.9 DESIGN CRITERIA

- A. Project Design Criteria: All equipment and materials for the project are to be suitable for performance in environment of the Hilliard N. Fletcher WRRF located in Tuscaloosa, Alabama, under the following conditions:
  - 1. Outdoor temperatures: 0 to 105 degrees F.
  - 2. Indoor process area temperatures: 50 to 105 degrees F.
  - 3. Indoor conditioned spaces: 50 to 90 degrees F.
  - 4. Design groundwater elevation: 10 Ft El.
  - 5. Frost line is assumed 7.0 below grade.

6. Moisture conditions: Defined in Specification Sections.
7. Site elevation: Generally, ranges from 145.0 to 165.0 feet above mean sea level.
8. Use anchor bolts, bolts, or welded studs for anchors for resisting seismic and wind forces. Anchor bolts used to resist seismic and wind forces shall have a standard hex bolt head embedded in the concrete. Do not use anchor bolts fabricated from rod stock with an L or J shape.
9. Do not use chemical anchors, concrete anchors, flush shells, powder actuated fasteners, sleeve anchors, or other types of anchors unless indicated on the Drawings or accepted in writing by the Engineer.
10. Seismic and wind forces must be resisted by direct bearing on the fasteners used to resist seismic and wind forces.
11. Complete shop drawings, seismic calculations, and wind calculations signed and sealed by a civil or structural engineer licensed in the state where the Project is located.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

## SECTION 01 14 00 – WORK RESTRICTIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Work restrictions.
  - 2. Work sequencing.
  
- B. Related Requirements:
  - 1. Section 01 20 00 – Price and Payment Procedures.
  - 2. Section 01 32 16 – Construction Progress Schedule.
  - 3. Section 01 50 00 – Temporary Facilities and Controls.
  - 4. Section 01 70 00 – Execution Requirements.
  - 5. Section 01 77 00 – Closeout Procedures.

#### 1.2 GENERAL WORK RESTRICTIONS

- A. Wastewater Treatment Facilities
  - 1. The existing Hilliard N. Fletcher WRRF facility is the City of Tuscaloosa's only means of treating domestic and industrial wastewater prior to discharge. Impairing the operational capabilities of this facility will result in serious environmental damage and monetary fines.
  - 2. Contractor shall bear the cost of penalties imposed on the Owner for discharge violations or other violations caused by actions of the Contractor.
  - 3. Conduct work in a manner that will not impair the operational capabilities of essential elements of the treatment process or reduce the capacity of the entire treatment plant below levels sufficient to treat the quality of raw wastewater to the water quality limitations specified in the discharge permit.
  - 4. The status of the treatment plant shall be defined as "operational" when it is capable of treating the entire quantity of wastewater received to the water quality limits specified in the discharge permit.
  
- B. Time Restrictions for Performing Work: Regular operating hours as determined by the Owner are from 7 am to 5 pm Monday through Friday.
  
- C. On-Site Workday Restrictions: Do not perform Work on Site during Work blackout days indicated by Owner.
  
- D. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction (AHJ).
  
- E. Provide safe, continuous access to process control equipment for plant operations personnel.
  
- F. Noise, Vibration, Dust, and Odors: Coordinate with Owner operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy.
  - 1. Notify Engineer or Owner not less than two days in advance of proposed disruptive operations.
  - 2. Obtain Engineer's or Owner's written permission before proceeding with disruptive operations.
  
- G. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, marijuana, and other controlled substances on Project Site, premises, or on Owner's property is not permitted.

- H. Employee Identification: Provide identification tags for Contractor personnel working on Project Site. Require personnel to use identification tags at all times.
- I. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project Site.
  - 1. Maintain list of approved screened personnel with Owner's representative.

### 1.3 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project Site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project Site to Work in areas indicated. Do not disturb portions of Project Site beyond areas in which the Work is indicated.
- C. Limits on Use of Site:
  - 1. Limit use of Site and premises to allow:
    - a. Owner occupancy.
    - b. Work by Owner.
    - c. Work by Others.
    - d. Use by the public where required.
  - 2. Driveways, Walkways, and Entrances: Keep driveways, parking areas, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
    - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on Site.
- D. Construction Operations: Limited to areas indicated on Drawings.
  - 1. Noisy and Disruptive Operations (such as Use of Jack Hammers and Other Noisy Equipment): Not allowed in close proximity to existing building during regular hours of operation. Coordinate and schedule such operations with Owner to minimize disruptions.
- E. Sound Level Restrictions: Sound pressure level measured at boundary of Site shall not exceed levels required by local ordinances or codes, and at no time shall exceed 40 dBA.

### 1.4 FACILITY OPERATIONS

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions, and only after arranging for temporary utility services according to requirements indicated:
  - 1. Notify Engineer and Owner not less than seven days in advance of proposed utility interruptions.
  - 2. Submit outage request plan to Engineer and Owner itemizing dates, times, and duration of each requested outage.
  - 3. Obtain Owner's written permission before proceeding with utility interruptions.
- B. Existing Operations Interruptions: Do not shutdown, interrupt, or otherwise impair the operational capability of treatment facilities or processes unless permitted under the following conditions. A facility or process shall be considered operational when it can achieve its defined treatment or process objective as defined by the Owner or Engineer.



1. Indicate required shutdowns of existing facilities or interruptions of existing operations on Construction Progress Schedule.
  2. Where required to minimize interruptions or impairments to systems operations while complying with specified work constraints, provide temporary treatment equipment, pumping, bypass systems, connections, power, lighting, controls, instrumentation, and safety devices.
  3. Do not remove or demolish systems required to keep the existing facilities operational at the capacities specified until the existing systems are replaced by temporary or new systems.
- C. Shutdown Constraints: Perform work within the following critical operational constraints:
1. Contractor shall coordinate all scheduled outages with the Engineer, the Plant Superintendent, and Chief Operator.
- D. Shutdown Definitions
1. Minor Shutdown: Any shutdown requiring less than four (4) hours.
  2. Major Shutdown: Any shutdown other than a minor shutdown.
  3. Dry Weather Period: Generally, June 1 to October 1. Final determination made by Owner based on weather, flows entering the plant, and plant operation requirements.
  4. Wet Weather Period: Any time not within the defined dry weather period.
  5. Low Flow Period: 2:00am to 6:00am.
- E. Shutdown Procedures
1. Notify Engineer and Owner not less than fourteen (14) days in advance of proposed minor shutdowns.
  2. Notify Engineer and Owner not less than thirty (30) days in advance of proposed major shutdowns.
  3. Contractor shall schedule a shutdown coordination meeting with Owner and Engineer one week prior to each shutdown.
  4. Any and all plant shutdowns shall require a shutdown plan, including detailed schedule, backup tools and equipment, personnel involved, contingency plan, and any procedures involved in restarting the process or facility.
  5. Obtain Engineer's or Owner's written permission before proceeding with proposed shutdowns.
  6. Shutdowns will only be allowed in dry weather periods. Shutdowns may be limited to low flow periods.

## 1.5 WORK SEQUENCE

- A. Use identified work sequences in this section as a guideline for scheduling and performing work. Perform work in a manner that will not prevent the facility from achieving the final treated water quality requirements established by regulation.
- B. Work sequence and constraints presented do not include all items affecting completion of the Work. They are intended to describe critical events necessary to minimize disruption to existing operations and to ensure compliance with treatment regulations and permit requirements.
- C. Construct Work in phases during construction period. Coordinate construction schedule and operations with Engineer and Owner:
1. North Aeration Basins Improvements
    - a. Field locate existing underground utilities through use of ground penetrating radar (GPR) and submit layout to Owner and Engineer for review and to confirm proposed layout of blower piping will not interfere with existing utilities.
    - b. The above grade piping system may be constructed without the need to take either basin out of service. More specifically, the blower discharge piping segments (not

- yet connected to blower equipment), main aeration blower header, pipe bridge, and blower discharge piping segments to each basin (not yet connected to aeration piping at basins) can be installed while the existing processes remain online.
- c. Once the above-grade piping system is in place, the Owner shall designate which basin shall be taken offline to begin rehabilitation of the diffuser system. The Owner will drain the desired tank. Once the tank has been drained, the Contractor assumes full responsibility for removing all remaining solids within the tank necessary to complete the Work and completing the necessary diffuser replacement. All work within the individual basin, including testing and system adjustments to the satisfaction of the Owner, must be completed and the basin placed back into service within 21 days.
  - d. In Aeration Basin No. 1, because the Nitrate Recycle Valve (NRCY) is stuck in an open position due to a broken stem, the effluent channel must also be taken offline at the same time the aeration basin is taken out of service. This channel cannot be offline for more than 12 hours and all Work related to this valve must be completed within this time window. Once repairs to the NRCY valve have been completed, the Owner will return this section of the effluent channel back into service. If necessary, the same procedure will apply to Aeration Basin No. 2 depending on the ability of the existing NRCY valve to fully close.
  - e. The corresponding effluent channel for the basin out of service will be taken out of service to allow the diffuser replacement and the necessary tie-in of the new above-grade aeration piping to be completed. All Work within each effluent channel segment must be completed within a 12-hour time window. Following this tie-in, the isolation valves on the aeration piping systems should be set into position such that all process air is still provided from the below-grade piping system.
  - f. Once all Work has been completed at the aeration basins and both segments of the proposed above-grade piping system have been connected to aeration piping at the basins, work can begin to connect blowers to the above-grade piping system. Blowers will be connected to the above-grade system in two phases. During the first phase, blowers currently in "STANDBY" status are to be disconnected from the existing piping system and connected to the new discharge piping system. Once these blowers are in place, all valves within the aeration piping systems will be set into position such that air is provided from the above-grade piping system and, simultaneously, the blowers providing air to the below grade system shall be turned off. At that time, the remaining blowers can now be connected to the new discharge piping system.
  - g. All existing mass-flow meters can be relocated to the new locations as indicated on the Drawings.
  - h. Upon completion of the work to bring the above-grade system online, work to complete the tie-in for the aeration piping to the Hydrologically Controlled Release structure and all necessary demolition and abandon-in-place tasks as detailed on the Drawings shall be performed.
  - i. To complete the required demolition of the below-grade piping system, the piping at each existing air meter box is to be disconnected and a blind flange installed.
2. Anaerobic Digesters
    - a. At all times, the Contractor shall exercise extreme caution when working around the digester facility and shall take all necessary precautions to maintain safe working conditions.
    - b. Contractor shall only work in digester at a time, starting with Anaerobic Digester No. 1.
      - 1) Prior to commencing the Work, the Owner shall remove and dewater as much of the solids from the digester as possible. When the Contractor is

ready to begin Work, the Owner will stop dewatering from the specified digester to be cleaned out and formally turn this tank over to the Contractor. Existing operations will continue, as normal, for the remaining anaerobic digesters.

- 2) Contractor shall remove all solids from the digester tank and complete the cleanout effort in accordance with Section 44 10 00, DIGESTER CLEANING AND COVER INSPECTION.
  - 3) Once cleaned out, the Contractor shall begin demolition of interior systems as indicated on the drawings. Simultaneously, temporary scaffolding or other provisions necessary for the cover manufacturer to assess the existing cover shall be setup.
  - 4) Upon completion of the cover assessment, the Contractor shall submit the findings and recommendations prepared by the cover manufacturer and the Owner and Engineer will determine what, if any, cover repairs are to be added to the project. These repairs are to be paid out of the contingencies included in the Base Bid price.
  - 5) Additionally, the Owner and Engineer will determine if the protective coating system is to be removed and re-applied. If determined to be included in the rehabilitation effort, this effort will be paid from the bid item included in the Base Bid price for the cover system protective coating replacement. If the existing protective coating system is determined to be in acceptable condition, no payment will be made for this item.
  - 6) Contractor shall complete construction of all other improvements including, but not limited to, installation of the new mixing system, digester gas handling system modifications, construction of the gravity sludge transfer box and associated piping.
  - 7) When complete, Contractor shall coordinate with Owner and Engineer to bring the digester back into service to complete the performance testing effort.
3. Digester Control Building Improvements
    - a. Contractor to complete improvements to existing digester electrical control room including, but not limited to, replacement of motor control centers, control room isolation, HVAC upgrades, roof rehabilitation, transfer piping support, and roof access.
    - b. This effort must be coordinated with the Owner and Engineer to ensure process-critical equipment can be taken offline appropriately.
  4. Digester Gas Conditioning Improvements
    - a. Construction of the digester gas scrubber may occur simultaneously with any other improvements.

#### 1.6 SEQUENCING OF CONSTRUCTION PLAN

- A. Before start of construction, post electronic file to Project website of construction plan regarding phasing of project and new Work for acceptance by Owner. After acceptance of plan, comply with accepted plan when coordinating construction sequencing unless deviations are accepted by Owner in writing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 20 00 - PRICE AND PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - Cash allowances.
  - Contingency allowances.
  - Testing and inspection allowances.
  - Schedule of Values.
  - Application for Payment.
  - Partial Payments.
  - Defect assessment.
  - Unit prices.
  - Alternates.

#### 1.2 BID ITEM DESCRIPTIONS

- A. The Basis of Payment will be as established in the Contract Documents, as lump sums or as unit price amounts based on actual quantities, and as described below:

**Base Bid Item No. 1: Mobilization and Demobilization**

- a. Payment shall be at the lump sum price and shall include all labor, materials, tools, equipment, permits, bonds, insurance, overhead and profit, and other required costs necessary to move personnel, equipment, materials, tools, supplies, and incidentals to the project site prior to beginning work and to move personnel, equipment, materials, tools, supplies, and incidentals from the project site immediately after project acceptance.
- b. Total payment for this bid item shall not exceed 5 percent of the contractor's base bid price. Payments for mobilization shall not exceed 75% of the total item. A minimum of 25% will be retained until such time that demobilization is complete, and the areas disturbed have been fully restored and accepted by the Owner.

**Base Bid Item No. 2: Facility 05 – Site Civil Improvements**

- c. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the work indicated in the Facility 05 drawings and associated specifications, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item.

**Base Bid Item No. 3: Facility 11 – Anaerobic Digester No. 1 Improvements**

- d. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the work indicated in the Facility 11 drawings and associated specifications, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item.
- e. Costs to complete the assessment of the digester cover, as described in Section 44 10 00, DIGESTER CLEANING AND COVER INSPECTION, by the cover manufacturer shall be incorporated into this bid item.

**Base Bid Item No. 4: Anaerobic Digester No. 1 Cleaning**

- f. Payment shall be for the full compensation, at the contract unit price per dry ton, for all work, labor, equipment, and materials to complete the digester cleanout effort as described in Section 44 10 00, DIGESTER CLEANING AND COVER INSPECTION.
- g. Costs to complete the assessment of the digester cover shall be included in Base Bid Item No. 3.

**Base Bid Item No. 5: Anaerobic Digester No. 1 Cover System Protective Coating System Replacement**

- h. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the replacement of the protective coating system on the underside of the Anaerobic Digester No. 1 cover system.
- i. This work shall only be completed at the authorization by the Owner and Engineer, based on the recommendations of the cover manufacturer following the cover assessment.
- j. If the existing protective coating system is determined to be in acceptable condition or the Owner and Engineer do not authorize this work, this bid item will not be paid and the amount indicated on the bid form will be credited back to the Owner by Change Order.

**Base Bid Item No. 6: Anaerobic Digester No. 1 Cover Repairs Contingency Allowance**

- k. This contingency allowance is to be used for any repairs to the Anaerobic Digester No. 1 cover system based on the observations and recommendations of the cover manufacturer following the assessment.
- l. This work shall only be completed at the authorization by the Owner and Engineer, based on the recommendations of the cover manufacturer following the cover assessment, and review of the costs prepared by the Contractor to address these recommendations.
- m. Any additional costs for repairs, not covered by this contingency allowance, will be made from the general project contingency allowance or through a formal Change Order.
- n. At closeout of the Contract, any funds remaining in this bid item will be credited to Owner by Change Order.

**Base Bid Item No. 7: Facility 12 – Anaerobic Digester No. 2 Improvements**

- o. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the work indicated in the Facility 12 drawings and associated specifications, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item.
- p. Costs to complete the assessment of the digester cover, as described in Section 44 10 00, DIGESTER CLEANING AND COVER INSPECTION, by the cover manufacturer shall be incorporated into this bid item.

**Base Bid Item No. 8: Anaerobic Digester No. 2 Cleaning**

- q. Payment shall be for the full compensation, at the contract unit price per dry ton, for all work, labor, equipment, and materials to complete the digester cleanout effort as described in Section 44 10 00, DIGESTER CLEANING AND COVER INSPECTION.
- r. Costs to complete the assessment of the digester cover shall be included in Base Bid Item No. 7.

**Base Bid Item No. 9: Anaerobic Digester No. 2 Cover System Protective Coating System Replacement**

- s. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the replacement of the protective coating system on the underside of the Anaerobic Digester No. 2 cover system.
- t. This work shall only be completed at the authorization by the Owner and Engineer, based on the recommendations of the cover manufacturer following the cover assessment.
- u. If the existing protective coating system is determined to be in acceptable condition or the Owner and Engineer do not authorize this work, this bid item will not be paid and the amount indicated on the bid form will be credited back to the Owner by Change Order.

**Base Bid Item No. 10: Anaerobic Digester No. 2 Cover Repairs Contingency Allowance**

- v. This contingency allowance is to be used for any repairs to the Anaerobic Digester No. 2 cover system based on the observations and recommendations of the cover manufacturer following the assessment.
- w. This work shall only be completed at the authorization by the Owner and Engineer, based on the recommendations of the cover manufacturer following the cover assessment, and review of the costs prepared by the Contractor to address these recommendations.
- x. Any additional costs for repairs, not covered by this contingency allowance, will be made from the general project contingency allowance or through a formal Change Order.
- y. At closeout of the Contract, any funds remaining in this bid item will be credited to Owner by Change Order.

**Base Bid Item No. 11: Facility 13 – Anaerobic Digester No. 3 Improvements**

- z. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the work indicated in the Facility 13 drawings and associated specifications, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item.
- aa. Costs to complete the assessment of the digester cover, as described in Section 44 10 00, DIGESTER CLEANING AND COVER INSPECTION, by the cover manufacturer shall be incorporated into this bid item.

**Base Bid Item No. 12: Anaerobic Digester No. 3 Cleaning**

- bb. Payment shall be for the full compensation, at the contract unit price per dry ton, for all work, labor, equipment, and materials to complete the digester cleanout effort as described in Section 44 10 00, DIGESTER CLEANING AND COVER INSPECTION.
- cc. Costs to complete the assessment of the digester cover shall be included in Base Bid Item No. 3.
- dd. At closeout of the Contract, any funds remaining in this bid item will be credited to Owner by Change Order.

**Base Bid Item No. 13: Anaerobic Digester No. 3 Cover System Protective Coating System Replacement**

- ee. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the replacement of the protective coating system on the underside of the Anaerobic Digester No. 3 cover system.
- ff. This work shall only be completed at the authorization by the Owner and Engineer, based on the recommendations of the cover manufacturer following the cover assessment.
- gg. If the existing protective coating system is determined to be in acceptable condition or the Owner and Engineer do not authorize this work, this bid item will not be paid and the amount indicated on the bid form will be credited back to the Owner by Change Order.

**Base Bid Item No. 14: Anaerobic Digester No. 3 Cover Repairs Contingency Allowance**

- hh. This contingency allowance is to be used for any repairs to the Anaerobic Digester No. 1 cover system based on the observations and recommendations of the cover manufacturer following the assessment.
- ii. This work shall only be completed at the authorization by the Owner and Engineer, based on the recommendations of the cover manufacturer following the cover assessment, and review of the costs prepared by the Contractor to address these recommendations.
- jj. Any additional costs for repairs, not covered by this contingency allowance, will be made from the general project contingency allowance or through a formal Change Order.
- kk. At closeout of the Contract, any funds remaining in this bid item will be credited to Owner by Change Order.

**Base Bid Item No. 15: Facility 20 – Digester Control Building Improvements**

- ll. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the work indicated in the Facility 20 drawings and associated specifications, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item.

**Base Bid Item No. 15: Facility 35 – Digester Gas Scrubber Improvements**

- mm. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the work indicated in the Facility 35 drawings and associated specifications, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item.

**Base Bid Item No. 17: Facility 40 – North Aeration Basin Improvements**

- nn. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary to complete the work indicated in the Facility 40 drawings and associated specifications, except those items listed separately. Any and all modifications necessary to complete this work but not listed herein shall be included in this bid item.

**Base Bid Item No. 18: General Project Contingency Allowance**

- oo. Payment shall be at the lump sum price and shall be full compensation for all work, labor, materials, start-up, training, commissioning, and other required costs necessary for work identified during the project.
- pp. Expenditure of any portion of the contingency allowance shall only be done following written authorization by Owner and Engineer. Contingency allowances are estimated amounts and final payment shall be based on actual costs as authorized by Change Order and the Contract Prices shall be correspondingly adjusted.
- qq. At closeout of the Contract, any funds remaining in the contingency allowance will be credited to Owner by Change Order.

1.3 DEDUCTIVE BID ALTERNATES

- A. In addition to the Base Bid Project, Owner may elect to remove a combination of the following Deductive Bid Alternates for which payment is as described below:

- 1. **Deductive Alternate Item No. 1: Facility 35 – Digester Scrubber**
  - a. Deductions shall be for the full compensation, at the lump sum price, for all work, labor and materials associated with the Work indicated for Facility 35, in its entirety.
- 2. **Deductive Alternate Item No. 2: Facility 12 – Anaerobic Digester No. 2**
  - a. Deductions shall be for the full compensation, at the lump sum price, for all work, labor and materials associated with the Work associated with cleanout, rehabilitation, and improvements to Facility 12, Anaerobic Digester No. 2.
  - b. All individual base bid items associated with completing the Work specific to Anaerobic Digester No. 2 shall be included in the deductive alternate.
- 3. **Deductive Alternate Item No. 3: Facility 13 – Anaerobic Digester No. 3**
  - a. Deductions shall be for the full compensation, at the lump sum price, for all work, labor and materials associated with the Work associated with cleanout, rehabilitation, and improvements to Facility 13, Anaerobic Digester No. 3.
  - b. All individual base bid items associated with completing the Work specific to Anaerobic Digester No. 3 shall be included in the deductive alternate.
- 4. **Deductive Alternate Item No. 4: Facility 20 – Digester Control Building Roof Replacement**

- a. Deductions shall be for the full compensation, at the lump sum price, for all work, labor and materials associated with replacement of the existing roof on the Digester Control Building.
  - b. The Contractor shall still be responsible for any repairs to the existing roof due to work associated with other improvements in other Facility drawings.
5. **Deductive Alternate Item No. 5: Panels FP-13-1, FP-15-1, and FP-16-7 Replacement**
- a. Deductions shall be for the full compensation, at the lump sum price, for all work, labor and materials associated with replacement of control panels FP-13-1, FP-15-1, and FP-16-7 in the electrical room of the Digester Control Building and included in the Facility 20 drawings.

#### 1.4 CONTINGENCY ALLOWANCES

- A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead, and profit will be included in Change Orders authorizing expenditure of funds from the contingency allowance.
- B. Funds will be drawn from contingency allowance only by Change Order.
- C. At closeout of Contract, funds remaining in contingency allowance will be credited to Owner by Change Order.

#### 1.5 SCHEDULE OF VALUES

- A. Submit electronic file to Project website of schedule on Progress Estimate schedule on EJCDC C-620 or form approved by Engineer and Owner. Document shall be a Microsoft Excel file type.
- B. Available Notice to Proceed Forms: EJCDC C-550 and CSI Form 1.4A.
- C. Apparent "low-bidder" shall submit a preliminary Schedule of Values as electronic file within 2 days after bid opening.
- D. Submit complete Schedule of Values as electronic file to Project website within 10 days after date of Owner-Contractor Agreement.
- E. Format: Use Table of Contents of this Project Manual. Identify each line item with number and title of major Specification Section. Also identify mobilization, bonds and insurance, progress schedule development, startup and commissioning, contract close-out, and demobilization as separate line items.
- F. Include in each line item amount of allowances as specified in this Section. For unit cost allowances, identify quantities taken from Contract Documents multiplied by unit cost to achieve total for each item.
- G. Include within each line item, direct proportional amount of Contractor's overhead and profit.
- H. Revise schedule to list approved Change Orders with each Application for Payment.
- I. An unbalanced or front-loaded schedule of values, or a schedule of values substantially different than the preliminary schedule, will not be accepted.
- J. Summation of the complete schedule of values representing all Work shall equal the Contract Price.



## 1.6 APPLICATION FOR PAYMENT

- A. AIA G736 replaces G722CMa-1992. AIA G737 replaces G723CMa-1992.
- B. Submit electronic file to project management website of each Application for Payment on EJCDC C-620 - Contractor's Application for Payment or similar form approved by Engineer and Owner.
- C. Content and Format: Use Schedule of Values for listing items in Application for Payment.
- D. Submit updated construction schedule with each Application for Payment.
- E. Payment Period: Submit at intervals stipulated in the Agreement.
- F. Submit submittals with transmittal letter as specified in Section 01 33 00 - Submittal Procedures.
- G. Substantiating Data: When Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:
  - Current construction photographs specified in Section 01 33 00 - Submittal Procedures.
  - Partial release of liens from major Subcontractors and vendors.
  - Record Documents as specified in Section 01 77 00 - Closeout Procedures, for review by Owner, which will be returned to Contractor.
  - Affidavits attesting to off-Site stored products.
  - Construction Progress Schedule, revised and current as specified in Section 01 33 00 - Submittal Procedures.

## 1.7 PARTIAL PAYMENTS FOR STORED MATERIALS

- A. No payments will be made for materials and equipment delivered or stored unless shop drawings and preliminary operations and maintenance manuals are accepted by Engineer. Thereafter, partial payments for materials and equipment delivered and stored, but not yet incorporated into the Work, shall not exceed 90% of the material value.
- B. Storage must meet the requirements of the General Conditions, be deemed acceptable by the Engineer and Owner, be located on the Site or a location agreed to by the Engineer and Owner and meet the documented storage recommendations from the material manufacturer.

## 1.8 PARTIAL PAYMENTS FOR UNDELIVERED FABRICATED EQUIPMENT

- A. No partial payments will be made for project-specific fabricated equipment except those specifically listed below and under the terms listed herein. Undelivered "Off the shelf" or catalog items are not eligible for partial payment.
- B. Payment shall not exceed 15% of the equipment value, not including shipping and handling charges.
- C. Payment will only be made when the following conditions are met:
  - Shop drawing and preliminary operations and maintenance manual acceptance by Engineer.
  - Equipment is adequately insured, maintained, stored, and protected by appropriate security measures.
  - Each equipment item is clearly marked and segregated from other items to permit inventory and accountability.
  - Authorization has been provided access to storage site for Engineer and Owner.

## 1.9 DEFECT ASSESSMENT

- A. This Article may be used to address Work performed in stipulated sum/price Contracts or in unit price Contracts; edit accordingly.
- B. Replace the Work, or portions of the Work, not conforming to specified requirements.
- C. If, in the opinion of Engineer or Owner, it is not practical to remove and replace the Work, Engineer or Owner will direct appropriate remedy or adjust payment. Potential remedies may include:  
The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Engineer or Owner.  
Defective Work will be partially repaired according to instructions of Engineer or Owner, and unit sum/price will be adjusted to new sum/price at discretion of Engineer or Owner.
- D. Individual Specification Sections may modify these options or may identify specific formula or percentage sum/price reduction.
- E. Authority of Engineer or Owner to assess defects and identify payment adjustments is final.
- F. Nonpayment for Rejected Products: Payment will not be made for rejected products for any of the following reasons:  
Products wasted or disposed of in a manner that is not acceptable.  
Products determined as unacceptable before or after placement.  
Products not completely unloaded from transporting vehicle.  
Products placed beyond lines and levels of the required Work.  
Products remaining on hand after completion of the Work.  
Loading, hauling, and disposing of rejected products.

## 1.10 UNIT PRICES

- A. This Article describes measurement and payment criteria applicable to Unit Price Work, whether unit price items are part of unit price Contract or part of Stipulated Sum/Price Contract.
- B. This Article should only be used with Work paid for by unit price payment method.
- C. Engineer will take measurements and compute quantities accordingly. Provide assistance in taking of measurements.
- D. Unit Quantities: Quantities and measurements indicated on Bid Form are for Contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Actual quantities provided shall determine payment.  
When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at contracted unit sum/prices.  
When actual Work requires 25 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim a Contract Price adjustment.
- E. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application, or installation of item of the Work; overhead and profit.
- F. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
- G. Measurement of Quantities:

Weigh Scales: Inspected, tested, and certified by applicable Alabama weights and measures department within past year.

Platform Scales: Of sufficient size and capacity to accommodate conveying vehicle.

Metering Devices: Inspected, tested, and certified by applicable Alabama department within past year.

Measurement by Weight: Concrete reinforcing steel, rolled or formed steel, or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

Measurement by Volume: Measured by cubic dimension using mean length, width, and height or thickness.

Measurement by Area: Measured by square dimension using mean length and width or radius.

Linear Measurement: Measured by linear dimension, at item centerline or mean chord.

Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.

#### 1.11 ALTERNATES

- A. Alternates are used when Owner or Architect/Engineer wants to competitively bid additional Work or bid different product or system compared to product or system specified as an integral part of base Project requirements. Submitted Bids for Alternates are expressed as cost increase or decrease to base Bid.
- B. This Article describes the scope of each Alternate and refers to the respective product Sections covering Work under each Alternate.
- C. When an Alternate requires products not covered under the base Bid Specifications, include separate Sections for required products in Project Manual. Concurrently, additional Drawings may be necessary to adequately illustrate some Alternates.
- D. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement. The Owner-Contractor Agreement may identify certain Alternates to remain an Owner option for a stipulated period of time.
- E. Coordinate related Work and modify surrounding Work. Description for each Alternate is recognized to be abbreviated but requires that each change shall be complete for scope of Work affected.  
Coordinate related requirements among Specification Sections as required.  
Include as part of each Alternate: Miscellaneous devices, appurtenances, and similar items incidental to or necessary for complete installation.  
Coordinate Alternate with adjacent Work and modify or adjust as necessary to ensure integration.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 25 00 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Quality assurance.
  - 2. Product options.
  - 3. Product substitution procedures.

#### 1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

#### 1.3 PRODUCT OPTIONS

- A. See Section 01 60 00 - Product Requirements.

#### 1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Refer to Front End Documents for procedures pertaining to submitting requests for substitutions during Bidding period.
- B. Engineer will not consider requests for substitutions prior to the date of the Owner-Contractor Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- D. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
  - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
  - 2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
  - 3. Reference to Article and Paragraph numbers in Specification Section.
  - 4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
  - 5. Impact to Contract time.
  - 6. Changes required in other Work.
  - 7. Availability of maintenance service and source of replacement parts as applicable.
  - 8. Certified test data to show compliance with performance characteristics specified.
  - 9. Samples when applicable or requested.
  - 10. Other information as necessary to assist Engineer's evaluation.
- E. A request constitutes a representation that Bidder or Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  2. Will provide same warranty for substitution as for specified product.
  3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
  4. Waives claims for additional costs or time extension that may subsequently become apparent.
  5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
  6. Will reimburse Owner, and Engineer if applicable, for review or redesign services associated with reapproval by authorities having jurisdiction.
- F. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.
- G. Substitution Submittal Procedure:
1. Submit requests for substitutions on form approved by Engineer and Owner.
  2. Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.
  3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
  4. Engineer will notify Contractor in writing of decision to accept or reject request.

#### 1.5 INSTALLER SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for substitutions within 30 days after date of Owner-Contractor Agreement. Requests received after that time may be considered or rejected at discretion of Engineer.
- B. Document each request with:
1. Installer's qualifications.
  2. Installer's experience in work similar to that specified.
  3. Other information as necessary to assist Engineer's evaluation.
- C. Substitution Submittal Procedure:
1. Submit electronic files to Project website of Request for Substitution for consideration. Limit each request to one proposed substitution.
  2. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 26 00 – CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Field Orders
  - 2. Change Proposals.
  - 3. Work Change Directives
  - 4. Change Orders.

#### 1.2 CHANGE PROCEDURES

- A. Submittals: Submit name of individual who is authorized to receive change documents and is responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Carefully study and compare Contract Documents before proceeding with fabrication and installation of Work. Promptly advise Engineer of any error, inconsistency, omission, or apparent discrepancy.
- C. Requests for Interpretation (RFI) and Clarifications: Allot time in construction scheduling for liaison with Engineer; establish procedures for handling queries and clarifications.
  - 1. Use form and method acceptable to Engineer for requesting interpretations.
  - 2. Engineer may respond with a direct answer on the Request for Interpretation form, or within the project management website used for submittals and RFIs according to Section 01 33 00, SUBMITTAL PROCEDURES.

#### 1.3 FIELD ORDERS

- A. Engineer will advise of minor changes in the Work not involving adjustment to Contract Price or Contract Time by issuing supplemental instructions on EJCDC C-942 or other similar form.
- B. Contractor shall acknowledge receipt by signing and returning one electronic copy to Engineer.

#### 1.4 CHANGE PROPOSALS

- A. Engineer may, in anticipation of ordering a revision to the Work, issue to the Contractor a Proposal Request including a detailed description and/or supplementary drawings and specifications.
- B. Proposal Requests are not instructions either to stop work in progress or to execute the proposed change.
- C. Contractor will prepare and submit, within 10 days, a detailed response to the Proposal Request with a detailed breakdown of proposed change in Contract Price and Contract Time. The proposed change in cost and time shall remain firm for a minimum period of 30 days after receipt by Engineer or Owner.
- D. Contractor may submit a Change Proposal to the Engineer without receipt of a Proposal Request, describing proposed change and its full effect on the Work. Include a statement describing reason for the change and the effect on Contract Price and Contract Time with full documentation and a statement describing effect on the Work by separate or other Contractors.

## 1.5 WORK CHANGE DIRECTIVES

- A. Work Directive Change: Engineer may issue directive, on EJCDC C-940 - Work Change Directive or similar form signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work and designate method of determining any change in Contract Price or Contract Time. A Work Change Directive is not a Change Order.
- B. Promptly execute the change described in the Work Change Directive.
- C. Contractor shall keep detailed records of work performed as a result of a Work Change Directive to substantiate resulting change in Contract Time or Contract Price. Detailed records may include but are not limited to the following:
  - 1. Date the work was performed.
  - 2. Parties performing the work.
  - 3. Time records, wage rates paid, and equipment rental rates.
  - 4. Invoices and receipts for materials, equipment, and subcontracts.

## 1.6 CHANGE ORDERS

- A. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- B. Change Order Forms: City of Tuscaloosa standard form.
- C. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation.
- D. Unit Price Change Order: For Contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of that which are not predetermined, execute Work under Work Directive Change. Changes in Contract Price or Contract Time will be computed as specified for Time and Material Change Order.
- E. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. Engineer will determine change allowable in Contract Price and Contract Time as provided in Contract Documents.
- F. Maintain detailed records of Work done on time and material basis. Provide full information required for evaluation of proposed changes and to substantiate costs for changes in the Work.
- G. Document each quotation for change in Project Cost or Time with sufficient data to allow evaluation of quotation.
- H. Correlation of Contractor Submittals:
  - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Price.
  - 2. Promptly revise Progress Schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of Work affected by the change and resubmit.
  - 3. Promptly enter changes in Record Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 30 00 - ADMINISTRATIVE REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Coordination and Project conditions.
  - 2. Requests for Information.
  - 3. Construction safety plan.
  - 4. Web-based project management software.
  - 5. Project meetings.

#### 1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordination Drawings
  - 1. Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
  - 2. Content shall be drawn to scale and large enough to indicate and resolve conflicts.
  - 3. Indicate functional and spatial relationships of architectural, structural, civil, mechanical, and electrical systems.
  - 4. Indicate space requirements for code or maintenance required clearances.
- E. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- F. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.
- H. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

#### 1.3 REQUESTS FOR INFORMATION

- A. Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.



- B. Coordinate and submit RFIs in a prompt manner to avoid delays in Work.
- C. RFI Content: Include detailed description of item needing information or interpretation and the following:
  - 1. Project name
  - 2. Owner name
  - 3. Owner project number
  - 4. Engineer name
  - 5. Engineer project number
  - 6. Date
  - 7. Contractor name
  - 8. RFI number
  - 9. RFI subject
  - 10. Specification section number, title, and related paragraphs, as appropriate
  - 11. Drawing number and detail references, as appropriate
  - 12. Field dimensions and pictures, as appropriate
  - 13. Contractor suggested resolution. If suggested resolution impacts Contract Time or Contract Price, it shall be explicitly stated in the RFI.
- D. Engineer will review and response to RFIs. Incomplete, inaccurate, or frivolous RFIs will be returned without response.
- E. Engineer's response may result in a change to the Contract Time or Contract Price. If Contractor believes response warrants this change, notify the Engineer in writing no more than 5 days from receipt of RFI response, and submit Change Proposal according to Section 01 26 00, CONTRACT MODIFICATION PROCEDURES.
- F. RFI shall be submitted through the web-based project management software system.

#### 1.4 CONSTRUCTION SAFETY PLAN

- A. Detail the methods and procedures to comply with federal, state, and local health and safety laws, rules, and requirements for the duration of the Contract Times. Include the following:
  - 1. Identification of the Certified or Licensed Safety Consultant, who will prepare, initiate, maintain, and supervise safety programs, and procedures.
  - 2. Procedures for providing workers with an awareness of safety and health hazards expected to be encountered during construction.
  - 3. Safety equipment appropriate to the safety and health hazards expected to be encountered during construction. Include warning devices, barricades, safety equipment in public right-of-way and protected areas, and safety equipment used in multi-level structures.
  - 4. Methods for minimizing employees' exposure to safety and health hazards expected during construction.
  - 5. Procedures for reporting safety or health hazards.
  - 6. Procedures to follow to correct a recognized safety and health hazard.
  - 7. Procedures for investigation of accidents, injuries, illnesses, and unusual events that have occurred at the construction site.
  - 8. Periodic and scheduled inspections of general work areas and specific workstations.
  - 9. Training for employees and workers at the jobsite.
  - 10. Methods of communication of safe working conditions, work practices and required personal protection equipment.
- B. Assume responsibility for every aspect of health and safety on the jobsite, including the health and safety of subcontractors, suppliers, and other persons on the jobsite:
  - 1. Forward available information and reports to the Safety Consultant who shall make the necessary recommendations concerning worker health and safety at the jobsite.

2. Employ additional health and safety measures specified by the Safety Consultant, as necessary, for workers in accordance with OSHA guidelines.
- C. Transmit to Owner and Engineer copies of reports and other documents related to accidents or injuries encountered during construction.

#### 1.5 WEB-BASED PROJECT MANAGEMENT SOFTWARE PACKAGE

- A. Web-Based Project Management Software Package: Use Engineer's Newforma web-based Project management software package for purposes of hosting and managing Project communication and documentation until final completion.
1. Web-based Project management software includes, at a minimum, the following features:
    - a. Compilation of Project data, including Contractor, Subcontractors, Engineer, Engineer's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    - c. Document workflow planning, allowing customization of workflow among Project entities.
    - d. Create, log, track, and notify Project members of Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, minor changes in the Work, Construction Change Directives, and Change Orders.
    - e. Track status of each Project communication in real time, and log time and date when responses are provided.
    - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    - g. Process and track payment applications.
    - h. Process and track contract modifications.
    - i. Create and distribute meeting minutes.
    - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    - k. Management of construction progress photographs.
    - l. Mobile device compatibility, including smartphones and tablets.

#### 1.6 DIGITAL PROJECT DATA LICENSING

- A. Engineer's Data Files Not Available: Engineer will not provide Engineer's BIM model or CAD drawing digital data files for Contractor's use during construction.

#### 1.7 PRECONSTRUCTION MEETING

- A. Engineer will schedule a preconstruction meeting at a mutually agreeable time after Notice of Award.
- B. Attendance Required: Engineer, Owner, Resident Project Representative, any appropriate governmental agency representatives, major Subcontractors, Contractor, and others necessary to agenda.
- C. Minimum Agenda: Attendees shall be prepared to discuss the following:
1. Execution of Owner-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Distribution of Contract Documents.
  4. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
  5. Designation of personnel representing parties in Contract, and Engineer.

6. Communication procedures.
7. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
8. Scheduling.
9. Critical Work sequencing.
10. Scheduling activities of Surveyors.
11. Construction waste management plan.
12. Safety plan.
13. Use of premises by Owner and Contractor.
14. Owner's requirements and partial occupancy.
15. Construction facilities and controls provided by Owner.
16. Temporary utilities provided by Owner.
17. Survey and building layout.
18. Security and housekeeping procedures.
19. Procedures for testing.
20. Procedures for maintaining record documents.
21. Requirements for startup of equipment.
22. Inspection and acceptance of equipment put into service during construction period

- D. Engineer: Will preside over meeting and record minutes and distribute copies to participants, with one electronic copy each to Engineer, Owner, Contractor, and those affected by decisions made.

#### 1.8 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at weekly intervals. Meetings to take place in Contractor's field office, Engineer's field office, or mutually agreed upon place.
- B. Contractor will make arrangements for meetings and prepare agenda with copies for participants.
- C. Attendance Required: Job superintendent, major Subcontractors, Contractors and suppliers, and Engineer and Owner as appropriate to agenda topics for each meeting.
- D. Minimum Agenda:
  1. Review minutes of previous meetings.
  2. Review of Work progress.
  3. Field observations, problems, and decisions.
  4. Identification of problems impeding planned progress.
  5. Review of submittal schedule and status of submittals.
  6. Review of off-Site fabrication and delivery schedules.
  7. Maintenance of Progress Schedule.
  8. Corrective measures to regain projected schedules.
  9. Planned progress during succeeding work period.
  10. Coordination of projected progress.
  11. Maintenance of quality and work standards.
  12. Effect of proposed changes on Progress Schedule and coordination.
  13. Other business relating to Work.
- E. Contractor: Record minutes and distribute copies to participants within seven days after meeting, with one electronic copy each to Engineer, Owner, and those affected by decisions made.

#### 1.9 PREINSTALLATION MEETINGS

- A. Scheduled by Contractor on a regular basis and as necessary to coordinate with manufacturers and installers before starting Work of major units of construction.

- B. Require attendance of parties directly affecting, or affected by, the Work.
- C. Notify Engineer and subcontractors seven days in advance of meeting date.
- D. Prepare agenda and preside over meeting:
  1. Review conditions of installation, preparation, and installation procedures.
  2. Review coordination with related Work.
- E. Record minutes and distribute copies to participants within three days after meeting, with an electronic copy each to Engineer, Owner, and those affected by decisions made.

#### 1.10 FACILITY STARTUP MEETINGS

- A. Schedule and preside over facility startup meetings prior to startup and testing of major process equipment. Prepare a facility startup plan for each process facility as specified in Section 01 75 00, STARTUP TESTING AND TRAINING.
- B. Agenda shall include discussion of the facility startup plan including coordination needed between various parties and identified risks with proposed mitigation action plan.
- C. Attendees will include Contractor, Engineer's representative, Owner, subcontractors and equipment manufacturers, and others deemed necessary.

#### 1.11 CLOSEOUT MEETING

- A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor, major Subcontractors, Engineer, Owner, and others appropriate to agenda.
- C. Notify Engineer seven days in advance of meeting date.
- D. Minimum Agenda:
  1. Start-up of facilities and systems.
  2. Operations and maintenance manuals.
  3. Testing, adjusting, and balancing.
  4. System demonstration and observation.
  5. Operation and maintenance instructions for Owner's personnel.
  6. Contractor's inspection of Work.
  7. Contractor's preparation of an initial "punch list."
  8. Procedure to request Engineer inspection to determine date of Substantial Completion.
  9. Completion time for correcting deficiencies.
  10. Inspections by authorities having jurisdiction.
  11. Certificate of Occupancy and transfer of insurance responsibilities.
  12. Partial release of retainage.
  13. Final cleaning.
  14. Preparation for final inspection.
  15. Closeout Submittals:
    - a. Project record documents.
    - b. Operating and maintenance documents.
    - c. Operating and maintenance materials.
    - d. Affidavits.
  16. Final Application for Payment.
  17. Contractor's demobilization of Site.

18. Maintenance.

- E. Record minutes and distribute copies to participants within two days after meeting, with one electronic copy each to Engineer, Owner, Construction Manager, and those affected by decisions made.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 32 16 - CONSTRUCTION PROGRESS SCHEDULE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Project schedules.
  - 2. Review and evaluation.
  - 3. Updating schedules.
  - 4. Adjustment of Contract Times

#### 1.2 QUALITY ASSURANCE

- A. The Contractor shall provide a schedule for the project based on the Critical Path Method (CPM).
- B. Scheduler: Contractor's personnel specializing in CPM scheduling with two years' minimum experience in scheduling construction work of complexity comparable to the Project and having use of computer facilities capable of delivering detailed graphic printout within 48 hours of request.
- C. Software: Prepare computerized schedule using Primavera or Microsoft Project, most current versions. Provide one licensed copy of the software to the Engineer for the duration of the project.
- D. Make all schedule submittals as electronic files using the web-based project management software specified in Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.

#### 1.3 PRELIMINARY SCHEDULE

- A. Within 10 days after date of Owner-Contractor Agreement, and at least seven days prior to the preconstruction meeting, submit proposed preliminary schedule in Gantt chart format defining planned operations for first 60 days of Work, with general outline for remainder of Work. Work activities depicted on the schedule shall include, but are not limited to:
  - 1. Notice to Proceed
  - 2. Permits
  - 3. Submittals
  - 4. Early procurement activities
  - 5. Site work
  - 6. Work sequences
  - 7. Contract milestones and completion dates
  - 8. Major facility Work
  - 9. System start-up summary
  - 10. Project close-out summary
- B. Preliminary schedule shall be accompanied by a list of all shop drawings and submittals anticipated for the project. Acceptance of submittal schedule is required for payment application approval.
- C. Participate in review of preliminary schedule jointly with Engineer within ten calendar days of submission.
- D. Within 20 days after joint review of proposed preliminary schedule, submit draft of proposed complete schedule for review. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.

- E. An accepted preliminary schedule, in conjunction with the schedule of values specified in Section 01 20 00, PRICE AND PAYMENT PROCEDURES, shall be the basis for progress payments for the first 60 days of Work. The preliminary schedule shall be updated monthly until the complete project schedule is approved.

#### 1.4 COMPLETE SCHEDULE

- A. Within 45 days after Notice of Award, submit complete cost loaded schedule using the Critical Path Method (CPM). The complete schedule shall show sequence and interdependence of all activities required for complete performance of all work, beginning with date of Notice to Proceed and concluding with date of final completion of Contract. Schedule shall be in Gantt Chart format.
- B. Acceptance of the complete schedule is required for payment application approval after the first 60 days of Work.
- C. Submit updated schedules every 30 days, as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the schedule is updated in a manner acceptable to Engineer.

#### 1.5 COMPLETE SCHEDULE FORMAT

- A. Provide a clear, legible, and accurate time-scaled logic diagram in Gantt chart format, indicating interdependence of activities and critical paths for the project.
- B. In addition to native electronic file format, provide electronic PDF version in 22" x 34" drawing size.
- C. Illustrate order and interdependence of activities and sequence of Work; how start of given activity depends on completion of preceding activities, and how completion of activity may restrain start of subsequent activities.
- D. Illustrate complete sequence of construction by activity, identifying Work of separate stages. Indicate dates for submittals, including dates for Owner-furnished items, and return of submittals; dates for procurement and delivery of critical products; and dates for installation and provision for testing. Include legend for symbols and abbreviations used.
- E. Complete schedule shall include all Work activities with the potential to delay project construction, including construction activity, procurement and submittal review activity, Owner activities, startup activities, and closeout activities.
- F. Schedules shall include provisions for Weather Days as defined in the Contract Documents.
- G. No activity, exclusive of submittal reviews and equipment lead times, shall have a duration longer than 15 days.
- H. At a minimum identify the execution of the following, omitting items not applicable to Work:
  - 1. Obtaining permits.
  - 2. Mobilization.
  - 3. Site work.
  - 4. Submittal reviews.
  - 5. Equipment lead times.
  - 6. Excavation and shoring.
  - 7. Dewatering.
  - 8. Concrete work, including installation of forms and reinforcement, placement of concrete, curing, finishing, and patching.

9. Tests for leakage of concrete structures intended to hold water.
  10. Structural steel work.
  11. Masonry work.
  12. Framing work.
  13. Finish carpentry work.
  14. Architectural work.
  15. Process equipment including pumps, conveyors, etc.
  16. Building specialties.
  17. Process mechanical work including pipes, valves, gates, etc.
  18. Building mechanical work including HVAC and plumbing.
  19. Electrical work.
  20. Instrumentation and Control work.
  21. Grading and paving.
  22. Fencing and landscaping.
  23. Testing and startup.
  24. Project close-out.
- I. Include the following information for each Work activity identified in the schedule:
1. Preceding and following event numbers.
  2. Activity description.
  3. Estimated duration of activity, in maximum 15-day intervals. Status of critical activities.
  4. Earliest start date.
  5. Earliest finish date.
  6. Actual start date.
  7. Actual finish date.
  8. Latest start date.
  9. Latest finish date.
  10. Total and free float.
  11. Monetary value of activity, keyed to Schedule of Values.
  12. Percentage of activity completed.
  13. Responsibility.
- J. Required Sorts: List activities in sorts or groups:
1. By preceding Work item or event number from lowest to highest.
  2. By longest float, then in order of early start.
  3. By responsibility in order of earliest possible start date.
  4. In order of latest allowable start dates.
  5. In order of latest allowable finish dates.
  6. Contractor's periodic payment request sorted by Schedule of Values list.
  7. List of basic input data-generating report.
  8. List of activities on critical path.
- K. Prepare sub-schedules for each stage of Work and Sequencing of Construction Plan identified in Section 01 14 00, WORK RESTRICTIONS.
- L. Cost Loading
1. Coordinate contents with Schedule of Values in Section 01 20 00, PRICE AND PAYMENT PROCEDURES.
  2. The sum of all activity costs shall equal the Contract Price.
- M. Produce a Summary Schedule alongside each updated Complete Schedule with consolidated groups of activities associated with major items of Work, intended to give an overall indication of the project schedule.



## 1.6 REVIEW AND EVALUATION

- A. Participate in joint review and evaluation of schedules with Engineer at each submittal.
- B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.
- C. After reviews, revise schedules incorporating results of review, and resubmit within 10 days.
- D. When schedule reflects Owner's and Contractor's agreement of project approach and sequence, schedule will be accepted by Owner. Use accepted schedule for planning, organizing, directing Work, and reporting progress.
- E. Engineer's acceptance of schedule will not make any change in Contract requirements. Schedule remains the Contractor's responsibility and Contractor retains responsibility for performing all activities, activity durations, and sequences required to perform the Work in accordance with the Contract Documents.

## 1.7 UPDATING SCHEDULES

- A. Schedule Updates:
  - 1. Overall percent complete, projected and actual.
  - 2. Completion progress by listed activity and sub-activity, to within five working days prior to submittal.
  - 3. Changes in Work scope and activities modified since submittal.
  - 4. Delays in submittals or resubmittals, deliveries, or Work.
  - 5. Adjusted or modified sequences of Work.
  - 6. Other identifiable changes.
  - 7. Revised projections of progress and completion.
- B. Narrative Progress Report:
  - 1. Submit with each monthly submission of Progress Schedule.
  - 2. Summary of Work completed during the past period between reports.
  - 3. Work planned during the next period.
  - 4. Explanation of differences between summary of Work completed and Work planned in previously submitted report.
  - 5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.
  - 6. Corrective action taken or proposed.
- C. Maintain schedules to record actual start and finish dates of completed activities.
- D. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.
- E. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- F. Upon approval of a Change Order, include the change in the next schedule submittal.
- G. Indicate changes required to maintain Date of Substantial Completion.
- H. Submit sorts as required to support recommended changes.

- I. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect including effects of changes on schedules of separate Contractors, if applicable.

## 1.8 ADJUSTMENT OF CONTRACT TIMES

- A. Contract time will be adjusted only for causes specified in Contract Documents. Reference the City of Tuscaloosa Contract Documents and Section 01 26 00, CONTRACT MODIFICATION PROCEDURES.
- B. Project delays are defined in the following categories:
  - 1. Non-excusable Delay: Actions or inactions of the Contractor, or events for which the Contractor has assumed contractual responsibility (including actions or inactions of subcontractors or suppliers) which would independently delay the completion of the Work beyond the current Contract completion date shall be designated as non-excusable delay. The Contractor shall not receive any time extension for such delays.
  - 2. Excusable Delay: Events which are unforeseeable, outside the control of, and without the fault or negligence of either the Owner or the Contractor (or any party for whom either is responsible), which would independently delay the completion of the Work beyond the current Contract completion date shall be designated as excusable delay. The Contractor is entitled to a time extension only and shall not receive any other damages.
  - 3. Compensable Delay: Actions or inactions of the Owner, or events for which the Owner has assumed contractual responsibility, which would independently delay the completion of the Work beyond the current Contract completion date shall be designated as compensable delay. The Contractor is entitled to a time extension and delay damages.
  - 4. Concurrent Delay: Concurrent delay is any combination of the above three types of delay occurring on the same calendar date(s), except in cases where the combination consists of two or more instances of the same type of delay occurring on the same calendar date(s). When one cause of delay is Owner-caused or caused by an event which is beyond the control and without the fault or negligence of either the Owner or the Contractor and the other Contractor-caused, the Contractor is entitled only to a time extension and no delay damages.
- C. If the Contractor believes that the Owner has impacted its work, such that the project completion date will be delayed, the Contractor must submit proof demonstrating the delay to the critical path. This proof, in the form of a Time Impact Analysis, may entitle the Contractor to an adjustment of Contract Time.
- D. Time Impact Analysis:
  - 1. The Time Impact Analysis submitted by the Contractor shall utilize the accepted schedule update that is current relative to the time frame of the delay event (change order, third party delay, or other Owner-caused delay). The Contractor shall represent the delay event in the schedule by 1) inserting new activities associated with the delay event into the schedule, 2) revising activity logic, or 3) revising activity durations.
  - 2. If the project schedule's critical path and completion date are impacted as a result of adding this delay event to the schedule, a time extension equal to the magnitude of the impact may be warranted.
  - 3. The Time Impact Analysis submittal shall consist of 1) a fragment of the portion of the schedule affected by the delay event, 2) a narrative explanation of the delay issue and how it impacted the schedule.
- E. When a delay to the project as a whole can be avoided by revising preferential sequencing or logic, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension and no compensation for extended overhead.

- F. Indicate clearly that the Contractor has used, in full, all project float available for the work involved in the request, including any float that may exist between the Contractor's planned completion date and the Contract completion date. Utilize the latest version of the Schedule Update accepted at the time of the alleged delay, and all other relevant information, to determine the adjustment of the Contract Time.
  
- G. Float shall be for the mutual benefit of the Owner and the Contractor. Adjustment of the Contract Times will be granted only when the Contract Float has been fully utilized and only when the revised date of completion of the Work has been pushed beyond the contract completion date. Adjustment of the Contract Times will be made only for the number of days that the planned completion of the work has been extended.
  - 1. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.
  - 2. Use of float suppression techniques, such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited. Use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of Owner and Contractor.
  - 3. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs, which:
    - a. Impacts Project's critical path,
    - b. Consumes all available float or contingency time, and
    - c. Extends Work beyond contract completion date.
  
- H. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond the Contract completion date will not be the basis for an adjustment to the contract time.
  
- I. The new Progress Schedule data, if accepted by the Owner, shall be included in the next monthly Schedule Update.
  
- J. When the Owner has not yet made a final determination as to the adjustment of the Contract Time, and the parties are unable to agree as to the amount of the adjustment to be reflected in the Progress Schedule, reflect an interim adjustment as acceptable to Engineer. It is understood and agreed that any such interim acceptance by the Engineer shall not be binding and shall be made only for the purpose of continuing to schedule the Work, until such time as a final determination as to any adjustment of the Contract Time acceptable to the Engineer has been made. Revise the Progress Schedule prepared thereafter in accordance with the final decision.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 32 33 – PHOTOGRAPHIC DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Preconstruction photos
  - 2. Periodic construction progress photos
  - 3. Post construction photos
  - 4. Video recordings
- B. Related Sections:
  - 1. Section 01 75 00 – Startup Testing and Training.

#### 1.2 SUBMITTALS

- A. Digital Photographs
  - 1. Submit construction progress image files monthly along with Application for Payment. Files shall be uploaded to web-based project management software.
  - 2. Contractor shall prepare, update, and submit a log of photos with each submittal of photos. Log shall historically track the submittal of photos in reverse order, i.e. most recent photos being first in the log. The log shall document the following information:
    - a. Identify each photo for topic of discussion. Identify name of Project, Contract number, phase, orientation of view, date and time of view, name and organization of photographer.
  - 3. Deliver complete set of digital image electronic files on CD, DVD, or USB flash drive to Owner with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.
- B. Video Recordings
  - 1. Submit video recordings to web-based project management software, and on USB flash drive.
  - 2. Project Video Log: Maintain an ongoing log that incorporates date of coverage in year-month-day-time format followed by a short description of video coverage.

#### 1.3 PHOTOGRAPH REQUIREMENTS

- A. Provide photographs in digital format of Site and construction throughout progress of Work produced by an experienced photographer acceptable to Engineer.
  - 1. Digital Images: JPG format, produced by digital camera with minimum sensor size of 12 megapixels, image resolution of not less than 3200 x 2400 pixels, and image stabilization technology. Compression shall be set to preserve quality over file size. Resizing to a smaller size when high resolution JPGs are available shall not be permitted.
  - 2. Submit digital media as originally recorded without alternation, manipulation, or modification using image-editing software.
  - 3. File Naming: Include date and time in filename for each image, as well as item being photographed and orientation of photo. Keep file naming convention consistent for all digital photographs.
- B. Preconstruction Photographs
  - 1. Before commencement of the Work, take photographs of Project Site and surrounding properties, including existing items to remain during construction, from different vantage points.

2. Take a minimum of 20 site photographs from different directions and 20 interior photographs of each building or structure to capture existing conditions. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

C. Concealed Work Photographs

1. Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed work including, but not limited to, the following:
  - a. Underground utilities
  - b. Underslab services
  - c. Piping
  - d. Electrical conduit
  - e. Waterproofing barriers

D. Periodic Progress Photographs

1. Photographically demonstrate progress of construction, taking photographs as frequent as required to document all major aspects of construction, but not less than once per week.
2. At a minimum, take 10 Site photographs from different directions and 20 interior photographs of all work areas indicating relative progress of the Work.

E. Post Construction Photographs

1. Upon completion of the Work, take a minimum of 20 photographs of Project Site and surrounding properties from different vantage points.
2. Take a minimum of 20 photographs of each new building or structure.

1.4 AUDIO-VIDEO RECORDINGS

- A. Prior to beginning Work on Construction Site or of a particular area of the Work, and again within 10 days following date of Substantial Completion, video-graph Construction Site and property adjacent to Construction Site.

- B. In the case of preconstruction recording, no Work shall begin in the area prior to Engineer's review and approval of content and quality of video for that area.

- C. Particular emphasis shall be directed to physical condition of existing vegetation, structures, and pavements within Construction Site and areas adjacent to and within the right-of-way or easement, and on Contractor storage and staging areas.

- D. Engineer shall have right to select subject matter and vantage point from which videos are to be taken.

E. Video Format and Quality:

1. Produce bright, sharp, and clear images with accurate colors, free of distortion and other forms of picture imperfections. Make sure sound is clear and free of distortion.
2. Electronically, and accurately display the month, day, year, and time of day of the recording.
3. Audio documentation shall be done clearly, precisely, and at a moderate pace.
4. Indicate date, project name, and a brief description of the location of taping, including:
  - a. Facility name.
  - b. Street names or easements.
  - c. Addresses of private property.
  - d. Direction of coverage, including engineering stationing, if applicable.
5. Electronic File Name:

- a. Date of coverage in year-month-day-time format followed by a short description of video coverage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Definitions.
  - 2. Submittal procedures.
  - 3. Proposed product list.
  - 4. Product data.
  - 5. Shop Drawings.
  - 6. Samples.
  - 7. Other submittals.
  - 8. Design data.
  - 9. Test reports.
  - 10. Certificates.
  - 11. Manufacturer's instructions.
  - 12. Manufacturer's field reports.
  - 13. Erection Drawings.
  - 14. Contractor review.
  - 15. Engineer review.

#### 1.2 DEFINITIONS

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

#### 1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer-accepted form. Package submittal information by individual specification section. Do not combine different specification sections together in submittal package, unless otherwise directed in specification.
- B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- C. Identify: Project (Engineer's project number and title), Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.
- D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite Project and post electronic submittals as PDF electronic files to web based project management software. Coordinate submission of related items.
- F. For each submittal for review, allow 30 days excluding delivery time to and from Contractor.
- G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

- H. Allow space on submittals for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized nor processed.
- L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

#### 1.4 PROPOSED PRODUCT LIST

- A. Within 15 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

#### 1.5 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Post electronic submittals as PDF electronic files to web-based project management software.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 77 00, CLOSEOUT PROCEDURES.

#### 1.6 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
  1. Include signed and sealed calculations to support design.
  2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
  3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Post electronic submittals as PDF electronic files to web based project management software.



- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 77 00, CLOSEOUT PROCEDURES.

#### 1.7 SAMPLES

- A. Samples: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:
  - 1. Submit to Engineer for aesthetic, color, and finish selection.
  - 2. Submit Samples of finishes, textures, and patterns for Engineer selection.
- C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.
- D. Include identification on each Sample, with full Project information.
- E. Submit number of Samples specified in individual Specification Sections; Engineer or Owner will retain one Sample.
- F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.
- G. Samples will not be used for testing purposes unless specifically stated in Specification Section.
- H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 77 00, CLOSEOUT PROCEDURES.

#### 1.8 OTHER SUBMITTALS

- A. Closeout Submittals: Comply with Section 01 77 00, CLOSEOUT PROCEDURES.
- B. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.
- C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.9 TEST REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.10 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

- C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

#### 1.11 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

#### 1.12 MANUFACTURER'S FIELD REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit report in duplicate and in electronic format (pdf) within 5 days of observation to Engineer for information.
- C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.13 ERECTION DRAWINGS

- A. Informational Submittal: Submit Drawings for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

#### 1.14 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.
- B. Contractor: Responsible for:
  1. Determination and verification of materials including manufacturer's catalog numbers.
  2. Determination and verification of field measurements and field construction criteria.
  3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
  4. Determination of accuracy and completeness of dimensions and quantities.
  5. Confirmation and coordination of dimensions and field conditions at Site.
  6. Construction means, techniques, sequences, and procedures.
  7. Safety precautions.
  8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

#### 1.15 ENGINEER REVIEW

- A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner, Contractor, and Construction Manager.
- B. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.
- C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order or Work Change Directive.
- E. Action Submittal Dispositions: Engineer will review, mark-up, stamp as appropriate, and distribute marked-up electronic copies to appropriate parties as noted:
  - 1. Furnish as Submitted:
    - a. Contractor may incorporate product(s) or implement Work covered by submittal.
  - 2. Furnish as Corrected or Noted:
    - a. Contractor may incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
  - 3. Revise and Resubmit:
    - a. Make corrections or obtain missing portions and resubmit.
  - 4. Partial Resubmittal:
    - a. Except for portions indicated, Contractor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with Engineer's notations.
  - 5. Rejected:
    - a. Contractor may not incorporate product(s) or implement Work covered by submittal.
- F. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

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:
  - 1. Quality control.
  - 2. Tolerances.
  - 3. References.
  - 4. Delegated Design Services.
  - 5. Conflicting Requirements.
  - 6. Labeling.
  - 7. Mockup requirements.
  - 8. Testing and inspection services.
  - 9. Manufacturers' field services.
  
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.
  
- B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
  
- C. Perform Work using persons qualified to produce required and specified quality.
  
- D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.
  
- E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

#### 1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### 1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.
- B. Dating of reference standards may conflict with applicable building codes that reference standards with established dates. Therefore, individual SpecText Sections do not date reference standards, but rely on the first Paragraph below for applicable date of issue. Conversely, some products may be tested to specifically dated standards.
- C. Conform to reference standard by date of issue current as of date for receiving Bids except where specific date is established by code.
- D. Obtain copies of standards and maintain on Site when required by product Specification Sections.
- E. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- F. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

#### 1.5 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional licensed in the state of Work, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

#### 1.6 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Engineer regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Engineer for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is 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. Refer uncertainties to Engineer for a decision before proceeding.

## 1.7 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
  - 1. Model number.
  - 2. Serial number.
  - 3. Performance characteristics.
- C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

## 1.8 MOCK-UP REQUIREMENTS

- A. Use this Article for full-size assemblies for review of construction or for assemblies requiring esthetic review or coordination of several Sections of the Work. An example is a glazed wall, adjacent solid wall, and perimeter construction, which may require testing or assessment for quality of Work.
- B. A mockup can also be used to educate and inform installers as to detailed relationship and connections between adjoining and adjacent products as mockup is being assembled or constructed.
- C. Individual Specification Sections should specify mockup size and requirements for performance testing such as air or water infiltration or the operation of the item.
- D. Tests will be performed under provisions identified in this Section and identified in individual product Specification Sections.
- E. Assemble and erect specified or indicated items with specified or indicated attachment and anchorage devices, flashings, seals, and finishes.
- F. Accepted mockups shall be comparison standard for remaining Work.
- G. Where mockup has been accepted by Engineer and is specified in product Specification Sections to be removed, remove mockup and clear area when directed to do so by Engineer.

## 1.9 QUALIFICATIONS

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.
  - 1. Requirements of authorities having jurisdiction supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

#### 1.10 OWNER'S REPRESENTATIVE

- A. Owner's project representative employed or retained by the Owner is authorized to inspect the Work in determining when the Work is faulty, defective, damaged, or does not conform to Contract Documents. Deficiencies or defects in the Work which have been observed will be called to the Contractor's attention.
- B. Owner's representative will not:
  - 1. Alter or waive provisions of the Contract.
  - 2. Inspect Contractor's means or methods of construction.
  - 3. Accept portions of the Work.
  - 4. Supervise, control, or direct Contractor's safety programs.

#### 1.11 CONTRACTOR TESTING AND INSPECTION SERVICES

- A. Employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing and inspection as required in the Specification Sections for various work and materials.
  - 1. Before starting Work, submit testing laboratory name, address, and telephone number, and names of full-time Professional Engineer or specialist and responsible officer.

2. Submit copy of report of laboratory facilities' inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.
- B. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Engineer or Owner.
  - C. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
    1. Submit final report indicating correction of Work previously reported as noncompliant.
  - D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
    1. Provide Engineer and independent firm with ample notice before expected time for operations requiring services, no less than 48 hours.
    2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
  - E. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
  - F. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
  - G. Agency Responsibilities:
    1. Test Samples of mixes submitted by Contractor.
    2. Provide qualified personnel at Site. Cooperate with Engineer and Contractor in performance of services.
    3. Perform indicated sampling and testing of products according to specified standards.
    4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
    5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.
    6. Perform additional tests required by Engineer.
    7. Attend preconstruction meetings and progress meetings.
  - H. Agency Reports: After each test, promptly submit a copy of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results. Include the following:
    1. Date issued.
    2. Project title and number.
    3. Name of inspector.
    4. Date and time of sampling or inspection.
    5. Identification of product and Specification Section.
    6. Location in Project.
    7. Type of inspection or test.
    8. Date of test.
    9. Results of tests.
    10. Conformance with Contract Documents.
  - I. Limits on Testing Authority:
    1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
    2. Agency or laboratory may not approve or accept any portion of the Work.
    3. Agency or laboratory may not assume duties of Contractor.



4. Agency or laboratory has no authority to stop the Work.
  - a. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
5. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
6. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 1.12 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner may employ and pay for a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction, as defined in Chapter 17 of the International Building Code (IBC). These special tests and inspections are in addition to all other testing and inspection requirements.
- B. Contractor's Responsibilities: The Contractor shall assist the Owner's special tests and inspections by making available materials for testing, providing advanced notice of needed inspections, and providing sufficient time in project schedule for execution of Owner's special tests and inspections. The costs of these support activities are included in the Contract Price.
  1. Cooperate with Owner's independent testing firm or laboratory personnel and provide access to construction operations.
  2. Secure and deliver to Owner's independent testing firm or laboratory adequate quantities of representative samples to be used and which require testing.
  3. Provide to Owner's independent testing firm or laboratory preliminary mix design proposed to be used for concrete and other material mixes which require control by testing laboratory.
  4. Provide incidental labor and facilities:
    - a. To provide access to construction
    - b. To obtain and handle samples at Project Site or at source of product to be tested.
    - c. To facilitate tests and inspections.
    - d. For storage and curing of test samples.
  5. Notify Owner's independent testing firm or laboratory 48 hours in advance of when testing is needed for laboratory to schedule and perform services.
- C. Refer to Section 01 45 24, SPECIAL TESTS AND INSPECTIONS, for additional special test and inspection requirements.

#### 1.13 OWNER TESTING AND INSPECTION SERVICES

- A. Owner will employ and Contractor shall pay, from the contingency allowance, for services of an independent firm to perform testing and inspection as directed by the Owner or Engineer to confirm Contractor's compliance with Contract Documents. Owner tests and inspections paid for by the contingency allowance are solely at the discretion of the Owner and Engineer, to confirm results of Contractor's independent testing and inspections. They are not for the Contractor's use to fulfill the testing and inspection requirements of the Contract Documents.
- B. Contractor's Responsibilities: The Contractor shall assist the Owner's special tests and inspections in the same manner as defined in "Special Tests and Inspections" Article of this Specification. The costs of these requirements are included in the Contract Price.

1.14 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, and commissioning as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of staff 30 days in advance of required observations. Observer is subject to approval of Engineer or Owner.
- C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 01 33 00, SUBMITTAL PROCEDURES, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 45 24 – SPECIAL TESTS AND INSPECTIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes: This Section describes the requirements of the Contractor to support special tests and inspections performed by the Owner's special inspector and testing laboratory as required by Chapter 17 of the International Building Code (IBC). The Contractor does not perform the tests and inspections described within this section, unless specifically directed to do so by another specification section included in the Contract Documents.
- B. Related sections:
  - 1. Section 01 40 00 – Quality Control.

#### 1.2 REFERENCES

- A. ASTM International (ASTM):
  - 1. ASTM C140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
  - 2. ASTM C270, Standard Specification for Mortar for Unit Masonry.
  - 3. ASTM C780, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
  - 4. ASTM C1019, Standard Test Method for Sampling and Testing Grout.
  - 5. ASTM C1314, Standard Test Method for Compressive Strength of Masonry Prisms.
- B. International Building Code (IBC).

#### 1.3 DESCRIPTION

- A. This Section describes special tests and inspections of structural assemblies and components to be performed in compliance with IBC. The Owner will employ one or more inspectors who will provide special inspections during construction.
- B. The Contractor shall support special tests and inspections as required by this document.

#### 1.4 INSPECTION

- A. Make available all Work required for inspection by the Owner's Special Inspector. Duties of the Special Inspector are described in the IBC.

#### 1.5 SPECIAL TESTING AND INSPECTIONS

- A. Selection of the material required to be tested shall be by the Owner's testing laboratory and not the Contractor. Special tests will be performed by the Owner's testing laboratory.
- B. Owner reserves the right to positive material identification tests.
  - 1. Contractor must make materials available for testing.
- C. The following types of work require special inspection or testing as described in IBC. Refer to the following verification, testing and inspection schedules.
  - 1. Appendix A, Cast-In-Place Concrete Special Inspection Schedule.
  - 2. Appendix B, Essential Architectural, Mechanical and Electrical Inspection Schedule.
  - 3. Appendix C, Essential Masonry Special Inspection Schedule.
  - 4. Appendix D, Soils Verification and Inspection Schedule.

5. Appendix E, Structural Steel Special Inspection Schedule.
6. Appendix F. Other Special Inspection.

#### 1.6 OTHER SPECIFIC TESTS

- A. Masonry shall be tested in accordance with IBC.
  1. Minimum strength of units shall be tested in accordance with ASTM C140.
  2. Minimum strength of grout shall be tested in accordance with ASTM C1019.
  3. Prior to construction, obtain samples of the aggregates, additives, and water; mix and test in laboratory in accordance with ASTM C270.
  4. During construction, sample and test masonry for consistency prior to use on each structure in accordance with ASTM C780.
  5. When approved by the building official, if installed masonry does not meet requirements, conduct prism tests in accordance with ASTM C1314.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.1 SCHEDULE

- A. The Contractor shall allow time necessary for Special Inspections as listed above.
- B. Sufficient notice shall be given so that the Special Inspections can be performed. This includes time for off-site Special Inspectors to plan the inspection and travel to site.

##### 3.2 PROCEDURE

- A. The Special Inspector will immediately notify the Engineer, Owner, and Contractor of any corrections required and follow notification with appropriate documentation.
- B. The Contractor shall take corrective actions based on Special Inspector's findings and recommendations at no additional cost to the Owner.
- C. The Contractor shall not proceed until the Work is satisfactory to the Special Inspector, Owner, and Engineer.

END OF SECTION

**APPENDIX A  
CAST-IN-PLACE CONCRETE SPECIAL INSPECTION SCHEDULE**

<b>Verification and Inspection</b>	<b>Reference Standard</b>	<b>Frequency of Inspection</b>	
		<b>Continuous During Task Listed</b>	<b>Periodic During Task Listed</b>
1. Inspection of reinforcing steel, including prestressing tendons, and placement.		–	X
2. Inspection of reinforcing steel welding.	IBC Table 1704.3, Item 5B	X	–
3. Inspect bolts to be installed in concrete prior to and during placement of concrete.		X	–
4. Verifying use of required design mix.		–	X
5. At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.		X	–
6. Inspection of concrete and shotcrete placement for proper application techniques.		X	–
7. Inspection for maintenance of specified curing temperature and techniques.		–	X

**APPENDIX B  
ESSENTIAL ARCHITECTURAL, MECHANICAL AND ELECTRICAL  
INSPECTION SCHEDULE**

Verification and Inspection	Reference Standard	Frequency of Inspection	
		Continuous During Task Listed	Periodic During Task Listed
1. Suspended ceiling system including anchorage.		–	X
2. Anchorage of electrical equipment for emergency standby power.		–	X
3. Anchorage of other electrical or mechanical equipment on floors or roofs.		–	X
4. Anchorage of ducts.		–	X
5. Anchorage of pipes.		–	X
6. Steel storage racks supporting pipelines.		–	X
7. Elevator installation.		–	X

**APPENDIX C  
ESSENTIAL MASONRY SPECIAL INSPECTION SCHEDULE**

Verification and Inspection	Reference Standard	Frequency of Inspection	
		Continuous During Task Listed	Periodic During Task Listed
1. From the beginning of masonry construction, the following shall be verified for compliance:			
a. Proportions of site-prepared mortar and grout.		–	X
b. Placement of masonry units and construction of mortar joints.		–	X
c. Placement of reinforcement and connectors.		–	X
d. Grout space prior to grouting.		X	–
e. Placement of grout.		X	–
2. The inspection program shall verify:			
a. Size and location of structural elements.		–	X
b. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames or other construction.		X	–
c. Specified size, grade and type of reinforcement.			X
d. Welding of reinforcing couplers.		X	–
e. Protection of masonry during cold weather (temperature below 40° F) or hot weather (temperature above 90° F).		–	X
3. Preparation of any required grout specimens, mortar specimens and/or prisms shall be observed.		X	–
4. Compliance with required inspection provisions of the construction documents and the approved submittals shall be verified.		–	X

**APPENDIX D  
SOILS VERIFICATION AND INSPECTION SCHEDULE**

<b>Verification and Inspection</b>	<b>Reference Standard</b>	<b>Frequency of Inspection</b>	
		<b>Continuous During Task Listed</b>	<b>Periodic During Task Listed</b>
1. Verify materials below footings are adequate to achieve the design bearing capacity.		–	X
2. Verify excavations are extended to proper depth and have reached proper material.		–	X
3. Perform classification and testing of controlled fill materials.		–	X
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of controlled fill.		X	–
5. Prior to placement of controlled fill, observe subgrade and verify that site has been prepared properly.		–	X



**APPENDIX E  
STRUCTURAL STEEL SPECIAL INSPECTION SCHEDULE**

Verification and Inspection	Reference Standard	Frequency of Inspection	
		Continuous During Task Listed	Periodic During Task Listed
1. Verify materials below footings are adequate to achieve the design bearing capacity.			
a. Identification markings to conform to ASTM standards specified in the approved construction documents.		–	X
b. Manufacturer's certificate of compliance required.		–	X
2. Inspection of high-strength bolting:			
a. Bearing-type connections.		–	X
b. Slip-critical connections.		X	X
3. Material verification of structural steel:			
a. Identification markings to conform to ASTM standards specified in the approved construction documents.		–	X
b. Manufacturers' certified mill test reports.		X	–
4. Material verification of weld filler materials:			
a. Identification markings to conform to AWS specification in the approved construction documents.		–	X
b. Manufacturer's certificate of compliance required.		–	X
5. Inspection of welding:			
a. Structural Steel		–	–
(i.) Complete and partial penetration groove welds.		X	–
(ii.) Multi-pass fillet welds.		X	–
(iii.) Single-pass fillet welds > 5/16".		X	–
(iv.) Single-pass fillet welds ≤ 5/16".		–	X
(v.) Floor and deck welds.		–	X
b. Reinforcing Steel		–	–
(i.) Verification of weldability of reinforcing steel other than ASTM A706.		–	X
(ii.) Reinforcing steel-resisting flexural and axial forces in boundary elements of special reinforced concrete shear walls and shear reinforcement.		X	–
(iii.) Shear reinforcement.		X	–
(iv.) "Form Saver" (reinforcing couplers).		X	–

Verification and Inspection	Reference Standard	Frequency of Inspection	
		Continuous During Task Listed	Periodic During Task Listed
6. Inspection of steel frame joint details for compliance with approved construction documents:			X
a. Details such as bracing and stiffening.		X	–
b. Member locations.		X	–
c. Application of joint details at each connection.		X	
7. Seismic force resisting systems identified on structural plans.			

**APPENDIX F  
OTHER SPECIAL INSPECTION SCHEDULE**

<b>Verification and Inspection</b>	<b>Reference Standard</b>	<b>Frequency of Inspection</b>	
		<b>Continuous During Task Listed</b>	<b>Periodic During Task Listed</b>
1. Shoring of Excavations.		–	X
2. Reinforced gypsum concrete.		–	X
3. Shotcrete.		–	X
4. Smoke control system.		–	X
5. Special grading, excavating, and filling.		–	X

## SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Temporary Utilities:
    - a. Temporary electricity.
    - b. Temporary lighting for construction purposes.
    - c. Temporary heating.
    - d. Temporary cooling.
    - e. Temporary ventilation.
    - f. Communication services.
    - g. Temporary water service.
    - h. Temporary sanitary facilities.
    - i. Temporary process pumping and piping.
  - 2. Construction Facilities:
    - a. Field offices and sheds.
    - b. Vehicular access.
    - c. Parking.
    - d. Progress cleaning and waste removal.
    - e. Project identification.
    - f. Traffic regulation.
    - g. Fire-prevention facilities.
  - 3. Temporary Controls:
    - a. Barriers.
    - b. Enclosures and fencing.
    - c. Security.
    - d. Water control.
    - e. Dust control.
    - f. Erosion and sediment control.
    - g. Noise control.
    - h. Pest and rodent control.
    - i. Pollution control.
  - 4. Removal of utilities, facilities, and controls.

#### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E 90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
  - 3. ASTM E 119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

#### 1.3 SUBMITTALS

- A. Temporary Pumping Systems
  - 1. Submit pump data, performance curves, and other operating information.
  - 2. Submit sketches showing layout of temporary pumping system, including pump quantity and location.
  - 3. Submit all information at least 30 days prior to when temporary pumping system is scheduled to be installed.

- B. Temporary Piping Systems
  - 1. Submit layout drawings showing proposed routing of piping, including proposed pipe support and pipe restraint locations.
  - 2. Submit product data for piping, fittings, restraints, supports, and all appurtenances of the piping system.
  - 3. Submit piping headloss calculations based on proposed layout.
  - 4. Submit all information at least 30 days prior to when temporary piping system is scheduled to be installed.

#### 1.4 TEMPORARY FACILITIES

- A. Temporary Provisions Provided by Contractor
  - 1. Temporary barriers, barricades, covered walkways, fencing, exterior closures, and interior closures.
  - 2. Temporary field offices.
  - 3. Cleaning during construction.
  - 4. Access roads and approaches.
  - 5. Temporary sanitary facilities.
  - 6. Temporary heating and ventilating after enclosure.
  - 7. Temporary electrical service and distribution system for power and lighting.
  - 8. Temporary telephone and internet service.
  - 9. Temporary tree and plant protection.
  - 10. Temporary heating before building enclosure.
  - 11. Temporary fire protection, dust control, erosion and sediment control, water control, noise control, and other necessary temporary controls
  - 12. Temporary provisions for protection of installed Work

#### 1.5 TEMPORARY ELECTRICITY

- A. Provide and pay for temporary power service required from utility source as needed for construction operation.
- B. When using Owner's existing power service, provide separate metering, and reimburse Owner for cost of energy used.

#### 1.6 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations at lighting levels not less than required by Occupational Safety and Health Administration (OSHA).
- B. Provide and maintain lighting to exterior staging and storage areas and interior work areas after dark for security purposes.
- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtailed, lamps, and the like, for specified lighting levels.
- D. Permanent building lighting may be used during construction. When used, maintain lighting and provide routine repairs including replacement of lamps.

#### 1.7 TEMPORARY HEATING

- A. Provide temporary heating devices and heat as needed to maintain specified conditions for construction operations.

- B. Before operating permanent equipment for temporary heating purposes, verify installation is approved for operation, equipment is lubricated, and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. Replace filters at Substantial Completion.
- C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress unless indicated otherwise in individual product Sections.

#### 1.8 TEMPORARY COOLING

- A. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.
- B. Before operating permanent equipment for temporary cooling purposes, verify installation is approved for operation, equipment is lubricated, and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts. Replace filters at Substantial Completion.
- C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress unless indicated otherwise in individual product Sections.

#### 1.9 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. For construction activity is hazardous locations, provide ventilation levels to achieve unclassified ratings in accordance with NFPA 820.

#### 1.10 COMMUNICATION SERVICES

- A. Internet Service: Provide, maintain, and pay for broadband Internet service to field office at time of Project mobilization. Internet service must provide a minimum of 1,000 mbps upload and download speeds. Provide desktop computer with Microsoft operating system and appropriate office function software, modem, and printer.

#### 1.11 TEMPORARY WATER SERVICE

- A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations. Where existing water service is used, provide separate metering and reimburse Owner for cost of water used.

#### 1.12 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization. Remove facilities at completion of project and leave Site in neat and sanitary condition.

#### 1.13 FIELD OFFICES AND SHEDS

- A. Do not use existing facilities for field offices or for storage.
- B. Contractor's Field Office: Portable or mobile building, or building constructed with floors raised aboveground, securely fixed to foundations with steps and landings at entrance doors.

1. Construction: Structurally sound, secure, weathertight enclosures for office and storage spaces. Maintain during progress of Work; remove enclosures at completion of Work.
  2. Provide lighting, electrical outlets, heating, cooling, and ventilating equipment, and equipped with sturdy furniture including conference table, drawing rack, filing cabinets, and drawing display table.
  3. Provide space for Project meetings, with table and chairs to accommodate eight people.
  4. Thermal Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.
  5. Exterior Materials: Weather-resistant, finished in color acceptable to Engineer.
  6. Interior Materials in Field Offices: Sheet-type materials for walls and ceilings, prefinished or painted; resilient floors and bases.
  7. Environmental Control:
    - a. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions.
- C. Storage Areas and Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and inspection of products to suit requirements in Section 01 60 00, PRODUCT REQUIREMENTS.
- D. Preparation: Fill and grade Sites for temporary structures sloped for drainage away from buildings.
- E. Installation:
  1. Install field office spaces ready for occupancy 15 days after date established by Notice to Proceed.
  2. Locate field offices where directed.
  3. Raise grade under field offices, as necessary, to elevation adequate to avoid flooding.
  4. Provide sanitary facilities in compliance with state and local health authorities.
- F. Maintenance and Cleaning:
  1. Arrange and pay for Janitorial service including daily trash service, continuous supply of toilet paper, hand towels, and hand soap, and monthly comprehensive cleaning for both Contractor office.
  2. Maintain walks free of mud, water, snow, and the like.
- G. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas to same or better condition as original condition.
- 1.14 VEHICULAR ACCESS
- A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes. Roads shall use gravel, crushed rock, or other stabilization material.
- B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.
- C. Where access roads cross existing fences, install and maintain gates.
- D. Maintain road grade and crown to eliminate potholes, rutting, and other irregularities that restrict access.
- E. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.

- F. Locate as required and within easements, rights-of-way, or Project limits. Obtain Engineer's approval of access roads.
- G. Provide unimpeded access for emergency vehicles.
- H. Provide and maintain access to fire hydrants and control valves free of obstructions.
- I. Provide means of removing mud from vehicle wheels before entering streets.
- J. Only use existing on-Site roads for construction traffic when designated and with Owner or Engineer approval.
- K. Upon completion of construction, restore ground surface disturbed by access road construction to original condition.

#### 1.15 PARKING

- A. Arrange for temporary surface parking areas to accommodate construction personnel.
- B. Locate as indicated on Drawings or as approved by Engineer or Owner.
- C. If Site space is not adequate, provide additional off-Site parking.
- D. No employee or equipment parking will be permitted on Owner's existing parking areas, except as specifically designated for Contractor's use.
- E. Do not allow heavy vehicles or construction equipment in parking areas.
- F. Do not allow vehicle parking on existing pavement.
- G. Designate parking spaces for Engineer or Owner construction observation personnel.
- H. Permanent Pavements and Parking Facilities:
  - 1. Before Substantial Completion, bases for permanent roads and parking areas may be used for construction traffic.
  - 2. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.
  - 3. Use of permanent parking structures is not permitted.
- I. Maintenance:
  - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
  - 2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.
- J. Removal, Repair:
  - 1. Remove temporary materials and construction when permanent paving is usable.
  - 2. Remove underground Work and compacted materials to depth of 2 feet; fill and grade Site as indicated.
  - 3. Repair facilities damaged by use, to original condition.
- K. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.



#### 1.16 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.
- C. Broom and vacuum clean interior areas before starting surface finishing and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from Site to maintain a clean and orderly Site and dispose of off-Site, at least at weekly intervals.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

#### 1.17 PROJECT IDENTIFICATION

- A. Project Informational Signs:
  - 1. Painted informational signs of same colors and lettering as Project identification sign or standard products; size lettering for legibility at 100-foot distance.
  - 2. Provide sign at each field office and storage shed, and provide directional signs to direct traffic into and within Site. Relocate as Work progress requires.
  - 3. No other signs are allowed without Owner's permission except those required by law.
- B. Design signs and structure to withstand 60-mph wind velocity.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
- D. Sign Materials:
  - 1. Structure and Framing: Metal or treated wood, structurally adequate.
  - 2. Sign Surfaces: Exterior grade plywood with medium-density overlay, minimum of 3/4 inches thick, standard large sizes to minimize joints.
  - 3. Rough Hardware: Galvanized or aluminum.
  - 4. Paint and Primers: Exterior quality, two coats.
  - 5. Lettering: Exterior quality paint, contrasting colors.
- E. Maintenance: Maintain clean signs and supports; repair deterioration and damage.
- F. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

#### 1.18 TRAFFIC REGULATION

- A. Signs, Signals, and Devices:
  - 1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
  - 2. Traffic Control Signals: As approved by local jurisdictions.
  - 3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
  - 4. Flag Person Equipment: As required by authorities having jurisdiction.
- B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

- C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- D. Haul Routes:
  1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.
- E. Traffic Signs and Signals:
  1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
  2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
  3. Relocate signs and signals as Work progresses, to maintain effective traffic control.
- F. Removal:
  1. Remove equipment and devices when no longer required.
  2. Repair damage caused by installation.
  3. Remove post settings to depth of 2 feet.

#### 1.19 FIRE-PREVENTION FACILITIES

- A. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- B. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
  1. Provide one fire extinguisher at each stairway on each floor of buildings under construction and demolition.
  2. Provide minimum of one fire extinguisher in every construction trailer and storage shed.
  3. Provide minimum of one fire extinguisher on roof during roofing operations using heat-producing equipment.

#### 1.20 CONSTRUCTOIN AIDS

- A. Provide railings, kick plates, enclosure, safety devices, and controls as required for adequate protection of life and property as required by applicable laws and regulations.
- B. Design temporary supports with adequate safety factor for designed load bearing capability. When requested, provide design calculations by a Professional Engineer prior to application of loads. Submitted design calculations are for information and record purposes only.

#### 1.21 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building. All devices shall conform to minimum requirements of OSHA and State agencies.
- C. Tree and Plant Protection: Preserve and protect existing trees and plants designated to remain.
  1. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
  2. Replace trees and plants damaged by construction operations.

- D. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

#### 1.22 ENCLOSURES AND FENCING

##### A. Exterior Enclosures:

1. Provide temporary weathertight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual Specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

##### B. Interior Enclosures:

1. Provide temporary partitions and ceilings as indicated on Drawings to separate work areas from Owner-occupied areas, to prevent penetration of dust and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
2. Construction: Framing and sheet materials with closed joints and sealed edges at intersections with existing surfaces.
3. Paint surfaces exposed to view from Owner-occupied areas.

#### 1.23 SECURITY

##### A. Security Program:

1. Protect Work on existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
2. Initiate program in coordination with Owner's existing security system at Project mobilization.
3. Maintain program throughout construction period until Owner occupancy or as directed by Engineer.

##### B. Entry Control:

1. Restrict entrance of persons and vehicles to Project Site.
2. Allow entrance only to authorized persons with proper identification.
3. Maintain log of workers and visitors and make available to Owner on request.
4. Coordinate access of Owner's personnel to Site in coordination with Owner's security forces.

##### C. Personnel Identification:

1. Provide identification badge for each person authorized to enter premises.
2. Badge to Include: Personal photograph, name, expiration date, and employer.
3. Maintain list of accredited persons and submit copy to Owner on request.
4. Require return of badges at expiration of employment on the Work.

##### D. Restrictions:

1. Do not allow cameras on Site or photographs taken except by written approval of Owner.

#### 1.24 WATER CONTROL

- A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.

- B. Protect Site from puddles or running water. Provide water barriers as required to protect Site from soil erosion.

1.25 DUST CONTROL

- A. Execute Work by methods that minimize raising dust from construction operations.
- B. Provide positive means to prevent airborne dust from dispersing into atmosphere, into Owner-occupied areas, and onto roadways, including dust pollution as a result of dumping and hauling rock or dirt.

1.26 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.
- F. Comply with sediment and erosion control plan indicated on Drawings.

1.27 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

1.28 PEST AND RODENT CONTROL

- A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work.
- B. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.29 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
- B. Do no cause or permit action to occur which would result in an overflow to an existing waterway.
- C. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
- D. Comply with pollution and environmental control requirements of authorities having jurisdiction, including EPA guidance document 430/9-73-007 "Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity".

1.30 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials before Substantial Completion inspection.
- B. Remove underground installations to minimum depth of 2 feet and grade to match surrounding conditions.

- C. Clean and repair damage caused by installation or use of temporary Work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

#### 1.31 PROTECTION OF WORK AND PROPERTY

- A. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
- B. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
- C. Maintain original Site drainage wherever possible.

#### 1.32 TEMPORARY PROCESS PIPING

- A. Contractor shall provide all piping, appurtenances, and other materials as required to provide temporary piping systems as specified herein, as indicated on the Drawings, and as needed to perform the Work.
- B. Contractor shall field route piping as needed and as field conditions dictate, unless otherwise indicated on the Drawings, and determine appropriate lengths of piping and quantity/type of pipe fittings needed to construct temporary piping system. Do not block access points such as stairs, doors, and walkways to existing facilities unless approved in writing by the Owner.
- C. Restrain piping at valves and at fitting where piping changes direction, changes sizes, and at ends:
  - 1. When piping is buried, use concrete thrust block or mechanical restraints.
  - 2. When piping is exposed or under water, use mechanical or structural restraints.
  - 3. Determine thrust forces by multiplying the nominal cross-sectional area of the piping by the operating pressure of the piping.
- D. Temporary piping systems shall be installed in a manner that will not damage existing or new facilities.
- E. Piping material, including gaskets, shall be suitable for the process fluid requiring temporary piping.
- F. After temporary piping is no longer required, remove piping, clean and repair damage cause by installation or use, and restore existing facilities to original condition.

#### 1.33 TEMPORARY PROCESS PUMPING

- A. Contractor shall provide temporary process pumping where required to complete the Work. Temporary process pumping shall be coordinated with the Owner and Engineer prior to implementation.
  - 1. Anticipated pressure will vary based on headloss and the final length and size of temporary piping. Contractor shall calculate headlosses and provide pumping with sufficient pressure to meet flow requirements. Calculations shall be sealed and signed by a Professional Engineer registered in the State where the Work is being performed.
  - 2. Pumps shall be capable of passing solids of a sufficient size for the type of liquid being pumped.

3. Temporary pump systems must be configured to match the operational condition of permanent systems. Where required, provide variable speed pumping to match incoming flows.
4. Provide and pay for all power required to operate temporary pump system.
5. All electrical and instrumentation components shall comply with applicable code requirements.
6. Temporary pumping will be required 24 hours per day during the time period when pumping is required and is critical to the proper operation of the Owner's system. Provide 24-hour on-site supervision of pumps to ensure that pumps are always operational and performing as required. Notify the Owner immediately if temporary pumping cannot be provided.
7. Contractor shall be responsible for repairing any damage or reimbursing the Owner for any regulatory fines or additional plant staff time resulting from the Contractor's failure to maintain temporary pumping.
8. Provide N + 1 standby pumping capacity, such that a failure of the largest pumping unit does not result in reduced capacity of the pumping system. Standby pump(s) shall be capable of providing required pumping capacity immediately upon failure of duty pump(s).
9. All necessary spare equipment and appurtenances shall be available at the Site to allow immediate repair and/or replacement of any pumping system component that is not functioning properly.

- B. After temporary process pumping is no longer required, remove pumping system components, clean and repair damage cause by installation or use, and restore existing facilities to original condition.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 60 00 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Products.
  - 2. Product delivery requirements.
  - 3. Product storage and handling requirements.
  - 4. Product options.

#### 1.2 PRODUCTS

- A. At minimum, comply with specified requirements and reference standards.
- B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- D. Domestic Products: Except where specified otherwise, domestic products are required and interpreted to mean products mined, manufactured, fabricated, or produced in United States or its territories.
- E. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.
- F. Furnish interchangeable components from same manufacturer for components being replaced.
- G. Special Tools and Accessories: Furnish to Owner, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, hand wheels, chain operators, special tools, and other spare parts as required for maintenance.
- H. Lubricant: Provide initial lubricant recommended by equipment Manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by Owner.
- I. Equipment Finish:
  - 1. Provide Manufacturer's standard finish and color, except where specific color is indicated.
  - 2. If Manufacturer has no standard color, provide equipment with gray finish as approved by Engineer.

#### 1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products according to manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

- C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.
- D. Deliver products in accordance with accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at Site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.
- E. Unload products in accordance with Manufacturer's instructions for unloading or as specified, and record receipt of products at Site. Promptly inspect for completeness and evidence of damage during shipment.
- F. Remove damaged products from Site, and expedite delivery of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

#### 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.
- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.
- E. Provide bonded off-Site storage and protection when Site does not permit on-Site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- J. Store electrical, instrumentation, and control products, and equipment with bearings in weather-tight structures maintained above 60°F. Protect electrical, instrumentation, and control products, and insulation against moisture, water, and dust damage. Connect and operate continuously all space heaters furnished in electrical equipment.
- K. Store finished products that are ready for installation in dry and well-ventilated areas. Do not subject to extreme changes in temperature or humidity.
- L. Hazardous Materials: Prevent contamination of personnel, storage building, and Site. Meet requirements of product specification, codes, and manufacturer's instructions.



1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 01 25 00, SUBSTITUTION PROCEDURES.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 70 00 - EXECUTION REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Examination.
  - 2. Preparation.
  - 3. Coordination of Owner's portion of the Work.
  - 4. Survey control.
  - 5. Execution.
  - 6. Indoor air quality procedures.
  - 7. Cutting and patching.
  - 8. Protecting installed construction.
  - 9. Work within public right-of-way.

#### 1.2 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

#### 1.3 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

#### 1.4 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel.
  - 1. Provide temporary facilities required for Owner-furnished, Contractor-installed or Owner-furnished, Owner-installed products.
  - 2. Refer to Section 01 10 00, SUMMARY, for other requirements for Owner-furnished, Contractor-installed or Owner-furnished, Owner-installed products.
- B. Coordination: Coordinate construction and operations of the Work with Work performed by Owner's construction personnel.
  - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's Work. Attend

preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

#### 1.5 SURVEY CONTROL

- A. Employ land surveyor registered in State of the Work and acceptable to Engineer and Owner.
- B. Coordinate with Engineer and Owner and protect survey controls and reference points. Promptly notify Engineer of discrepancies discovered.
- C. Control datum for survey is as indicated on Drawings.
- D. Prior to beginning Work, verify and establish floor elevations of existing facilities, where applicable, to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.
- E. Verify setbacks and easements; confirm Drawing dimensions and elevations.
- F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices. Accuracy of stakes, alignments, and grades may be checked randomly by Engineer; notice will be given for when checking will be conducted. When notice of checking is given, postpone parts of the Work affected by stakes, alignments or grades until checked.
- G. Submit copy of Site drawing signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- H. Maintain complete and accurate log of control and survey work as Work progresses.
- I. On completion of foundation walls and major site improvements, prepare certified survey illustrating dimensions, locations, angles, and elevations of construction.
- J. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- K. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- L. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- M. Final Property Survey: Prior to Substantial Completion, prepare final property survey illustrating locations, dimensions, angles, and elevations of buildings and Site Work that have resulted from construction indicating their relationship to permanent benchmarks and property lines.
  - 1. Show significant features (real property) for Project.
  - 2. Include certification on survey, signed by surveyor, that principal metes, bounds, lines, levels, and elevations of Project are accurately shown.

#### 1.6 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
  - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
  - 2. Physically separate products in place and provide electrical insulation or protective coatings to prevent galvanic action or corrosion between dissimilar metals.
  - 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual effect choices to Engineer for final decision.
- E. Allow for expansion of materials and building movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
  - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
  - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry-recognized standard mounting heights for particular application indicated.
  - 1. Refer questionable mounting height choices to Engineer for final decision.
  - 2. Elements Identified as Handicap Accessible: Comply with applicable codes and regulations.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

#### 1.7 INDOOR AIR QUALITY PROCEDURES

- A. Prevent indoor air quality problems resulting from construction and renovation process.
- B. Protect HVAC system during construction and renovation, control pollutant sources, and interrupt contamination pathways.
- C. Sequence material delivery and installation to avoid exposing insulation, carpeting, acoustical ceilings, gypsum board, and other absorptive materials to contamination and moisture.
- D. Enclose buildings before storing and installing moisture-sensitive products within building under construction.
- E. Install construction return filter at each return grille before operating permanent air handlers during construction.
- F. Replace filters after completing construction.
- G. Conduct building flush-out after construction ends.

## 1.8 ALTERATION PROCEDURES

- A. Existing facilities may be occupied for normal operations during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.
  - 1. Perform Work not to interfere with operations of occupied areas.
  - 2. Keep utility and service outages to a minimum and perform only after written approval of Owner.
  - 3. Clean Owner-occupied areas daily. Clean spillage, overspray, and heavy collection of dust in Owner-occupied areas immediately.
- B. Materials: As specified in product Sections; match existing products with new products for patching and extending Work.
- C. Employ skilled and experienced installer to perform alteration and renovation Work.
- D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- E. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- F. Remove debris and abandoned items from area and from concealed spaces.
- G. Prepare surface and remove surface finishes to permit installation of new Work and finishes.
- H. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity.
- I. Remove, cut, and patch Work to minimize damage and to permit restoring products and finishes to specified condition.
- J. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with neat transition to adjacent finishes.
- K. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- L. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Engineer for review.
- M. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition to Engineer for review and request instructions from Engineer.
- N. Trim existing doors to clear new floor finish. Refinish trim to specified condition.
- O. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.
- P. Finish surfaces as specified in individual product Sections.

## 1.9 CUTTING AND PATCHING

- A. Employ skilled and experienced Installers to perform cutting and patching.

- B. Submit written request in advance of cutting or altering elements affecting the following:
  - 1. Structural integrity of element.
  - 2. Integrity of weather-exposed or moisture-resistant elements.
  - 3. Efficiency, maintenance, or safety of element.
  - 4. Visual qualities of sight-exposed elements.
  - 5. Work of Owner or separate Contractor.
- C. Execute cutting, fitting, and patching to complete Work and to accomplish the following:
  - 1. Fit the several parts together, to integrate with other Work.
  - 2. Uncover Work to install or correct ill-timed Work.
  - 3. Remove and replace defective and nonconforming Work.
  - 4. Remove samples of installed Work for testing.
  - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products according to requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. At penetrations of fire-rated walls, partitions, ceiling, or floor construction, completely seal voids with fire-rated material to full thickness of penetrated element to maintain fire rating of complete assembly.
- J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
- K. Identify the hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

#### 1.10 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.11 WORK WITHIN PUBLIC RIGHT-OF-WAY

- A. All work within public right-of-way shall comply with requirements and standards of the State of Alabama Department of Transportation.
- B. Except where otherwise specified, indicated on the Drawings, or accepted in writing by the Engineer, the maximum length of open trench, where construction is in any stage of completion, shall not exceed the linear footage as set forth below. Descriptions under following area designations are general in nature and may be amended in writing by the Engineer due to particular or peculiar field conditions:
  - 1. Commercial Areas, 400 Linear Feet: Industrial, shopping centers, churches, schools, hotels, motels, markets, gas stations, government and private office buildings, hospitals, fire and police stations, and nursing homes.
  - 2. Residential Areas, 1 Block or 600 Linear Feet, whichever is the Least: Single and multi-family residences, apartments, and condominiums.
  - 3. Undeveloped Areas, 1,000 Linear Feet: Parks, golf courses, farms, undeveloped subdivided land.
- C. Completely backfill trenches across streets and install temporary or permanent pavement as soon as possible after pipe laying.
- D. Use substantial steel plates with adequate trench bracing to bridge across trenches at street and alley crossings, commercial driveways, and residential driveways where trench backfill and temporary patch have not been completed during regular working hours.
- E. Provide safe and convenient passage for pedestrians.
- F. Maintain access to critical facilities at all times including fire stations, fire hydrants, and hospitals.
- G. Provide traffic control devices, barricades, and signage as required by the regulating agency.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 75 00 – STARTUP TESTING AND TRAINING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Factory testing.
  - 2. Manufacturer's services.
  - 3. Startup plan.
  - 4. Pre-startup testing.
  - 5. Functional testing.
  - 6. Site Acceptance Test.
  - 7. Demonstration and Training

#### 1.2 FACTORY TESTING

- A. Test equipment for proper performance at point of manufacture or assembly when specified.
  - 1. Demonstrate equipment meets specified performance requirements.
  - 2. Perform testing as specified in the equipment specification sections.
  - 3. Provide certified copies of test results. Do not ship equipment until receiving written approval of test results.
- B. Factory testing may require witnessing by the Owner or Engineer as specified in the equipment specification sections. When required, provide or reimburse the cost for travel, lodging, and meals for up to two (2) representatives, or quantity as specified in the equipment specification section.

#### 1.3 MANUFACTURER'S SERVICES

- A. Execute testing and startup under supervision of manufacturer's representative according to manufacturer's instructions. Schedule services to avoid conflict with other testing and startup activity.
- B. Comply with requirements of individual equipment specification sections, including requirements for an on-site manufacturer's representative to inspect, check, and approve equipment or system installation prior to startup and supervise placing equipment or system in operation.
- C. Manufacturer's representative shall maintain a log of activities, prepare startup and testing forms, and submit records generated during start-up and testing phase of Project.
- D. Manufacturer's Certificate of Proper Installation: Provide a written report prepared and signed by Manufacturer's representative certifying that equipment:
  - 1. Has been properly installed, adjusted, aligned, and lubricated.
  - 2. Is free of any stresses imposed by connecting piping or anchor bolts.
  - 3. Is suitable for satisfactory full-time operation under full load conditions.
  - 4. Operates within the allowable limits for vibration.
  - 5. Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning.
  - 6. Control logic for start-up, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning.



## 1.4 STARTUP PLAN

- A. Provide a startup plan for each piece of equipment and each system not less than two weeks prior to planned initial start-up of equipment or system. At a minimum, provide the following information:
  - 1. Step-by-step instructions for startup of each piece of equipment or system.
  - 2. Description of the process, including equipment numbers/nomenclature of each item and all included devices.
  - 3. Detail procedure for startup including valves to be opened/closed, sequence of startup, etc.
  - 4. Startup requirements including water, power, chemicals, etc.
  - 5. Provide testing plan with test logs for each item and system when specified. Include testing of alarms, control circuits, capacities, ratings, speeds, flows, pressures, vibrations, sound level, and other specified performance parameters.
  - 6. Provide a summary of shutdown requirements for existing systems, if any, which are necessary to complete startup of new equipment and systems.
- B. Coordinate schedule for startup of various equipment and systems. Allow realistic durations in the Progress Schedule for testing and startup activities, including the following:
  - 1. Manufacturer's services
  - 2. Pre-startup testing
  - 3. Functional testing
  - 4. Site Acceptance Test
- C. Revise and update startup plan based upon review comments or to accommodate changes in startup sequence.

## 1.5 PRE-STARTUP TESTING

- A. Prior to start-up of any piece of equipment, perform all checks and adjustments required to make the equipment ready for safe and proper operation.
- B. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing all pre-startup testing.
- C. Perform pre-startup testing and checks as indicated in the individual equipment specification sections and as required by manufacturer's literature.
- D. Mechanical Systems
  - 1. Remove rust preventatives and oils applied to protect equipment during construction.
  - 2. Flush lubrication systems and dispose of flushing oils. Recharge lubrication system with lubricant recommended by manufacturer.
  - 3. Flush fuel system and provide fuel for testing and startup.
  - 4. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
  - 5. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
  - 6. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
  - 7. Perform cold alignment and hot alignment to manufacturer's tolerances.
  - 8. Adjust V-belt tension and variable pitch sheaves.
  - 9. Inspect hand and motorized valves for proper adjustment. Tighten packing glands to insure no leakage, but permit valve stems to rotate without galling. Verify valve seats are positioned for proper flow direction.
  - 10. Tighten leaking flanges or replace flange gasket. Inspect screwed joints for leakage.
  - 11. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to functional testing.

- E. Electrical Systems
  - 1. Perform testing as indicated in Division 26 including insulation testing, continuity testing, ground testing, circuit breaker testing, and motor testing.
  - 2. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- F. Instrumentation and Control Systems
  - 1. Perform testing as indicated in Division 40 including instrumentation calibration and adjustment, point-to-point wiring checks, signal range testing, and input/output testing.
  - 2. Verify that tests agree with those required by equipment or system manufacturer.
- G. Document results of pre-startup testing on test forms and reports and submit upon completion of testing. Acceptance of pre-startup testing results is required prior to performing functional testing.

## 1.6 FUNCTIONAL TESTING

- A. Functionally test mechanical, electrical, and instrumentation and control equipment for proper operation after pre-startup testing and adjusting is completed.
- B. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing all functional testing.
- C. Functional testing of equipment shall be performed for all possible operational scenarios from no load to full load conditions. The various tests performed during functional testing shall be designed to demonstrate that systems fulfill all the requirements of the Contract Documents.
- D. Functional testing shall be performed utilizing water, air, electricity, chemicals, or other mediums to simulate permanent operating conditions.
  - 1. Some processes may require the use of temporary clean water for functional demonstration testing.
  - 2. Contractor shall coordinate with the Owner for availability of water source. Contractor shall be responsible for all temporary piping, pumping, and power to convey clean water to the facility for testing.
  - 3. Coordinate with Owner removal of test water from process after satisfactory completion of functional testing. Do not discharge test water in a manner to cause upset or disruption to plant operations.
- E. Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration.
- F. Demonstrate that equipment meets performance requirements specified.
- G. Demonstrate proper operation of each instrument loop function including alarms, local and remote controls, instrumentation, and other equipment functions. Where required, generate signals with test equipment to simulate operating conditions in each control mode.
- H. Document results of functional testing on test forms and reports, and submit upon completion of testing. Acceptance of functional testing results is required prior to performing the Site Acceptance Test.

## 1.7 SITE ACCEPTANCE TEST

- A. After all systems have been functionally tested and are operating in accordance with the Contract Documents, the Contractor shall perform a Site Acceptance Test of the comprehensive completed installation.

- B. During the testing period, the Owner shall have full use of the system. The Owner will provide operations, personnel, power, fuel, and other consumables for the duration of the site acceptance test.
- C. The complete installation must meet all performance requirements for the duration of the Site Acceptance Test.
- D. Contractor personnel shall be readily available to address issues onsite during the test. Immediately correct defects in materials, workmanship, or equipment which become evident during the test.
- E. The Site Acceptance Test period shall be 30 days, during which time the completed installation must meet specified operation without significant interruption. A significant interruption may include any of the following events:
  1. Failure to meet specified functional or performance requirements for more than 2 consecutive hours.
  2. Failure of any critical component that is not corrected within 8 hours after failure.
  3. Other failures or interruptions as defined by the Engineer.
- F. A significant interruption will require restarting of the Site Acceptance Test after the problem is corrected and when directed by the Owner/Engineer. Restarting and satisfactory completion of the Site Acceptance Test shall be conducted at no additional cost to the Owner.

#### 1.8 DEMONSTRATION AND TRAINING

- A. Demonstrate operation and maintenance of products to Owner's personnel prior to date of Substantial Completion.
- B. Provide a training schedule for all training sessions required for the project. Allow for multiple sessions of each training to accommodate multiple operator shifts. Submit training schedules for approval by Owner.
- C. Demonstrate Project equipment and instruct in classroom environment located at the Site and instructed by qualified manufacturer's representative who is knowledgeable about the equipment.
- D. Provide a lesson plan for each required course, containing the following minimum information:
  1. Title and objectives.
  2. Recommended attendees.
  3. Course description and outline.
  4. Instructional materials and equipment requirements.
  5. Instructor resumes.
- E. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time at designated location.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- H. Allot the required instruction time for each item of equipment and system as specified in individual equipment specification sections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

**MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION**

OWNER: \_\_\_\_\_ EQUIP. SERIAL NO: \_\_\_\_\_  
 EQUIP. TAG NO: \_\_\_\_\_ EQUIP. SYSTEM: \_\_\_\_\_  
 PROJECT NO: \_\_\_\_\_ SPEC. SECTION: \_\_\_\_\_

I hereby certify that the above referenced equipment/system has been:

(Check Applicable)

<input type="checkbox"/>	Installed in accordance with Manufacturer's recommendations.
<input type="checkbox"/>	Inspected, checked, and adjusted.
<input type="checkbox"/>	Serviced with proper initial lubricants.
<input type="checkbox"/>	Electrical and mechanical connections meet quality and safety standards.
<input type="checkbox"/>	All applicable safety equipment has been properly installed.
<input type="checkbox"/>	Functional tests.
<input type="checkbox"/>	System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate its equipment, and (iii) authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: \_\_\_\_\_, 20\_\_\_\_.

Manufacturer: \_\_\_\_\_

By Manufacturer's Authorized Representative: \_\_\_\_\_  
 (Authorized Signature)

**UNIT PROCESS STARTUP FORM**

OWNER: \_\_\_\_\_ PROJECT: \_\_\_\_\_

Unit Process Description: (Include description and equipment number of all equipment and devices):

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Startup Procedure: (Describe procedure for sequential startup and evaluation, including valves to be opened/closed, order of equipment startup, etc.):

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Startup Requirements (Water, power, chemicals, etc.):

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Evaluation Comments:

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**FACILITY PERFORMANCE DEMONSTRATION/CERTIFICATION FORM**

OWNER: \_\_\_\_\_ PROJECT: \_\_\_\_\_

Unit Process Description: (List unit processes involved in facility startup):

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Unit Processes Startup Sequence: (Describe sequence for startup, including computerized operations if any):

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Contractor Certification that Facility is capable of performing its intended function(s), including fully automatic operation:

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_, 20 \_\_\_\_

Engineer: \_\_\_\_\_ Date: \_\_\_\_\_, 20 \_\_\_\_

## SECTION 01 77 00 – CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
1. Closeout procedures.
  2. Project record documents.
  3. Operation and maintenance data.
  4. Manual for materials and finishes.
  5. Manual for equipment and systems.
  6. Spare parts and maintenance products.
  7. Product warranties and product bonds.
  8. Maintenance service.
  9. Final cleaning.

#### 1.2 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
1. Submit maintenance manuals, Project record documents, digital images of construction photographs, video recordings, and other similar final record data in compliance with this Section.
  2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section and Section 01 75 00, STARTUP TESTING AND TRAINING.
  3. Complete demonstration and training to Owner's operating and maintenance personnel as specified in compliance with this Section and Section 01 75 00, STARTUP TESTING AND TRAINING.
  4. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
  5. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
  6. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
  7. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
  8. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
  9. Perform final cleaning according to this Section.
- B. Substantial Completion Inspection:
1. When Contractor considers Work to be substantially complete, submit to Engineer and Owner:
    - a. Written certificate that Work, or designated portion, is substantially complete.
    - b. List of items to be completed or corrected (initial punch list).
  2. After receipt of request for Substantial Completion, Engineer or Owner will make inspection to determine whether Work or designated portion is substantially complete.
  3. Should Engineer or Owner determine that Work is not substantially complete:
    - a. Engineer or Owner will promptly notify Contractor in writing, stating reasons for its opinion.



- b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion.
    - c. Engineer or Owner will reinspect Work.
    - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer or Owner inspection.
  - 4. When Engineer or Owner finds that Work is substantially complete, Engineer or Owner will:
    - a. Prepare Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
    - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
  - 5. After Work is substantially complete, Contractor shall:
    - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
    - b. Complete Work listed for completion or correction within time period stipulated.
- C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
  - 1. When Contractor considers Work to be complete, submit written certification that:
    - a. Contract Documents have been reviewed.
    - b. Work has been examined for compliance with Contract Documents.
    - c. Work has been completed according to Contract Documents.
    - d. Work is completed and ready for final inspection.
  - 2. Submittals: Submit the following:
    - a. Final punch list indicating all items have been completed or corrected.
    - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
    - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
    - d. Accounting statement for final changes to Contract Sum.
    - e. Contractor's affidavit of payment of debts and claims.
    - f. Contractor affidavit of release of liens.
    - g. Consent of surety to final payment.
  - 3. Perform final cleaning for Contractor-soiled areas according to this Section.
- D. Final Completion Inspection:
  - 1. After receipt of request for final inspection, Engineer or Owner will make inspection to determine whether Work or designated portion is complete.
  - 2. Should Engineer or Owner consider Work to be incomplete or defective:
    - a. Engineer or Owner will promptly notify Contractor in writing, listing incomplete or defective Work.
    - b. Contractor shall remedy stated deficiencies and send second written request to Engineer or Owner that Work is complete.
    - c. Engineer or Owner will reinspect Work.
    - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer or Owner inspection.

### 1.3 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, product data, and Samples.

- 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates used.
  - 3. Changes made by Addenda, bulletin, Change Order, and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
  - 1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
  - 2. Include locations of concealed elements of the Work.
  - 3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
  - 4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
  - 5. Identify and locate existing buried or concealed items encountered during Project.
  - 6. Measured depths of foundations in relation to finish first floor datum.
  - 7. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 8. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 9. Field changes of dimension and detail.
  - 10. Details not on original Drawings.
- G. Submit PDF electronic files of marked-up documents to Engineer within 10 days after the date of Substantial Completion and prior to final Application for Payment.

#### 1.4 OPERATION AND MAINTENANCE DATA

- A. Submit in PDF composite electronic indexed file.
- B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.
- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.
- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
  - a. Significant design criteria.
  - b. List of equipment.
  - c. Parts list for each component.
  - d. Operating instructions.
  - e. Maintenance instructions for equipment and systems.
  - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - g. Safety precautions to be taken when operating and maintaining or working near equipment.
3. Part 3: Project documents and certificates, including the following:
  - a. Shop Drawings and product data.
  - b. Air and water balance reports.
  - c. Certificates.
  - d. Executed and notarized duplicates of warranties and bonds.

#### 1.5 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Completed volumes, with Engineer comments, will be returned after Substantial Completion. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within 10 days after final inspection.
- E. Submit in PDF composite electronic indexed file of final volumes within 10 days after final inspection.
- F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom-manufactured products.
- G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- H. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- I. Additional Requirements: As specified in individual product Specification Sections.
- J. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

## 1.6 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Completed volumes, with Engineer comments, will be returned after Substantial Completion. Revise content of document sets as required prior to final submission.
- D. Submit two sets of revised final volumes within 10 days after final inspection.
- E. Submit in PDF composite electronic indexed file of final volumes within 10 days after final inspection.
- F. Equipment and Systems: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- H. Include color-coded wiring diagrams as installed.
- I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- K. Include servicing and lubrication schedule and list of lubricants required.
- L. Include manufacturer's printed operation and maintenance instructions.
- M. Include sequence of operation by controls manufacturer.
- N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- O. Include control diagrams by controls manufacturer as installed.
- P. Include Contractor's coordination drawings indicating installed color-coded piping diagrams.
- Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- S. Include test and balancing reports as specified in Section 01 40 00, QUALITY REQUIREMENTS.

- T. Additional Requirements: As specified in individual product Specification Sections.
- U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

#### 1.7 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.
- B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.

#### 1.8 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.
- B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include table of contents and assemble in three D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
  - 2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.
- H. Refer to Section 01 78 36, WARRANTIES AND BONDS, for additional requirements.

#### 1.9 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections during warranty period.
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.
- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

1.10 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
  - 1. Employ experienced personnel or professional cleaning firm.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces; and vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.
- D. Clean or replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

1.11 DISINFECTION OF POTABLE WATER SYSTEMS

- A. Disinfect piping and tanks intended to carry potable water in accordance with American Water Works Association Standards.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

## SECTION 01 78 36 – WARRANTIES AND BONDS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

#### 1.2 RELATED WORK

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01 77 00, CLOSEOUT PROCEDURES.
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Division 2 through 44.

#### 1.3 SUBMITTALS

- A. Submit written warranties to the Owner prior to the date fixed by the Engineer for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.
- B. Refer to individual Sections of Divisions 2 through 44 for specific content requirements, and particular requirements for submittal of special warranties.
- C. Contractor shall submit digital copies and a 3-ring binder of warranties for each piece of equipment installed coupled with an overall project summary spreadsheet listing of all equipment items and date warranty starts and expires, etc.

#### 1.4 WARRANTY REQUIREMENT

- A. Warranty Period
  1. Warranties shall commence on the date of Substantial Completion.
  2. Warranties shall be in force from the date of Substantial Completion through the date of Final Acceptance.
  3. Warranties shall be in force for **one year** following the date of Final Acceptance.
    - a. Warranty periods defined in Specification Divisions 02 through 44, longer than the warranty period defined in this specification, shall prevail over the requirements in this specification.
    - b. Warranty periods defined in Specification Divisions 02 through 44, shorter than the warranty period defined in this specification, shall be required to meet the warranty period requirements in this specification.
- B. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- E. Owner 's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- F. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- G. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- H. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

#### 1.5 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the Manufacturer to the Owner.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION



DIVISION 2  
EXISTING CONDITIONS



## SECTION 02 41 00 – DEMOLITION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Portions of buildings and other areas, equipment and materials selective demolition, and partial demolition work are as shown on Drawings and specified herein.
  - 2. Equipment and materials to be removed for construction and reinstalled for reuse or continued operation are as shown on the drawings and specified herein.
  
- B. Related Sections:
  - 1. Section 01 32 16 – Construction Progress Schedule.
  - 2. Section 01 40 00 – Quality Requirements.
  - 3. Section 31 23 23.13 – Fill and Backfill.

#### 1.2 SUBMITTALS

- A. Shop Drawings:
  - 1. Plans showing all equipment and materials to be removed and reinstalled for reuse on continued operation including interim storage plans for each item.
  
- B. Quality requirements Submittals:
  - 1. Schedule of demolition, as part of and consistent with the progress schedule specified in Section 01 32 16, CONSTRUCTION PROGRESS SCHEDULE.
  - 2. Methods of demolition and equipment proposed to demolish each structure.
  - 3. Copies of any authorizations and permits required to perform Work.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Utilities:
  - 1. Notify Owner and appropriate utilities 72 hours prior to turning off affected services before starting demolition or alterations.
  - 2. Remove utility lines exposed by demolition excavation.
  - 3. Remove electric, sanitary, and storm drainage adjacent to buildings to be demolished.
  - 4. Excavate utility lines serving buildings to be demolished and provide a permanent leak-proof closure for water and gas lines.
  - 5. Plug sewer lines at locations shown or at limits of excavation if NOT shown with min. 2,000 psi compressive strength concrete plug to prevent groundwater infiltrating sewer systems. Length of plug shall be 5 feet minimum.
  
- B. Removal and Storage of Equipment for Reuse:
  - 1. DO NOT remove equipment and materials without approval of Engineer.
  - 2. Properly store and maintain equipment and materials in same condition as when removed.
  - 3. Engineer shall determine condition of equipment and materials prior to removal.

### 3.2 DEMOLITION

- A. Drawings define minimum portion of equipment to be removed and structures to be modified. Unless otherwise shown, rough cuts or breaks may be made exceeding limits of demolition shown.
- B. Provide all demolition, removal, temporary storage, and reinstallation of existing equipment as required for implementation of the work.
- C. Core drill floor slabs, catch basins, and other concrete improvements to remain in place below ground, or break holes at structure's lowest point to allow water to freely migrate through.
- D. Remove piping from areas to be backfilled. Pipe, valves, and fittings adjacent to those to be removed may also be removed as salvage.
- E. Remove all materials associated with existing equipment that is to be removed or relocated.
- F. Cut off concealed or embedded conduit, boxes, or other materials a minimum of 3/4 inch below final finished surface.
- G. Cut off drilled piers a minimum of 6 inches below bottom of new foundations.
- H. Demolish existing concrete structure to 18 inches below grade.

### 3.3 DISPOSAL

- A. Dispose of debris and other non-salvaged materials offsite in licensed landfills.

### 3.4 BACKFILLING

- A. Demolished Areas:
  - 1. Backfill to existing ground level, elevations shown, or foundation level of new construction.
- B. Backfill Material and Compaction:
  - 1. For fill in structures, use sand conforming to Section 31 23 23.13, FILL AND BACKFILL. Top 6" of backfill to grade shall be select fill conforming to Section 31 23 23.13, FILL AND BACKFILL and shall be compacted to 90% standard proctor density.
  - 2. DO NOT use demolition debris as backfill material.

### 3.5 SALVAGE

- A. Equipment and materials NOT reused or reinstalled, including all metals and piping within the limits of demolition, unless otherwise specified, shall be removed by the Contractor. Owner reserves the right to select any portions of equipment and materials, including metals and piping that are to be delivered to the Owner for scrap.

END OF SECTION

DIVISION 3  
CONCRETE



## SECTION 03 01 00 – MAINTENANCE OF CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Repair and resurfacing of new and existing concrete surfaces in preparation for finish materials and final use.
  
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.
  - 2. Section 01 40 00 – Quality Requirements.
  - 3. Section 03 30 00 – Cast-In-Place Concrete.
  - 4. Section 03 20 00 – Concrete Reinforcing.

#### 1.2 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
  - 1. AASHTO:
    - a. T277, Standard Method of Test for Rapid Determination of the Chloride Permeability of Concrete.
  - 2. ASTM International:
    - a. A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
    - b. A185 – Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
    - c. A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
    - d. C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
    - e. C78 – Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading).
    - f. C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
    - g. C157 – Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
    - h. C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    - i. C348 – Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.
    - j. C469 – Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.
    - k. C496 – Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
    - l. C531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes.
    - m. C596 – Standard Test Method for Drying Shrinkage of Mortar Containing Portland Cement.
    - n. C666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
    - o. C779 – Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
    - p. C882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
    - q. C928 – Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair.

- r. C1012 – Standard Test Method for Length Change of Hydraulic Cement Mortars Exposed to a Sulfate Solution.
  - s. C1202 – Standard Test Method for Electrical Induction of Concrete’s Ability to Resist Chloride Ion Penetration.
  - t. C1583 – Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
  - u. D638 – Standard Test Method for Tensile Properties of Plastics.
  - v. D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
  - w. D4258 – Standard Practice for Surface Cleaning Concrete for Coating.
  - x. D4259 – Standard Practice for Abrading Concrete.
  - y. E699 – Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee.
3. NSF International:
- a. NSF 61, Standard for Drinking Water System Components – Health Effects.

### 1.3 DEFINITIONS

- A. Low Pressure Spray Mortar: Mortar designated by “S” before the product number, applied by low pressure spraying, or in small areas by hand troweling.
- B. Defective Area: As defined in Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. High-Pressure Water Blasting (sometimes referred to as water demolition): Water projected under pressure and at high velocity which may or may NOT use an abrasive medium. Used for preparation of concrete surfaces including cleaning, removal of existing coatings and roughening.
- D. New Concrete: As defined in Section 03 30 00, CAST-IN-PLACE CONCRETE.
- E. Rebound: Shotcrete material that bounces off the surface against which shotcrete is being applied.
- F. Shotcrete: Mortar pumped through a hose and projected at a high velocity against a surface as a construction technique.

### 1.4 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Action Submittal:
  - 1. Product data sheets for each material supplied.
- C. Information Submittals:
  - 1. Mortar System:
    - a. Manufacturer’s installation instructions.
    - b. Manufacturer’s recommended fabric size for mesh reinforcement.
  - 2. Written description of equipment proposed for hydro-demolition surface preparation.
  - 3. Certificates:
    - a. Certificate of Compliance that proposed product systems meet or exceed the requirements of ASTM C928 and specified performance criteria when tested in accordance with Article FIELD QUALITY REQUIREMENTS.
    - b. Mortar system Manufacturer’s Certificate of Proper Installation.
    - c. Confirmation that mortar materials meet requirements of NSF 61, where applicable.
  - 4. Statements of Qualification:



- a. Independent testing laboratory.
  - b. Mortar system Manufacturer's representative.
  - c. Repair mortar system applicator.
5. Mortar system Manufacturer's proposed modified test procedures for ASTM C109 and ASTM C882 test methods.
  6. Independent testing laboratory test report.

## 1.5 QUALITY ASSURANCE

- A. Qualifications:
  1. Independent Testing Laboratory: Based on evaluation of laboratory submitted criteria in accordance with ASTM E699.
  2. Mortar System Applicator: For low pressure spray mortar system in lieu of endorsement, complete mortar system manufacturer's demonstration in accordance with Article MANUFACTURER'S SERVICES. For Shotcrete Mortar, a trained and experienced applicator certified by the repair mortar manufacturer.
- B. Pre-repair Conference:
  1. Required Attendees: Contractor, repair Subcontractor, repair material representative.
  2. Schedule and conduct prior to incorporation of repair products.
  3. Agenda:
    - a. Review field conditions.
    - b. Confirm material selection.
    - c. Repair material representative shall review proposed preparation, application, finishing and curing of the materials.

## 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver repair mortar in moisture-resistant packaging.
- B. Handle in accordance with manufacture's written instructions.

## PART 2 - PRODUCTS

### 2.1 LOW PRESSURE SPRAY MORTAR SYSTEM (FOR VERTICAL AND OVERHEAD REPAIRS)

- A. Mortar:
  1. One component, rheoplastic, cement based, fiber reinforced, shrinkage compensated, gray in color, with a minimum 30-minute working time.
  2. Cured materials mixed to a flow of 70%, at five drops shall conform to the following criteria:
    - a. Minimum Slant Shear Bond Strength: 3,000 psi in 28 days in accordance with "modified" ASTM C882 test method.
    - b. Minimum Compressive Strength: 11,000 psi at 28 days in accordance with ASTM C109.
    - c. Minimum Direct Shear Bond Strength: 650 psi in 28 days in accordance with Michigan DOT.
    - d. Minimum Tensile Bond Strength (MBT In-House Test): 300 psi. in 28 days.
    - e. Minimum Flexural Properties: 1,250 psi in 28 days in accordance with ASTM C348.
    - f. Modulus of Elasticity: 4.1 to 4.5 by 106 psi in accordance with ASTM C469.
    - g. Maximum Permeability: 1,000 coulombs in accordance with AASHTO T 277.
    - h. System shall NOT produce a vapor barrier.
- B. Sprayable, extremely low permeability, sulfate resistant, easy to use, and requiring only the addition of water.

- C. Free of chlorides and other chemicals causing corrosion.
- D. Manufacturer and Product:
  - 1. BASF Building Systems, MasterEmaco S 488CI.
  - 2. Sika Corp., Lyndhurst, NJ; SikaRepair 224.

## 2.2 SHOTCRETE MORTAR (FOR VERTICAL AND OVERHEAD REPAIRS)

- A. Mortar:
  - 1. Blend of Portland cements, microsilica, aggregates and fibers designed for the repair of vertical and overhead surfaces.
  - 2. Workable down to 1/4" thickness.
  - 3. Shall NOT contain chlorides, nitrates, or high aluminum cements.
- B. Properties:
  - 1. Working time: 5 – 10 minutes, Finishing time: 10 – 20 minutes, Color: dark gray.
  - 2. Compressive strength per ASTM C109:
    - a. 6,000 psi min at 7 days.
    - b. 7,000 psi min at 28 days.
  - 3. Flexural Strength per ASTM C78: 1,100 psi min at 28 days.
  - 4. Splitting Tensile Strength per ASTM C496: 400 psi min at 28 days.
  - 5. Certified to meet NSF 61 for potable water projects.
- C. Manufacturers and Products:
  - 1. BASF Building Systems, MasterEmaco S 211 SP.
  - 2. Sika Corp., SIKACHEM 103F.

## 2.3 POLYMER-MODIFIED REPAIR MORTAR (HORIZONTAL SURFACE REPAIR)

- A. Mortar: One component, polymer-modified, cementitious based, chloride resistant, flowable, gray in color, working time of 20 minutes minimum, surface renovation mortar conforming to the following properties:
  - 1. Bond strength in accordance with ASTM C1042 Test Method at 7 days: Minimum 1,750 psi.
  - 2. Modules of Elasticity: ASTM C469, minimum 2.0 by 10<sup>6</sup> psi.
  - 3. Compressive Strength:
    - a. ASTM C109 at 1 day: minimum 2,500 psi.
    - b. ASTM C109 at 28 days: minimum 7,500 psi.
  - 4. Flexural Properties, ASTM C348 at 28 days: minimum 1,200 psi.
  - 5. Permeability, AASHTO T 277: 800 coulombs maximum.
  - 6. Splitting Tensile Strength: ASTM C496 at 7 days, minimum 450 psi.
  - 7. Drying Shrinkage, ASTM C596 at 28 days: -0.090%.
  - 8. Freeze Thaw Resistance, ASTM C666, at 300 cycles: 95% RDF.
  - 9. Abrasion Resistance: ASTM C799, 60 minutes, 0.0165".
- B. Manufacturers and Products:
  - 1. BASF Building Systems, MasterEmaco T 310 CI (NOT for potable water structures).
  - 2. Sika Corp, SikaTop 111 Plus (for potable water structures).

## 2.4 HIGH EARLY STRENGTH REPAIR MORTAR (HORIZONTAL SURFACE REPAIR)

- A. Mortar: One or two component, fast-setting, high early strength repair mortar.
- B. Properties:
  - 1. Compressive Strength per ASTM C109:

- a. 1,500 psi min at 2 hours.
- b. 4,500 psi min at 1 day.
- c. 8,000 psi min at 7 days.
- d. 9,000 psi min at 28 days.
- 2. Flexural Strength per ASTM C348:
  - a. 850 psi min at 1 day.
  - b. 1,000 psi min at 7 days.
  - c. 1,100 psi min at 28 days.
- 3. Slant Shear Bond Strength per ASTM C882:
  - a. 2,500 psi min at 1 day.
  - b. 2,900 psi min at 7 days.
  - c. 3,100 psi min at 28 days.
- 4. Splitting Tensile Strength per ASTM C496:
  - a. 850 psi min at 1 day.
  - b. 1,200 psi min at 7 days.
  - c. 1,300 psi min at 28 days.
- 5. Chloride Ion Permeability per AASHTO T277:
  - a. 960 coulombs max at 28 days.

C. Manufacturers and Products:

- 1. BASF Building Systems, MasterEmaco T 415 (NOT for potable water structures).
- 2. Euclid Chemical Co, Versaspeed (NOT for potable water structures).

2.5 WATER

- A. Clean and free from oil, acid, alkali, organic matter, or other deleterious substances, meeting federal drinking water standards.

2.6 REINFORCEMENT

- A. Per Section 03 20 00, CONCRETE REINFORCING.

2.7 ACCESSORIES

- A. Finishing Aid Manufacturer and Product: BASF Building Systems, MasterKure ER 50.
- B. Flexible Cementitious Rebar Coating Manufacturer and Product:
  - 1. BASF Building Systems, MasterEmaco P 124.
  - 2. Sika Corp., Armatec 110 EpoCem.

PART 3 - EXECUTION

3.1 GENERAL

- A. Where required because of deficiencies, concrete surface repair system shall be appropriate for the surface type and allowable schedule.

3.2 PREPARATION

- A. Remove unsound and deteriorated concrete from Work by high pressure water blasting machines capable of scoring concrete surfaces to minimum amplitude roughness of 3/16" or as shown. Remove to provide for maximum thickness specified for mortar.
- B. High pressure water blasting machines with 8,000 psi minimum.

- C. Collect and dispose of water from removal operations in manner and location acceptable to Owner.
- D. DO NOT use power-driven jackhammers and chipping hammers, unless water blasting is prohibited due to potential damage to installed equipment.
- E. Remove concrete minimum of 1" clearance around rebar for application and bonding of new mortar to entire periphery of exposed rebar if the following surface conditions exist:
  1. 50% or more of periphery around rebar is exposed during removal of concrete.
  2. 25% or more of periphery around rebar is exposed during removal of concrete and corrosion has eventuated to the extent that loss of section has occurred.
  3. Bond between existing concrete and reinforcement has deteriorated.
- F. Clean exposed reinforcing bars of rust and concrete, and coat with flexible cementitious rebar coating.
- G. Maintain surface areas free of slurry where concrete has been removed. Remove slurry from prepared areas before new mortar is applied.
- H. Square edges of repair area by sawing or chipping to avoid feathered edges.
- I. Clean surface areas to be filled with new mortar of laitance and contamination by high pressure water blasting NOT more than 24 hours before applying bonding agent, Saturated Surface Dry (SSD) existing concrete at time of application of mortar.

### 3.3 LOW PRESSURE SPRAY MORTAR APPLICATION

- A. Mix mortar in mortar-concrete mixer attached to pump-spray equipment for spray application. Mix with a slow speed drill and jiffler-type paddle or small mortar type mixer for hand trowel application.
- B. Apply mortar by low pressure spraying with a machine such as Moynotype, MEYCO DEQUNA Model 20.
- C. Finish mortar with a hand float application to smooth even surface matching adjacent concrete. Provide finishing aid at full strength.
- D. Bonding Agent:
  1. Hand apply bonding agent within 20 minutes of troweling on mortar. Prevent bonding agent from drying by reapplying bonding agent to maintain surface tackiness of coat.
  2. Work mortar firmly and quickly into area and compact with firm trowel stroke. Finish smooth with finishing aid at full strength.

### 3.4 SHOTCRETE MORTAR APPLICATION

- A. Apply mortar in accordance with ACI 506.2 and per manufacturer's instructions.
- B. DO NOT reuse rebound materials.
- C. Mortar shall be applied in a steady, uninterrupted flow. Hold nozzle at right angles to the surface.
- D. Apply at minimum thickness of 2" of cover over existing reinforcement or to level of surrounding concrete, whichever is thicker.
- E. Apply finish to mortar to match existing concrete finish.

3.5 POLYMER-MODIFIED REPAIR MORTAR APPLICATION FOR REPAIR OF HORIZONTAL SURFACES

- A. Mix mortar in mortar-concrete mixer.
- B. Hand Troweling: Apply (scrub in) a bond coat slurry of the repair mortar to the SSD prepared substrate before application of the mortar. DO NOT apply more of the bond coat than can be covered with mortar before the bond coat dries. DO NOT re-temper this bond coat.
- C. Place mortar into prepared area from one side to the other.
- D. Work material firmly into the side and bottom of patch to assure a good bond. Level repair mortar and screed to elevation of existing concrete.
- E. Finish to same texture as existing concrete around patch.
- F. Use self-leveling mixture where appropriate to obtain uniform or plane surface.

3.6 HIGH EARLY STRENGTH MORTAR APPLICATION

- A. Remove standing water from application area.
- B. Apply bond scrub mortar coat per manufacturer's instructions.
- C. Work material into bottom and sides of the patch to ensure good continuous bond.
- D. Level mortar to match elevation of existing concrete.
- E. Finish to same texture as existing concrete.

3.7 CURING

- A. Water fog nozzle all of the mortar systems prior to curing in accordance with mortar system Manufacturer's instructions.
- B. Commence water curing after mortar system application and when curing shall NOT cause erosion of mortar.
- C. Continuously cure mortar system for a period of 7 days.
- D. DO NOT membrane cure, unless method is part of mortar system Manufacturer's instructions and approval has been obtained.
- E. Cure intermediate layers of mortar in accordance with manufacturer's instructions.

3.8 FIELD QUALITY REQUIREMENTS

- A. Independent testing laboratory shall perform the following:
  - 1. Secure production samples of mixed materials during construction and test for compliance with the Specifications.
  - 2. Obtain actual core samples from the completed repair Work and test, where required.
  - 3. Perform "modified" ASTM C109 and ASTM C882 test methods in accordance with manufacturer's approved modifications of testing procedures.
- B. Construction Testing:

1. Production Samples:
  - a. Obtain mixed mortar material from shotcrete or spray equipment and produce samples, and cure samples prior to testing.
  - b. Provide minimum of three samples each test for each 1,000 square feet or portion thereof of mortar repair to be installed.
2. Core Samples of In-Place Repair:
  - a. Obtain two core samples and test samples for each 2,000 square feet or portion thereof for actual repair Work.
  - b. Cores shall be either 2-1/2" or 3" in diameter and shall be cored through cured mortar repair and into base concrete to total depth equal to at least 2.5 times repair mortar thickness.
  - c. Sawcut the cores after removal to trim base concrete thickness to same thickness as mortar so that bond line is at center of repaired sample.
  - d. Samples shall be epoxy bonded to steel plates at each end using a bonding agent to prevent failure in bond to steel plates.
  - e. Sustain bond line without failure or movement with a minimum of 300 psi in direct tension. The tension test shall use eyebolts or threaded connectors tapped and threaded into base plate so that tension load is concentric with center of core sample.

- C. Repair and fill holes where core samples have been removed using same mortar used in repair.
- D. If possible, use Direct Tension Bond Test per ASTM C1583 in place of core sampling.

### 3.9 MANUFACTURER'S SERVICES

- A. Provide mortar system manufacturer's representative at site for installation assistance, inspection and certification of proper installation, and training of mortar system applicators.
- B. Mortar System Manufacturer's Demonstration:
  1. Schedule a time for Manufacturer's demonstration of repair system proposed for the Project. Prepare mortar, to specified consistency, for testing and placement. Initiate curing on portions of each type of surface to be repaired to include overhead and vertical applications.
  2. Prepare surface area in advance of demonstration and obtain manufacturer's acceptance of preparation for each type of application.
  3. Demonstrate:
    - a. Mixing and application equipment capabilities and procedures, including the flow of material from nozzle or sprayer.
    - b. Nozzle operator and person in charge of low-pressure sprayer, capabilities, and ability to follow prescribed application procedures and properly operate equipment and apply surface repair materials.
  4. Make compression test samples during demonstration and deliver to an independent testing laboratory for testing at 1, 7, and 28 days. Take a core of the demonstration placement, or demonstrate Direct Bond Tensile test, and test for tensile bond at 1 day.

### 3.10 PROTECTION

- A. Protect adjacent surfaces, and equipment, from being damaged by overshooting of low-pressure spray mortar.

3.11 CLEANING

- A. Remove overshot mortar and deposited rebound materials as Work proceeds. Remove from Work, waste materials, unsound material from concrete surfaces, material chipped from walls, water used in preparation of application and finishing.

END OF SECTION

## SECTION 03 10 00 – CONCRETE FORMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.
  - 2. Section 03 35 00 – Concrete Finishing.
  - 3. Section 03 62 00 – Non-Shrink Grouting.

#### 1.2 REFERENCES

- A. The following is a list of standards which may be referenced:
  - 1. ACI:
    - a. 117, Standard Specifications for Tolerances for Concrete Construction and Materials.
    - b. 350, Code Requirements for Environmental Engineering Concrete Structures
    - c. 347, Formwork for Concrete.
  - 2. NSF International: 61, Drinking Water System Components – Health Effects.

#### 1.3 DESIGN REQUIREMENTS

- A. Design formwork in accordance with ACI 301, ACI 347, and ACI 350 to provide concrete finishes specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. When high range water reducer (superplasticizer) is used in concrete mix, forms shall be designed for full hydrostatic pressure per ACI 347.
- C. Make joints in forms watertight.
- D. Limit panel deflection to 1/360th of each component span to achieve tolerances specified.
- E. Ensure compatibility between form liner and concrete mixture with manufacturer and concrete producer.

#### 1.4 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Shop Drawings:
  - 1. Form Ties-Tapered Through-Bolts: Proposed method of sealing form tie hole; coordinate with details shown.
  - 2. Manufacturer's Data for the Following Products:
    - a. Form-release agent.
    - b. Form liners.
- C. Samples: One each as follows:
  - 1. Form ties.
- D. Information Submittals:
  - 1. Statement of qualification for formwork designer.
  - 2. Statement of qualification for form liner designer and installer.
- E. Mockup Panel – for each form liner type.



## 1.5 QUALIFICATIONS

- A. Formwork Designer: Formwork, falsework, and shoring design shall be by an Engineer licensed in the State of the project site.
- B. Form liner designer shall have previous experience with the design and installation of similar form liners.
- C. Form liner installer shall be approved by the manufacturer.

## PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

- A. Wall Forms and Underside of Slabs:
  - 1. Materials: Plywood, hard plastic finished plywood, overlaid waterproof particle board, or steel in "new and undamaged" condition, of sufficient strength and surface smoothness to produce specified finish.
  - 2. Circular Structures:
    - a. Conform forms to circular shape of structure.
    - b. Straight panels may be substituted for circular forms provided panels DO NOT exceed 2' in horizontal width and angular deflection is no greater than 3-1/2° per joint.
- B. Painted Surface Forms: High density overlay plywood for flat concrete surfaces to be painted.
- C. Form Liners: Elastomeric FRP, ABS or PVC.
- D. All Other Forms: Materials as specified for wall forms.
- E. Form-Release Agent:
  - 1. Material: Release agent shall NOT bond with, stain, or adversely affect concrete surfaces, and shall NOT impair subsequent treatments of concrete surfaces when applied to forms or form liners. A "ready to use" water-based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations and can be used in potable water facilities. Certified as complying with NSF 61.
  - 2. Manufacturers and Products:
    - a. Atlas Construction Supply; Bio-Guard
    - b. Cresset Chemical Company; Crete-Lease 20-VOC.
    - c. Hill and Griffith; Grifcote LV-50 Plus
- F. Rustication Grooves and Beveled Edge Corner Strips: Nonabsorbent material, compatible with form surface, fully sealed on all sides prohibiting loss of paste or water between the two surfaces.
- G. Form Ties:
  - 1. Material: Steel
  - 2. Spreader Inserts:
    - a. Conical or spherical type.
    - b. Design to maintain positive contact with forming material.
    - c. Furnish units that shall leave no metal closer than 1" to concrete surface when forms, inserts, and tie ends are removed.
  - 3. Wire ties NOT permitted.
  - 4. Flat bar ties for panel forms furnish plastic or rubber inserts with minimum 1" depth and sufficient dimensions to permit patching of tie hole.

5. Water Stop Ties: For water-holding structures, basements, pipe galleries, and accessible spaces below finish grade, furnish one of the following:
  - a. Integral steel water stop 0.103" thick and 0.625" in diameter tightly and continuously welded to tie.
  - b. Neoprene water stop 3/16" thick and 15/16" diameter whose center hole is 1/2-diameter of tie, or molded plastic water stop of comparable size.
  - c. Orient water stop perpendicular to tie and symmetrical about center of tie.
  - d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.
6. Through-Bolts: Tapered minimum 1" diameter at smallest end.
7. Elastic Vinyl Plug:
  - a. Design and size of plug to allow insertion with tool to enable plug to elongate and return to original length, and diameter upon removal forming watertight seal.
  - b. Manufacturer and Product: Dayton/Richmond Co., Miamisburg, OH; A58 Sure Plug.
  - c. Sika Corporation; X-Plug
  - d. Recess plug 1" minimum and grout over hole. See Section 03 62 00, NON-SHRINK GROUTING.

### PART 3 - EXECUTION

#### 3.1 FORM SURFACE PREPARATION

- A. Thoroughly clean form surfaces that shall be in contact with concrete or that have been in contact with previously cast concrete, dirt, and other surface contaminants prior to coating surface.
- B. Exposed Wood Forms in Contact with Concrete: Apply form-release agent as recommended by the manufacturer.
- C. Steel Forms: Apply form-release agent to steel forms as soon as they are cleaned to prevent discoloration of concrete from rust.
- D. Form Liner Forms:
  1. Prepare forms as recommended by the manufacturer.
  2. Provide liners in full sheets and locate seams as shown on approved shop drawings.
  3. Clean form liner after each use and use only form-release agents approved by the manufacturer.

#### 3.2 ERECTION

- A. General: Unless specified otherwise, follow applicable recommendations of ACI347.
- B. Beveled Edges (Chamfer):
  1. Form 3/4" bevels at concrete edges, unless otherwise shown.
  2. Where beveled edges on existing adjacent structures are other than 3/4", obtain Engineer's approval of size prior to placement of beveled edge.
- C. Wall Forms:
  1. DO NOT reuse forms with damaged surfaces.
  2. Locate form ties and joints in an uninterrupted uniform pattern.
  3. Inspect form surfaces prior to installation to assure conformance with specified tolerances.
- D. Forms Supporting Form Liners:
  1. Construct to withstand the high hydraulic pressures associated with rapid filling and heavy high-frequency vibration.

- E. Form Liner Installation:
  1. Protect form liners from extended exposure to sunlight and high surface temperatures during installation.
  2. Install form liners per manufacturer's written instructions.
  3. Place form liners in accordance with specified patterns and joints.
  4. Maintain required concrete cover between form liner and reinforcement.
  
- F. Forms for Curbs and Sidewalks:
  1. Provide standard steel or wood forms.
  2. Set forms to true lines and grades, and securely stake in position.
  
- G. Form Tolerances: Provide forms in accordance with ACI 117, 347 and 318 and the following tolerances for finishes specified:
  1. Wall Tolerances:
    - a. Straight Vertical or Horizontal Wall Surface: Flat planes within tolerance specified.
    - b. Wall Type W-A:
      - 1) Plumb within 1/4" in 10' or within 1" from top to bottom for walls over 40 feet high.
      - 2) Depressions in Wall Surface: Maximum 5/16" when 10' straightedge is placed on high points in all directions.
    - c. Wall Type W-B:
      - 1) Plumb within 1/8" in 10' or within 1/2" from top to bottom for walls over 40' high.
      - 2) Depressions in Wall Surface: Maximum 1/8" when 10' straightedge is placed on high points in all directions.
  2. Thickness: Maximum -1/4" or +1/2" from dimension shown.
  3. Form Offset: Between adjacent pieces of form work, facing material shall NOT exceed 1/8" where exposed to public view and 1/4" maximum for all other conditions.

### 3.3 ADDITIONAL REQUIREMENTS

- A. Construct forms tight enough to prevent loss of concrete mortar.
  
- B. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  1. Install keyways, reglets, recesses and the like for easy removal.
  2. DO NOT use rust-stained steel form-facing material.
  3. Use only form or form-tying methods which DO NOT cause spalling of the concrete upon form stripping or tie removal.
  
- C. Elevated Structural Slabs and Beams: DO NOT strip forms until concrete has reached 80 percent of the specified 28-day strength as determined by test cylinder breaks.
  
- D. Forms with Form Liners: Remove per manufacturer's recommendations. Use consistent removal timing to avoid variations in concrete color. Avoid damaging formed profiles.
  
- E. Set edge forms, bulkheads and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
  
- F. Provide temporary 12-inch-wide x 18-inch-high openings for cleanouts and inspection ports every 7 feet at the bottom of each lift form and where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations, where possible.

- G. Chamfer exterior corners and edges of permanently exposed concrete.
- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds and bulkheads required in the Work.
  - 1. Determine sizes and locations from trades providing such items.
  - 2. Openings shall be of sufficient size to permit final alignment of pipes or other items without deflection or offsets of any kind. Allow space for packing where items pass through the wall to ensure watertightness. Provide openings with continuous keyways and waterstops. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated in the typical structural details. Reinforcing shall be at least 2 inches clear from the opening surfaces and encased items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions before placing reinforcement.
- L. Embedded Items.
  - 1. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions and directions furnished with items to be embedded.
    - a. Install anchor bolts/rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
    - b. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles and other conditions.
    - c. Check special castings, channels or other metal parts that are to be embedded in the concrete prior to and again after placing the concrete.
    - d. Check nailing blocks, plugs and strips necessary for the attachment of trim, finish and similar work prior to placing the concrete.
- M. Pipes and wall spools cast in concrete.
  - 1. Install wall spools, wall flanges, and wall anchors before placing concrete. DO NOT weld, tie or otherwise connect the wall spools or anchors to the reinforcing steel.
  - 2. Support pipe and fabricated fittings to be encased in concrete-on-concrete piers or pedestals. Carry concrete supports to firm foundations so that no settlement shall occur during construction.
  - 3. Pipes or spools located below operating water level shall have waterstop ring collars and shall be cast in place. DO NOT block out such piping and grout after the concrete section is cast. Pipes fitted with thrust rings shall be cast in place.
- N. Removing and reusing forms.
  - 1. General: DO NOT remove forms from concrete which has been placed with outside temperature below 50°F without first determining and verifying with Engineer if the concrete has properly set without regard for time. DO NOT apply loading on green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.
    - a. Leave formwork for beam soffits, joists, structural slabs, beams, girders, and other structural elements that support weight of concrete in place until concrete has achieved 100 percent its 28-day design compressive strength.

- b. Formwork for sides of beams, walls, columns, and similar parts of the Work that does NOT support weight of concrete may be removed after cumulatively curing at NOT less than 50°F (10 deg C) for 48 hours after placing concrete, if concrete is hard enough to NOT be damaged by form-removal operations and curing and protection operations are maintained.
    - c. Leave bracing for walls until the top or roof slab concrete reaches 100% of its 28-day design compressive strength.
    - d. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
  - 2. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated or otherwise damaged form-facing material shall NOT be acceptable for exposed surfaces. Apply new form-release agent.
  - 3. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. DO NOT use patched forms for exposed concrete surfaces.
- O. Aluminum surfaces in contact with concrete.
  - 1. Aluminum surfaces in contact with concrete or grout or dissimilar metals shall be protected with a Mylar isolator, bituminous paint or other material approved by Engineer.
- P. Shores and reshores.
  - 1. Comply with ACI 318 (ACI 318M) and ACI 301 for design, installation and removal of shoring and reshoring.
    - a. DO NOT remove shoring or reshoring until measurement of slab tolerances is complete.
  - 2. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member shall be excessively loaded or shall induce tensile stress in concrete members without sufficient steel reinforcement.
  - 3. For multi-storied structures, the shoring and reshoring diagrams and procedures shall be signed and sealed by a Registered Professional Engineer in the state where the construction is being undertaken. These diagrams and procedures shall take into account the effect of the loads on the uncured concrete and the construction load on each floor.
  - 4. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

END OF SECTION

## SECTION 03 15 00 – CONCRETE JOINTS AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Waterstops
  - 2. Joint Fillers
  
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.

#### 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. A36 – Specification for Carbon Structural Steel.
  - 2. C920 – Specification for Elastomeric Joint Sealants.
  - 3. D570 – Standard Test Method for Water Absorption of Plastics.
  - 4. D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
  - 5. D638 – Standard Test Method for Tensile Properties of Plastics.
  - 6. D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
  
- B. U.S. Army Corps of Engineers (USACE):
  - 1. CRD-C-572 – Specification for Polyvinyl Chloride Waterstop.
  
- C. NSF International (NSF):
  - 1. 61 – Drinking Water Components – Health Effects.

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
  
- B. Product Data:
  - 1. Polyvinyl Chloride (PVC) Waterstop.
  - 2. Bond Breaker.
  - 3. Premolded Joint Fillers.
  - 4. Pourable Joint Fillers.
  - 5. Preformed Control Joints.
  - 6. Dowels.
  
- C. Shop Drawings:
  - 1. Construction Joints, Expansion Joints, and Control Joints: Layout and location for each type. Include joint locations shown on the drawings, additional required joint locations, and any proposed alternate locations.
  
- D. Samples:
  - 1. PVC waterstop prefabricated splice, joint and cross of each type used on the project.
  
- E. Manufacturer's Certificate:
  - 1. Joint Filler for Potable Water Structures: Confirmation that material is certified to NSF 61.
  - 2. Joint Filler for Aeration or Oxygenation Basins: Confirmation that material is suitable for the oxygen content used in the process.

3. PVC Waterstop meets or exceeds the physical properties requirements of USACE CRD-C-572.

F. Manufacturer's Instructions:

1. For storage, handling, application/installation, and repair of:
  - a. Waterstop.
  - b. Bond Breaker.
  - c. Premolded Joint Fillers.
  - d. Pourable Joint Fillers.
  - e. Prefomed Control Joints.

#### 1.4 QUALITY ASSURANCE

A. Field-Welded Joints:

1. PVC waterstop field-welded joints shall be free of misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the resistance to water pressure. Replace defective joints.

B. Inspections:

1. Quality of welded joints shall be subject to acceptance by the Engineer.
2. PVC Waterstop: The following defects represent a partial list of grounds for rejection:
  - a. Offset of joints greater than 1/16-inch.
  - b. Exterior crack at joint due to incomplete bond which is greater than 1/16-inch.
  - c. Any combination of offset and crack resulting in a net reduction of the cross section greater than 1/16-inch.
  - d. Misalignment of joint which shall result in misalignment of the waterstop in excess of 1/2-inch in 10 feet.
  - e. Porosity in the welded joint detectable through visual inspection.
  - f. Bubbles or inadequate bonding.

#### 1.5 MOCKUPS

A. Welding Demonstration

1. Demonstrate ability to weld acceptable joints in PVC waterstops before installing waterstops in forms.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials under cover to protect from oil, dirt, and sunlight as required by the Manufacturer.

### PART 2 - PRODUCTS

#### 2.1 METAL WATERSTOPS

A. Stainless Steel Waterstops:

1. For use in chemical containment where PVC or TPER is NOT compatible.
2. ASTM A240, Type 316L, 20-gage thickness, nominal 6-inches wide.
3. Manufacturers:
  - a. Greenstreak, Model No. 499.
  - b. Earthshield, Model No. JP 558.
  - c. Or equal.

#### 2.2 THERMOPLASTIC ELASTOMERIC RUBBER (TPER) WATERSTOP

- A. For use where ozone resistance is required.

- B. Compound shall NOT contain scrapped material, reclaimed material, or pigment.
- C. Ozone resistance per ASTM D1171 for 450 pphm.
- D. Type: Ribbed with center bulb:
  - 1. Construction Joints – 6”.
  - 2. Expansion Joints – 9”.
- E. Manufacturers:
  - 1. Westec Barrier Technologies; Envirostop 600 Series.
  - 2. Vinylex; Model VRB6316 – 6”, VRB9316 – 9”.
  - 3. Or equal.

2.3 POLYVINYL CHLORIDE (PVC) WATERSTOP

- A. Manufactured from prime virgin PVC. Compound shall have no scrap or reclaimed material.
- B. Properties as indicated in the following table:

Physical Characteristics	Test Method	Required Results
Specific Gravity	ASTM D792	Not less than 1.3.
Hardness	ASTM D2240	70 to 90 Type A15 Shore durometer.
Tensile Strength	ASTM D638	NOT less than 2,000 pounds per square inch.
Ultimate Elongation	ASTM D638	NOT less than 300 percent.
Alkali Extraction	CRD-C-572	7-day weight change between minus 0.1 percent and plus 0.25 percent. Hardness change within 5 points.
Low Temperature Brittle Point	ASTM D746	No sign of cracking or chipping at -35 degrees Fahrenheit minimum.
Water Absorption	ASTM D570	NOT more than 0.15 percent after 24 hours.
Accelerated Extraction Tensile	CRD-C-572	NOT less than 1,600 pounds per square inch.
Stiffness in Flexure	ASTM D747	NOT less than 600 pounds per square inch.
Tear Resistance	ASTM D624	NOT less than 225 pounds per inch.
Thickness	–	3/8 inch.

- C. Performance requirements per COE Specification CRD-C-572.
- D. Unless otherwise specified on drawings, waterstop types shall be as follows:
  - 1. Construction Joints: 6-inch wide flat ribbed or centerbulb.
  - 2. Manufacturers: Flat Ribbed.
    - a. Vinylex; R638.
    - b. Sika Greenstreak; 679.
    - c. Or equal.
  - 3. Manufacturers: Centerbulb.
    - a. Vinylex; RB638H.
    - b. Sika Greenstreak; 732.
    - c. Or equal.
  - 4. Expansion and Contraction Joints: 9-inch wide centerbulb.



- 5. Manufacturers:
  - a. Vinylex; RB938H.
  - b. Sika Greenstreak; 735.
  - c. Or equal.

#### 2.4 HYDROPHILIC WATERSTOP

- A. For use only where new concrete is placed against existing concrete and where shown on drawings.
- B. Non-bentonite hydrophilic rubber compound.
- C. Manufacturers:
  - 1. Adeka Ultra Seal; MC-2010M with 3M-2141 adhesive and P-201 sealant.
  - 2. Sika Greenstreak; Hydrotite CJ-1020-2K with Leakmaster LV-1 adhesive and sealant.
  - 3. Or equal.

#### 2.5 INJECTION-TYPE WATERSTOP

- A. Reinjectable Waterstop Hose System – use where shown on drawings.
- B. Waterstop Hose:
  - 1. PVC compound.
  - 2. Creates uniform discharge of injection material over entire length of hose.
  - 3. Can be cleaned using water and vacuum pressure.
- C. Injection Material:
  - 1. Resin grout as recommended by waterstop hose manufacturer.
- D. Manufacturers:
  - 1. Deneef; TRIOject Injection Hose System with Hydro Active Grout.
  - 2. Sika Greenstreak; Fuko Injection Hose System with Multigel 850.
  - 3. Or equal.

#### 2.6 RETROFIT PVC WATERSTOP

- A. Material – see PVC waterstop.
- B. Stainless Steel Batten Bar – AISI Type 304.
- C. Manufacturers:
  - 1. Vinylex; RET638.
  - 2. Sika Greenstreak; 609.
  - 3. Or equal.

#### 2.7 BOND BREAKER

- A. Tape for Joints:
  - 1. Adhesive-backed glazed butyl or polyethylene tape.
- B. Use bond breaker as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, except where bond breaking tape is specifically called out on drawings.

## 2.8 PREMOLDED JOINT FILLER

- A. Sponge Rubber:
  - 1. Neoprene, closed cell, ASTM D1056 Type 2C5.
  - 2. Manufacturer:
    - a. Monmouth Rubber and Plastics; Durafoam DK5151, or equal.

## 2.9 POURABLE JOINT FILLERS

- A. Meet requirements of NSF 61 for potable water containment structures.
- B. Self-leveling or non-sag for use in level, sloping, or vertical joints.
- C. Manufacturer:
  - 1. Sika Corp.; Sikaflex-2c SL, or equal.

## 2.10 PREFORMED CONTROL JOINTS

- A. One-Piece, flexible PVC.
- B. Manufacturer:
  - 1. WR Meadows; Keyway, or equal.

## 2.11 JOINT SEALANT

- A. One-part polyurethane, moisture curing, ASTM C920, Type S, Grade NS or P, Class 25, capable of being continuously immersed in water.
- B. Manufacturer:
  - 1. Sika Corp; Sikaflex-1a, or equal.

## PART 3 - EXECUTION

### 3.1 SURFACE PREPARATION

- A. Construction Joints:
  - 1. Remove laitance from reinforcement and dowels.
  - 2. Roughen surface to min 1/4-inch amplitude.
  - 3. Protect waterstop, if present.
- B. Expansion Joints:
  - 1. Mechanically roughen joint on each side of waterstop.
  - 2. Use high-pressure air to clean joint.
  - 3. Prime surfaces as required before placing joint filler.
  - 4. Protect waterstop.
- C. Contraction Joint:
  - 1. Coat concrete surfaces above and below waterstop with bond breaker.
  - 2. DO NOT coat waterstop.

### 3.2 INSTALLATION OF WATERSTOPS

- A. General:
  - 1. Waterstop shall be installed in all wall and slab joints of hydraulic structures and below grade structures, unless noted otherwise.

2. Join waterstop at intersections to provide a continuous seal.
  3. The center axis of the waterstop shall be placed at the joint. The waterstop shall be placed in the center of the wall or slab to be sealed, unless noted otherwise on the drawings.
  4. Secure waterstop in position using tie wire to reinforcement at a maximum spacing of 24 inches. DO NOT displace waterstop during concrete placement.
  5. Repair or replace damaged waterstop.
  6. Slabs with horizontal waterstop: limit concrete placement to elevation of waterstop in first pass, ensure space beneath waterstop completely fills with concrete, vibrate under waterstop, then place remaining concrete to full height of slab.
  7. If any waterstop, once installed on one side of a joint, is exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to protect the exposed waterstop from direct sunlight until embedded in concrete.
- B. Metal Waterstops:
1. Where spliced, lap at least 12 inches and secure with sheet metal screws.
  2. Install per manufacturer's written instructions.
  3. Install where shown on drawings.
- C. TPER Waterstops:
1. Install similar to PVC waterstops in accordance with manufacturer's written instructions.
  2. Use only factory-made waterstop fabrications for all intersections, changes of direction and transitions.
  3. Field splice permitted only for straight butt welds.
- D. PVC Waterstops:
1. Install per manufacturer's written instructions.
  2. Splice using Teflon-coated thermostatically controlled heating iron at approximately 380 degrees F.
    - a. Use only factory-made waterstop fabrications for all intersections, changes of direction and transitions.
    - b. Field splice permitted only for straight butt welds.
    - c. The continuity of the waterstop ribs and center bulb shall be maintained.
    - d. Allow at least 10 minutes before the new splice is strained in any way.
    - e. Finished splices shall provide a cross section that is dense and free of porosity with a tensile strength that is NOT less than 80 percent of the original materials.
- E. Hydrophilic Waterstop:
1. Install in accordance with manufacturer's written instructions.
  2. Provide a minimum of 2-1/2 inches of concrete cover over waterstop.
  3. Lap ends of waterstop strip together at splices and corners and join with sealant.
  4. DO NOT allow the vibrator to contact the waterstop.
  5. Lap hydrophilic waterstop a minimum of 2 feet with intersecting plastic waterstop.
- F. Injection-Type Waterstop:
1. Install per manufacturer's written instructions.
  2. After concrete has cured for a minimum of 28 days, inject resin grout into waterstop hose as instructed by manufacturer.
  3. When complete, clean out hose to allow for future injections.
- G. Retrofit PVC Waterstop:
1. Install per manufacturer's written instructions.
  2. Apply a bed of epoxy slightly wider than the waterstop base to the concrete surface.
  3. Before the epoxy cures, place the waterstop, securing with stainless steel batten bars and stainless steel post-installed anchors. Make sure to eliminate any air pockets or voids between the waterstop and the existing concrete.
  4. Butt splice as with PVC waterstop prior to attaching to concrete.

- H. Pre-Molded Joint Filler:
  - 1. Install per manufacturer's written instructions.
  - 2. Sufficient in width to completely fill joint space.
  - 3. Where waterstop is present, cut to butt tightly against waterstop and concrete face.
  
- I. Pourable Joint Filler:
  - 1. Install per manufacturer's written instructions and:
    - a. Apply primer prior to pouring joint filler.
    - b. Fill entire joint above waterstop.
    - c. Use masking tape at top of slab at each side of the joint; move tape, and clean spillage.
    - d. Sealant products used as fillers need NOT meet sealant geometry parameters.
  
- J. Preformed Control Joints:
  - 1. Use only where specifically shown on drawings. DO NOT use in water-holding basins.
  - 2. Install per manufacturer's written instructions.

END OF SECTION

## SECTION 03 20 00 – CONCRETE REINFORCING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Reinforcing steel and related items required for cast-in-place concrete.
- B. Related sections:
  - 1. Section 03 10 00 – Concrete Forming.
  - 2. Section 03 30 00 – Cast-In-Place Concrete.

#### 1.2 REFERENCES

- A. American Concrete Institute (ACI):
  - 1. SP-66, Detailing Manual.
  - 2. 318 – Building Code Requirements for Structural Concrete.
  - 3. 350 – Code Requirements for Environmental Engineering Concrete Structures.
- B. ASTM International:
  - 1. A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
  - 2. A1064 – Standard Specification for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- C. Concrete Reinforcing Steel Institute (CRSI):
  - 1. Manual of Standard Practice.

#### 1.3 SUPERVISION

- A. Workmanship: Always provide qualified supervision reinforcing work is in progress. Workmen shall be experienced iron workers.
- B. Codes: Reinforcement placement and detailing shall comply with practice specified in the ACI SP-66 – Detailing Manual - latest edition of the American Concrete Institute or its latest revision, unless otherwise specified herein.

#### 1.4 SUBMITTALS

- A. Shop drawings: Shop drawings shall be prepared for all reinforcement required by the project. Shop drawings shall be logically and legibly prepared to permit reasonable ease of sorting, selecting, placing reinforcement as well as checking drawings. Preparer and fabricator shall be identified on the drawings.
  - 1. Reinforcement shall NOT be fabricated until the shop drawings have been processed, approved, and returned.
  - 2. Check all shop drawings to verify reinforcement dimensions required by drawings are satisfied.
  - 3. Provide bar sizes, bar lengths, bar material, bar grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and lap lengths, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- B. Reinforcement shop drawings:
  - 1. Review of reinforcement shop drawings by the Engineer shall be limited to general compliance with the Contract Documents.

2. Submit reinforcement shop drawings in a complete package for each specific structure. Partial submittals shall be rejected.
- C. Changes to reinforcing steel contract drawing requirements:
1. Indicate in separate letter submitted with shop drawings any changes of requirements indicated on the Drawings for reinforcing steel.
  2. Such changes shall NOT be acceptable unless the Engineer has accepted such changes in writing.

## PART 2 - PRODUCTS

### 2.1 CONCRETE REINFORCEMENT

- A. General: All reinforcement shall be free from rust, loose mill scale, and other contaminants.
- B. All bars shall be billet steel bars for concrete reinforcement ASTM A615 Grade 60.
- C. Wire bar supports located between reinforcing bars and face of concrete:
1. Stainless steel. Type 304 stainless steel bar supports.
  2. Support reinforcing for concrete placed on ground using bar support chairs with Type 304 stainless steel plates for resting on ground welded to the chairs.
- D. Concrete bar supports located between reinforcing bars and face of concrete:
1. Manufactured expressly for supporting reinforcing bars.
  2. Manufactured with two annealed steel wires to securely tie concrete bar support to reinforcing steel.
  3. Manufactured with minimum  $f'_c = 5,000$  psi concrete.

### 2.2 WWR (WELDED WIRE REINFORCEMENT):

- A. In accordance with ASTM A185 (withdrawn in 2013, replaced by A1064), 75ksi minimum tensile strength.
- B. WWR may NOT be used in place of reinforcing bars unless accepted in writing by the Engineer.
- C. Provide WWR in flat sheet form.
- D. If WWR is used, provide WWR having cross-sectional area per linear foot of NOT less than cross-sectional area per linear foot of reinforcing bars indicated on the Drawings.

### 2.3 ACCESSORIES

- A. General: Accessories shall be subject to Engineer's approval.
1. Tie wire - 18-gauge annealed steel wire.
  2. Number of chairs shall be adequate to prevent sag during steel and concrete placement.
  3. Wall layer spacers shall be 1/4-inch round "Z" bar.
  4. Horizontal layer spacers shall be wire bar supports or reinforcing bars bent to support top layer.
  5. Dowel bar splicer:
    - a. Dowel bar splicer shall be Richmond or approved equal, manufactured from standard specified rebar material, with NC threads and shop fabricated to specified dowel configurations.
  6. Mechanical Connectors:
    - a. Approved Manufacturers: Dayton Superior, Erico, or approved equal.

- b. The mechanical connection shall meet the code requirements of developing in tension and compression as required by the referenced codes. Install per the manufacturer's approved procedures.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Reinforcing bars and welded wire fabric reinforcement: Verify that reinforcement is new stock free from rust scale, loose mill scale, excessive rust, dirt, oil, and other coatings which adversely affect bonding capacity when placed in the work.
- B. Other trades: Coordinate all work of other trades to avoid conflict with reinforcement.
- C. Shop drawings: Check all shop drawings to verify dimensions required.

### 3.2 FABRICATING

- A. General: Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Reinforcement shall be shop fabricated except where straight bars No. 5 or smaller are required.
- B. Bending: All bending shall be by using bending jigs and mandrels. All bars shall be bent cold.
- C. Cutting: Bars shall be cut by cold shearing. Torch cutting in the field may be permitted in special situations.

### 3.3 PREPARATION

- A. Surface Preparation:
  - 1. Reinforcing bars: thin coating of red rust resulting from short exposure shall NOT be considered objectionable. Thoroughly clean any bars having rust scale, loose mill scale, or thick rust coat.
  - 2. Cleaning of reinforcement materials: Remove concrete or other deleterious coatings from dowels and other projecting bars by wire brushing or sandblasting before bars are embedded in subsequent concrete placement.

### 3.4 PLACING

- A. General:
  - 1. Accurately place all bars to meet tolerances as outlined in ACI 318 and tie in place before placing concrete, include dowels. Tie with 18-gauge steel wire.
  - 2. Corner bars required for horizontal reinforcing. Unless otherwise noted on plans corner bars shall be same size and spacing as horizontal bar.
  - 3. No field bending of bars shall be allowed.
- B. Clearance:
  - 1. Preserve clearance between bars of 1 inch minimum, NOT less than one bar diameter or 1-1/3 times large aggregate, whichever is larger.
  - 2. Provide following concrete coverage over reinforcing steel unless otherwise indicated on plans:
    - a. Three inches above subgrade - in excavation.
    - b. Two inches above subgrade - slab on fill.
    - c. Two inches from form - walls exposed to water or earth and for slab over water.
    - d. One and one-half inches from form - normal cover interior walls, beams, columns, etc.

- e. Three-fourths inch on top steel - interior slabs.
  - f. One and one-half inches on top and bottom - exterior slab.
  - 3. Lap all reinforcing bars as required by ACI 318-latest edition Class B as indicated on the drawings except where otherwise required by ACI.
  - 4. Stagger splices except where otherwise shown.
  - 5. Welded splices are NOT permitted.
  - 6. Lap welded wire reinforcement a minimum of two spaces.
- C. Dowels: All dowels shall be placed and securely anchored before placing concrete.
- D. Supports:
- 1. Provide enough to prevent sagging, to prevent shifting, and to support loads during construction; but in no case less than quantities and at locations as indicated in ACI 315 (SP-66).
  - 2. DO NOT use brick, broken concrete masonry units, spalls, rocks, wood, or similar materials for supporting reinforcing steel.
  - 3. DO NOT use reinforcing bars that have less cover than required by the Contract Documents.
  - 4. DO NOT adjust location of reinforcement required by the Contract Documents to provide cover to these bars.
  - 5. Wire chairs shall NOT be accepted to hold reinforcing clearance on walls.
- E. Tying of bar reinforcement:
- 1. Fasten bars securely in place with wire ties.
  - 2. Tie bars sufficiently often to prevent shifting.
  - 3. Provide at least 3 ties in each bar length.
  - 4. DO NOT apply to dowel lap splices or to bars shorter than 4 feet, unless necessary for rigidity.
  - 5. Tie slab bars at every intersection around periphery of slab.
  - 6. Tie wall bars and slab bar intersections other than around periphery at NOT less than every fourth intersection, but at NOT greater than following maximum spacings:

<b>Bar Size</b>	<b>Slab Bar Spacing Inches</b>	<b>Wall Bar Spacing Inches</b>
Bars Number 5 and Smaller	60	48
Bars Number 6 through Number 9	96	60
Bars Number 10 and Number 11	120	96

- 7. After tying wire ties, bend ends of wire ties in towards the center of the concrete section.
    - a. The cover for wire ties shall be the same as the cover requirements for reinforcing bars.
- F. Openings and Obstructions:
- 1. Place additional reinforcing around openings as shown on the drawings and standard details.
  - 2. Bend reinforcing around obstructions. Place extra reinforcing where cutting is authorized. Engineer's approval required before cutting steel.
  - 3. Consult Engineer on special situations.
- G. Welded Wire Reinforcement:
- 1. Install necessary wiring, spacing chairs, or supports to keep welded wire fabric in place while concrete is being placed.



2. Bend fabric as indicated on the Drawings or required to fit work.
3. Unroll or otherwise straighten fabric to make flat sheet before placing in the Work.
4. Lap splice welded wire fabric as indicated on the Drawings.
5. If lap splice length is NOT indicated on the Drawings, splice fabric in accordance with ACI 318 and ACI 350.

H. Certification: Certify material and type of deformation.

I. Condition: All reinforcement shall be free from loose rust, dirt coating, oil, paint, or any foreign substance.

END OF SECTION

## SECTION 03 30 00 – CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes Cast-in-Place Concrete for:
  - 1. Hydraulic (liquid containing) structures.
  - 2. Beams and columns.
  - 3. Building walls.
  - 4. Retaining walls.
  - 5. Foundation walls.
  - 6. Footings.
  - 7. Suspended slabs.
  - 8. Slabs on grade.
  - 9. Equipment pads.
  
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.
  - 2. Section 01 40 00 – Quality Requirements.
  - 3. Section 01 50 00 – Temporary Facilities and Controls.
  - 4. Section 01 60 00 – Product Requirements.
  - 5. Section 01 77 00 – Closeout Procedures.
  - 6. Section 03 01 00 – Maintenance of Concrete.
  - 7. Section 03 15 00 – Concrete Joints and Accessories.
  - 8. Section 03 35 00 – Concrete Finishing.
  - 9. Section 03 39 00 – Concrete Curing.
  - 10. Section 03 64 00 – Concrete Repair Crack Injection.

#### 1.2 REFERENCE STANDARDS

- A. American Concrete Institute (ACI):
  - 1. ACI 117 – Specification for Tolerances for Concrete Construction and Materials
  - 2. ACI 301 – Specifications for Structural Concrete
  - 3. ACI 305R – Guide to Hot Weather Concreting
  - 4. ACI 306.1 – Standard Specification for Cold Weather Concreting
  - 5. ACI 308.1 – Specification for Curing Concrete
  - 6. ACI 318 – Building Code Requirements for Structural Concrete
  - 7. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures
  - 8. ACI 350.1 – Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures
    - a. Manual of Concrete Practice
  
- B. ASTM International:
  - 1. C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field
  - 2. C33 – Standard Specification for Concrete Aggregates
  - 3. C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
  - 4. C42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  - 5. C94 – Standard Specification for Ready-Mixed Concrete
  - 6. C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
  - 7. C150 – Standard Specification for Portland Cement
  - 8. C172 – Standard Practice for Sampling Freshly Mixed Concrete
  - 9. C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

10. C227 – Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
11. C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
12. C260 – Standard Specification for Air-Entraining Admixtures for Concrete
13. 309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
14. C330 – Standard Specification for Lightweight Aggregates for Structural Concrete
15. C494 – Standard Specification for Chemical Admixtures for Concrete
16. C595 – Standard Specification for Blended Hydraulic Cements
17. C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
18. 881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
19. C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars
20. C1012 – Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
21. C1017 – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
22. C1064 – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
23. C1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
24. C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
25. C1116 – Standard Specification for Fiber-Reinforced Concrete
26. C1218 – Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
27. C1240 – Standard Specification for Silica Fume Used in Cementitious Mixtures
28. C1260 – Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
29. C1315 – Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete
30. D994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
31. D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
32. D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
33. E96 – Standard Test Methods for Water Vapor Transmission of Materials
34. E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
35. E1155 – Standard Test Method for Determining  $F_F$  Floor Flatness and  $F_L$  Floor Levelness Numbers
36. E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
  - a. ASTM E1745 – Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

### 1.3 DEFINITIONS

#### A. Cementitious Materials:

1. Portland cement alone or in combination with one or more of the following:
  - a. Blended hydraulic cement.
  - b. Fly ash and other pozzolans.
  - c. Ground granulated blast-furnace slag.
  - d. Silica fume.
2. Subject to compliance with requirements.

- B. Cold Weather:
  - 1. Ambient temperature below 40 degrees F or approaching 40 degrees F and falling.
- C. Defective Area:
  - 1. Surface defects that include:
    - a. Honeycomb
    - b. Rock pockets
    - c. Indentations
    - d. Surface voids greater than 3/16-inch deep
    - e. Surface voids greater than 3/4-inch diameter.
  - 2. Cracks in liquid containment structures and below-grade habitable spaces that are 0.010-inch wide and wider
  - 3. Cracks in other structures that are 0.015-inch wide and wider
  - 4. Spalls, chips, embedded debris, lift lines, sand lines, deviations that exceed specified tolerances and include, but are NOT limited to, fins, form pop-outs, and other projections, stains, and other color variations that can NOT be removed by cleaning.
- D. Exposed Concrete:
  - 1. Concrete surface that can be seen inside or outside of structure regardless of whether concrete is above water, dry at all times, or can be seen when the structure is drained.
- E. Hot Weather:
  - 1. As defined in ACI 305R.
- F. Hydraulic Structure:
  - 1. Liquid containment structure.
- G. New Concrete:
  - 1. Less than 60 days old.

#### 1.4 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data: Submit data for each type of product indicated.
- C. Design Data:
  - 1. Submit concrete mix design for each mix included in the Supplement at the end of this Section.
    - a. Proportions of all materials in the mix, signed by the mix designer.
    - b. Average strength per ACI 301.
    - c. Manufacturer's Certificate of Compliance per Section 01 60 00, PRODUCT REQUIREMENTS.
    - d. Cementitious materials.
    - e. Admixtures.
    - f. Test Reports – chemical analysis, chloride-ion content, shrinkage test results.
    - g. Coarse and fine aggregate gradations.
    - h. Water to be withheld for later addition at Project site.
  - 2. Detailed plan for placing and curing concrete in cold weather.
  - 3. Detailed plan for placing and curing concrete in hot weather.
    - a. Thermal control plan for concrete sections greater than 2'-6".
    - b. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
    - c. Manufacturer Instructions: Submit installation procedures and interfacing required with adjacent Work.

- d. Field Quality requirements Submittals: Indicate results of Contractor-furnished tests and inspections, including tightness test results and floor surface flatness and levelness measurements.

D. Ready-Mix Concrete Delivery Tickets

- 1. Record the amount of water added at the Project site on the delivery ticket.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 77 00, CLOSEOUT PROCEDURES, specifies requirements for closeout submittals.
- B. Project Record Documents: Record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

- A. Include this Article to specify compliance with overall reference standards affecting products and installation included in this Section.
- B. Perform Work according to ACI 301 and ACI 117.
- C. Comply with ACI 305R when placing concrete during hot weather.
- D. Comply with ACI 306.1 when placing concrete during cold weather.
- E. Obtain each type or class of cementitious material from a single source, obtain aggregate from a single source and obtain admixtures from a single supplier for the Project. If any of these sources need to, by necessity, change, notify the Engineer.
- F. Installer Qualifications: Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician. If an ACI-certified Technician is NOT available, submit flatwork installer qualifications to the Engineer.
- G. Manufacturer Qualifications: A firm with a minimum of 5 years' experience in manufacturing ready-mix concrete products and that complies with ASTM C94 requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready-Mixed Concrete Production Facilities" or equivalent program.
  - 2. Mix Designer: Certified as NRMCA Concrete Technologist Level 2 or Licensed Engineer. If neither, the Mix Designer's qualifications shall be submitted to the Engineer.
- H. Testing Agency Qualifications: An independent agency, acceptable to the Authority Having Jurisdiction, qualified according to ASTM C1077 and ASTM E329 for the testing indicated.
  - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field-Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
    - a. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician – Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician – Grade II.
- I. Concrete Pre-Installation Conference:
  - 1. Schedule and conduct at Project site prior to submitting mix designs.
  - 2. Required meeting attendees:
    - a. Contractor's superintendent.
    - b. Structural Engineer in responsible charge or designee.

- c. Independent testing agency.
  - d. Ready-mix producer.
  - e. Concrete Subcontractor.
  - f. Admixture representative.
3. Agenda shall include:
- a. Concrete testing and special inspection.
  - b. Mix designs and admixtures.
  - c. Formwork and formwork removal.
  - d. Reinforcement.
  - e. Placement methods.
  - f. Concrete finishing.
  - g. Curing procedures.
  - h. Hot and cold weather placement protections.
  - i. Joints.
  - j. Placement of anchors and miscellaneous embeds.
  - k. Tolerances including floor and slab flatness and levelness.
  - l. Concrete repair procedures.

#### 1.7 MOCKUPS

- A. Section 01 40 00, QUALITY REQUIREMENTS, specifies requirements for mockups.
- B. Construct mockups for architectural concrete surfaces receiving special treatment or finish as result of formwork.
- C. Size: Sufficient to indicate required special treatment or finish.
- D. If requested by Architect/Engineer, cast concrete against sample panel.
- E. Obtain acceptance of Architect/Engineer for resultant surface finish prior to erecting formwork.
- F. Locate where indicated on Drawings.
- G. Incorporate accepted mockup as part of Work.

#### 1.8 AMBIENT CONDITIONS

- A. Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS, specifies requirements for ambient condition control facilities for product storage and installation.
- B. Maintain concrete temperature after installation at minimum 50 degrees F for minimum seven days.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Concrete:
  - 1. Cement:
    - a. Comply with ASTM C150, for cement type, see Supplement at End of Section.
    - b. Type: Portland.
  - 2. Blended Cement:
    - a. Comply with ASTM C595.
    - b. For sulfate resistance option, see Supplement at End of Section.
    - c. Color: Gray.

3. Normal Weight Aggregates:
    - a. Comply with ASTM C33.
    - b. Coarse Aggregate Maximum Size: 1" nominal.
    - c. Coarse Aggregate – NOT more than 15 percent by weight of thin or elongated pieces having a length of five times the average thickness.
    - d. Fine Aggregate – consisting of clean natural sand or of sand prepared from crushed stone or crushed gravel.
  4. Water:
    - a. Comply with ACI 318.
    - b. Potable, without deleterious amounts of chloride ions.
- B. Admixtures:
1. Manufacturers:
    - a. BASF Admixtures, Inc, Shakopee, MN.
    - b. Euclid Chemical Co., Cleveland, OH.
    - c. W.R. Grace & Co., Cambridge, MA.
    - d. Substitutions: As specified in Section 01 60 00, PRODUCT REQUIREMENTS.
  2. Air Entrainment: Comply with ASTM C260.
  3. Chemical:
    - a. Comply with ASTM C494.
    - b. Type A - Water-Reducing.
    - d. Type B - Retarding.
    - e. Type C - Accelerating.
    - f. Type D - Water-Reducing and Retarding.
    - g. Type E - Water-Reducing and Accelerating.
    - h. Type F - Water-Reducing, High Range.
    - i. Type G - Water-Reducing, High Range, and Retarding.
  4. Fly Ash: Comply with ASTM C618, Class F.
  5. Silica Fume: Comply with ASTM C1240.
  6. Slag:
    - a. Description: Ground-granulated blast-furnace slag.
    - b. Comply with ASTM C989.
    - c. Grade 100 or 120.
  7. Plasticizing:
    - a. Comply with ASTM C1017.
    - b. Type I or Type II.
  8. Shrinkage Reducing Admixture:
    - a. BASF; Tetraguard AS20.
    - b. Euclid; Eucon SRA Series.
    - c. W.R. Grace; Eclipse Series.

## 2.2 CONCRETE MIX

- A. See Supplement at the end of this Section for design requirements for each concrete mix.
- B. Select proportions for concrete according to ACI 318.
- C. Use water-reducing admixture in concrete that is part of a Hydraulic Structure or with a water-cementitious ratio below 0.50.
- D. Where fly ash is used, it shall be limited to 25 percent of total cementitious materials, unless approved in writing by the Engineer.
- E. Limit water-soluble chloride-ion content in hardened concrete to 0.15 percent by weight of cement for non-hydraulic structures and 0.10 percent for hydraulic structures.

- F. Fine aggregate shall be in the range of 36 percent to 40 percent of total aggregate weight.
- G. Concrete Shrinkage Limits: See Subsection 3.5.J.
- H. Target Slump
  - 1. Without high-range water reducers – 4 inches
    - a. With high-range water reducers – 2 inches prior to the addition of the admixture, 8 inches maximum at point of delivery, unless otherwise permitted.
    - b. Target slump for drilled pier – 6 to 8 inches.
- I. Admixtures:
  - 1. Include admixture types and quantities indicated in concrete mix designs only if approved by Architect/Engineer.
  - 2. Cold Weather:
    - a. Use accelerating admixtures in cold weather.
    - b. Use of admixtures shall NOT relax cold weather placement requirements.
  - 3. Hot Weather: Use set-retarding admixtures.
  - 4. DO NOT use calcium chloride or admixtures containing calcium chloride.
    - a. Add air entrainment admixture to concrete mix for Work exposed to freezing and thawing.
    - b. Average Compressive Strength Reduction: NOT permitted.
- J. Ready-Mixed Concrete: Mix and deliver concrete according to ASTM C94 and deliver batch ticket information.
  - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 90 minutes to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
    - a. Contractor may coordinate with the concrete producer and admixture manufacturer to demonstrate the efficacy of using a retarding admixture to extend placement times during hot weather.
- K. Site-Mixed Concrete: Mix concrete according to ACI 318.

## 2.3 ACCESSORIES

- A. Bonding Agent:
  - 1. Manufacturers:
    - a. BASF Building Systems Inc.
    - b. Euclid Chemical Co.
    - c. Prime Resins
    - d. Sika Chemical Corp.
  - 2. Substitutions: As specified in Section 01 60 00, PRODUCT REQUIREMENTS.
  - 3. Furnish materials according to ASTM C881, Type V standards.
  - 5. Description: Two-component moisture insensitive, 100 percent solids epoxy resin.
- B. Vapor Retarder:
  - 1. Manufacturers:
    - a. Fortifiber Corp.
    - b. Revan Industries, Inc.
    - c. Stego Industries, LLC
  - 2. Substitutions: As specified in Section 01 60 00, PRODUCT REQUIREMENTS.
  - 3. Furnish materials according to E1745, Class B standards.
  - 5. Description: Clear polyethylene film.
  - 6. Thickness: 10 mils min.
  - 7. Type: As recommended for below-grade application.
    - a. Joint Tape: As recommended by manufacturer.



- C. Bond Breaker:
  - 1. Manufacturers:
    - a. Dayton Superior: EDOCO Clean Lift Bond Breaker
  - 2. Substitutions: As specified in Section 01 60 00, PRODUCT REQUIREMENTS.
  - 3. Description: Nonstaining, providing positive bond prevention.
  
- D. Concrete Reinforcing Fibers:
  - 1. Manufacturers:
    - a. Euclid Chemical Co.
    - b. Propex Concrete Systems Corp.
    - c. Substitutions: As specified in Section 01 60 00, PRODUCT REQUIREMENTS.
  - 2. Description: High-strength industrial-grade fibers specifically engineered for secondary reinforcement of concrete.
  - 3. Comply with ASTM C1116.
  - 4. Tensile Strength: 130 ksi.
  - 5. Toughness: 15 ksi.
  - 6. Fiber Length: 3/4 inch.
  - 7. Fiber Count: 34 million/lb.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Section 01 77 00, CLOSEOUT PROCEDURES, specifies requirements for installation examination.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and shall NOT interfere with placing concrete.

#### 3.2 PREPARATION

- A. Section 01 77 00, CLOSEOUT PROCEDURES, specifies requirements for installation preparation.
- B. Previously Placed Concrete:
  - 1. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
    - a. Remove laitance, coatings, and unsound materials.
    - b. Doweled Joints: Install dowel bars and support assemblies at joints as indicated on drawings.
    - c. Remove debris and ice from formwork, reinforcement, and concrete substrates.
- C. Remove water from areas receiving concrete before concrete is placed.

#### 3.3 INSTALLATION

- A. Placing Concrete:
  - 1. Place concrete according to ACI 301.
  - 2. Notify testing laboratory Engineer minimum 24 hours prior to commencement of operations.
  - 3. Ensure that reinforcement, inserts, embedded parts, formed expansion and contraction joints, and waterstop are NOT disturbed during concrete placement.

4. Install vapor retarder under interior slabs on grade according to ASTM E1643. Lap joints minimum 6 inches and seal watertight by taping edges and ends per manufacturer's instructions.
  - a. Repairs:
    - 1) Repair vapor retarder damaged during placement of concrete reinforcement.
    - 2) Using vapor retarder material, lap over damaged areas minimum 6 inches and seal watertight.
5. Joint Filler:
  - a. Separate slabs on grade from vertical surfaces with 1/2-inch-thick joint filler.
  - b. Place joint filler in floor slab pattern placement sequence; set top to required elevations; secure to resist movement by wet concrete.
  - c. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.
6. Deposit concrete at final position, preventing segregation of mix. Limit vertical free fall to 5 feet.
7. Place concrete in continuous operation for each panel or section as determined by predetermined expansion, control and construction joints.
  - a. Place in horizontal layers NOT to exceed 2.0 feet in depth, except for slabs which shall be placed full depth.
  - b. DO NOT exceed formwork design pressures.
8. DO NOT use aluminum conveying devices.
9. Retempering of concrete is NOT permitted where cement has partially hydrated.
10. Pumping of Concrete:
  - a. Provide standby pump, conveyor system or other system onsite during pumping to ensure completion of concrete placement without cold joints in case of equipment failure.
11. Consolidate concrete using mechanical vibrating equipment per ACI 301
  - a. DO NOT use vibrators to transport concrete within formwork. Insert and withdraw vibrators vertically at uniform spacing to quickly penetrate placed layer and at least 6 inches into preceding layer. DO NOT insert vibrators into lower layers that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement, waterstop and other items without causing segregation.
  - b. Slabs with horizontal waterstop: limit concrete placement to elevation of waterstop in first pass, ensure space beneath waterstop completely fills with concrete, vibrate under waterstop, then place remaining concrete to full height of slab.
  - c. Maintain at least one standby vibrator prior to placing concrete.
12. Maintain records of concrete placement, including date, location, quantity, air temperature, and test samples taken.
13. Maximum Size of Concrete Placements:
  - a. Locate expansion, control and contraction joints where shown on drawings
  - b. Locate construction joints where shown on drawings or where approved in joint location submittal per Section 03 15 00, CONCRETE JOINTS AND ACCESSORIES.
  - c. Provide vertical construction joints in walls and slabs at maximum spacing of 40 feet, unless shown or approved otherwise.
  - d. Place joints to avoid penetrations.
14. DO NOT interrupt successive placement and DO NOT permit cold joints to occur.
15. Minimum Time Between Adjacent Placements:
  - a. Construction or Control Joints: 7 days unless otherwise specified.
  - b. Construction joint between top of footing or slab and column or wall: NOT less than 24 hours.
  - c. Expansion or Contraction Joints: NOT less than 24 hours.
16. Hot Weather Placement:
  - a. Comply with ACI 305.1
  - b. Maintain concrete temperature below 95 deg F at time of placement. If chilled water or ice are used to maintain concrete temperature, that water equivalent shall be included in the total water used to calculate the water-cement ratio.

- c. Fog-spray forms, reinforcement, and subgrade just before placing concrete, without creating standing water or dry areas.
- 17. Cold Weather Placement:
  - a. Comply with ACI 306.1
  - b. DO NOT place concrete on frozen subgrade or subgrade containing frozen materials. Top 12 inched of subgrade shall be thawed prior to concrete placement.
  - c. DO NOT place concrete in contact with reinforcement or embedments with surfaces that are less than 35 deg F.
  - d. Provide supplemental heat when other means of thermal protection are insufficient. Vent carbon-based fuel heaters away from concrete surface to avoid concrete carbonation.
  - e. Provide temperature sensors placed on the concrete surfaces throughout the work. Record surface temperature at least once every 12 hours.
  - f. Protect concrete from freezing until the end of the curing period.
- 18. Saw-Cut Joints (where permitted):
  - a. Saw-cut joints within 12 hours after placing.
  - b. Use 3/16-inch-thick blade.
  - c. Cut into 1/4 depth of slab thickness.
- 19. Screeding:
  - a. Screed floors and slabs to elevations and slopes shown on drawings.
  - b. Surface Flatness: FF 20 (conventional slab).
- B. Concrete Finishing:
  - a. Per Section 03 35 00, CONCRETE FINISHING.
- C. Curing and Protection:
  - 1. Per Section 03 39 00, CONCRETE CURING.
- 3.4 BACKFILL AGAINST STRUCTURES
  - A. DO NOT backfill against walls until the concrete has reached the design 28-day strength as demonstrated by concrete cylinder breaks.
  - B. For structures with top slabs or diaphragms, the top slab shall reach design strength, or the diaphragm shall be secured per the contract documents prior to backfill.
  - C. Unless otherwise permitted, backfill evenly around structure to prevent differential horizontal pressures.
- 3.5 FIELD QUALITY REQUIREMENTS
  - A. Section 01 40 00, QUALITY REQUIREMENTS, specifies requirements for inspecting and testing.
  - B. Inspection and Testing: Performed by testing laboratory according to ACI 318.
  - C. Provide unrestricted access to Work and cooperate with appointed testing and inspection firm.
  - D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
  - E. Concrete Inspections:
    - 1. Continuous Placement Inspection: Inspect for proper installation procedures.
      - a. Periodic Curing Inspection: Inspect for specified curing temperature and procedures.

- b. Samples for testing air content in pumped concrete shall be taken at point of placement and point of delivery to establish a correlation to estimate air content at point of placement. All other samples shall be taken at point of delivery.
  - c. Provide adequate facilities for safe storage and proper curing of concrete test specimens onsite for first 24 hours.
  
- F. Strength Test Samples:
  - 1. Sampling Procedures: Comply with ASTM C172.
  - 2. Cylinder Molding and Curing Procedures:
    - b. Comply with ASTM C31.
    - c. Cylinder Specimens: Standard cured.
  - 3. Sample concrete and make one set of four 4-inch diameter test cylinders for every 50-cu. yd. or less of each class of concrete placed each day, and for every 5,000 sq. ft. of surface area for slabs and walls.
  - 4. If volume of concrete for a class of concrete would provide less than five sets of cylinders, take samples from five random batches, or from every batch if less than five batches are used.
    - a. Make one additional cylinder during cold weather concreting and field cure.
  
- G. Field Testing:
  - 1. Slump Test Method: Comply with ASTM C143.
  - 2. Air Content Test Method: Comply with ASTM C173 or C231.
  - 3. Temperature Test Method: Comply with ASTM C1064.
  - 4. Frequency of Testing:
    - a. Measure slump and temperature for each sample.
    - b. Measure air content in air-entrained concrete for each sample.
  
- H. Cylinder Compressive Strength Testing:
  - 1. Test Method: Comply with ASTM C39.
  - 2. Test Acceptance: According to ACI 318.
  - 3. Test one cylinder at seven days.
  - 4. Test two cylinders at 28 days. Retain one cylinder for 56 days for testing when requested by Engineer.
    - a. Dispose of remaining cylinders if testing is NOT required.
  
- I. Core Compressive Strength Testing:
  - 1. Sampling and Testing Procedures: Comply with ASTM C42.
  - 2. Test Acceptance: According to ACI 318.
    - a. Drill three cores for each failed strength test from failed concrete.
  
- J. Shrinkage Testing:
  - 1. Comply with ASTM C157 with the following modifications:
    - a. Prisms shall be moist cured for 7 days prior to the 28-day drying period.
    - b. Measurement at the end of the 7-day moist cure shall be considered the initial length.
    - c. The reported results shall be the average of three prisms.
  - 2. If the drying shrinkage measurement of a specimen varies from the average by more than .004 percent, disregard the results from that specimen.
  - 3. Test shrinkage characteristics every 5,000 cubic yards and every 3 months during construction of hydraulic structures.
  - 4. Results at the end of the 28-day drying period shall NOT exceed 0.04 percent if 3-inch prisms are used or 0.038 percent if 4-inch prisms are used.
    - a. If the 7-day or 14-day field shrinkage tests exceed the limits established by testing of the mix design, furnish an additional 14 days of water cure beyond the original curing period for hydraulic structures. Modify the mix design to reduce shrinkage.
  
- K. Liquid Tightness Tests:

1. In accordance with ACI 350.1.
2. Purpose: To determine the integrity and water tightness of finished concrete surfaces of liquid containment structures. Contractor shall perform and pay for all costs associated with liquid tightness tests. Report all test results to the Engineer.
3. For All Water-Holding Structures:
  - a. Perform tightness tests after the concrete structure is complete and capable of resisting the hydrostatic pressure of the water test. The concrete shall have achieved its full design strength.
  - b. Perform tightness tests before backfill, brick facing, or other work that shall cover the concrete wall surfaces has begun.
  - c. Install all temporary bulkheads, cofferdams and pipe blind flanges and close all valves. Inspect each to assure that it provides a complete seal.
  - d. Fill with water to test level shown, or maximum liquid level if no test level is given. Maintain this level for 72 hours prior to the start of the test to allow for water absorption, structural deflection and temperature to stabilize.
  - e. Measure evaporation and precipitation by floating a partially filled, transparent, calibrated, open top container.
  - f. Measure the water surface at two points 180 degrees apart, when possible where attachments such as ladders exist, at 24-hour intervals. Use a sharp pointed hook gage and fixed metal measure capable of reading to 1/100 of an inch. Continue the test for a period sufficient to produce at least 1/2" drop in the water surface based on the assumption that leakage would occur at the maximum allowable rate specified or for 72 hours, whichever is the lesser time.
4. Acceptance Criteria:
  - a. Volume loss shall NOT exceed 0.075% of contained liquid volume in a 24-hour period, correcting for evaporation, participation, and settlement.
  - b. No damp spots or seepage visible on exterior surfaces. A damp spot is defined as sufficient moisture to be transferred to a dry hand upon touching.
5. Repairs when test fails:
  - a. Dewater the structure; fill leaking cracks with crack repair epoxy as specified in Section 03 64 00, CONCRETE REPAIR CRACK INJECTION. Patch areas of damp spots previously recorded and repeat tightness test in its entirety until the structure successfully passes the test.

L. Water-Soluble Chloride-Ion Concentration Test Method:

1. Comply with ASTM C1218.
2. Test at 28 days.
3. Maximum Chloride-Ion Concentration: As permitted by applicable code.

M. Patching:

1. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.
2. Honeycombing or Embedded Debris in Concrete:
  - a. NOT acceptable.
  - b. Notify Engineer upon discovery.
  - c. Patch imperfections per Section 03 01 00, MAINTENANCE OF CONCRETE.

N. Defective Concrete:

1. Description: See Definitions.
2. Repair or replacement of defective concrete shall be determined by Engineer.
3. DO NOT patch, fill, touch up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

### 3.6 SUPPLEMENTS

- A. Requirements of concrete mix designs following "End of Section" are a part of this specification and supplement requirements of Part 1 through Part 3 of this Section.

END OF SECTION

## 5000 PSI CONCRETE MIX

- A. Use for Hydraulic Structures exposed to freezing and thawing cycles, severe sulfate exposure and requiring low permeability. Typically used in wastewater treatment.
  
- B. Mix Design Properties:
  - 1. Maximum water / cementitious ratio of 0.40.
  - 2. Minimum compressive strength at 28 days of 5,000 psi.
  - 3. Conform to shrinkage limits.
  - 4. Air content of 4.5% to 7.0%, assuming 3/4" or 1" maximum aggregate size.
  - 5. Provide cementitious materials per one of the following:
    - a. ASTM C150 Type V – type F fly ash may be included as an option
  - 6. Minimum cementitious materials content in the mix shall be:
    - a. 560 pounds per cubic yard for 3/4-inch maximum aggregate size.
    - b. 535 pounds per cubic yard for 1-inch maximum aggregate size.
    - c. Limit maximum cementitious content to 100 pounds per cubic yard greater than specified minimums.
  - 7. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent.
    - a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.10 percent.
    - b. Refer to PART 1 through PART 3 of this Section for additional requirements.

## 4500 PSI CONCRETE MIX

- A. Use for Hydraulic Structures exposed to freezing and thawing cycles, moderate sulfate exposure and requiring low permeability. Typically used in water treatment.
  
- B. Mix Design Properties:
  - 1. Maximum water / cementitious ratio of 0.42.
  - 2. Minimum compressive strength at 28 days of 4,500 psi.
  - 3. Conform to shrinkage limits.
  - 4. Air content of 4.5% to 7.0%, assuming 3/4" or 1" maximum aggregate size.
  - 5. Provide cementitious materials per one of the following:
    - a. ASTM C150 Type II – type F fly ash may be included as an option.
    - b. ASTM C595 Type IP – complies with moderate sulfate resistance option.
  - 6. Minimum cementitious materials content in the mix shall be:
    - a. 560 pounds per cubic yard for 3/4-inch maximum aggregate size
    - b. 535 pounds per cubic yard for 1-inch maximum aggregate size
    - c. Limit maximum cementitious content to 100 pounds per cubic yard greater than specified minimums.
  - 7. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent.
    - a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.10 percent.
    - b. Refer to PART 1 through PART 3 of this Section for additional requirements.



## 4500 PSI CONCRETE MIX

- A. Use for Hydraulic Structures NOT exposed to freezing and thawing cycles, moderate sulfate exposure and requiring low permeability. Typically used in water treatment in non-freeze / thaw areas.
  
- B. Mix Design Properties:
  - 1. Maximum water / cementitious ratio of 0.42.
  - 2. Minimum compressive strength at 28 days of 4,500 psi.
  - 3. Conform to shrinkage limits.
  - 4. Air content of 3.5% to 6.0% for 3/4" maximum aggregate size and 3.0% to 5.5% for 1" maximum aggregate size.
  - 5. Provide cementitious materials per one of the following:
    - a. ASTM C150 Type II – type F fly ash may be included as an option.
    - b. ASTM C595 Type IP – complies with moderate sulfate resistance option.
  - 6. Minimum cementitious materials content in the mix shall be:
    - a. 560 pounds per cubic yard for 3/4-inch maximum aggregate size
    - b. 535 pounds per cubic yard for 1-inch maximum aggregate size
    - c. Limit maximum cementitious content to 100 pounds per cubic yard greater than specified minimums.
  - 7. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent.
    - a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.10 percent.
    - b. Refer to PART 1 through PART 3 of this Section for additional requirements.

## 4500 PSI CONCRETE MIX

- A. Use for non-hydraulic structural concrete exposed to freezing and thawing cycles, moderate sulfate exposure and requiring low permeability. Typically used for buildings.
  
- B. Mix Design Properties:
  - 1. Maximum water / cementitious ratio of 0.45.
  - 2. Minimum compressive strength at 28 days of 4,500 psi.
  - 3. Air content of 5.5% to 7.0% for 3/4" and 1" maximum aggregate size.
  - 4. Provide cementitious materials per one of the following:
    - a. ASTM C150 Type II – type F fly ash may be included as an option.
    - b. ASTM C595 Type IP – complies with moderate sulfate resistance option.
  - 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent.
    - a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.30 percent.
    - b. Refer to PART 1 through PART 3 of this Section for additional requirements.

## 4000 PSI CONCRETE MIX

- A. Use for secondary elements NOT exposed to freezing and thawing cycles, with moderate sulfate exposure. Typically used below grade for electrical duct banks, pipe encasements NOT cast monolithically with structural slabs, thrust blocks, and drilled piers.
  
- B. Mix Design Properties:
  - 1. Maximum water / cementitious ratio of 0.50.
  - 2. Minimum compressive strength at 28 days of 4,000 psi.
  - 3. Air content of 1.5% to 4.5% for 3/4" and 1" maximum aggregate size.
  - 4. Provide cementitious materials per one of the following:
    - a. ASTM C150 Type II – type F fly ash may be included as an option.
    - b. ASTM C595 Type IP – complies with moderate sulfate resistance option.
  - 5. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent.
    - a. Test if total chloride-ion content of individual ingredients, calculated on the basis of concrete proportions, exceeds 0.30 percent.
    - b. Refer to PART 1 through PART 3 of this Section for additional requirements.

## SECTION 03 35 00 – CONCRETE FINISHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Finishing Methods.
  - 2. Flatness Tolerances.
  - 3. Schedule of Concrete Finishes.
  
- B. Related Sections:
  - 1. Section 03 64 00 – Concrete Repair Crack Injection.
  - 2. Section 09 90 00 – Painting and Protective Coatings.

#### 1.2 REFERENCE STANDARDS

- A. American Concrete Institute (ACI):
  - 1. 117, Specification for Tolerances for Concrete Construction and Materials.
  
- B. ASTM International:
  - 1. E1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

#### 1.3 QUALITY ASSURANCE

- A. Mockup Panels for Architectural Wall Finishes:
  - 1. Construct in accordance with the Contract Documents to demonstrate wall finish types WF-3, WF-4, WF-5, or WF-6, if used on the project.
  - 2. Panel dimension 6 feet by 8 feet, minimum.
  - 3. Construct panel with the same materials, forming and curing methods as the final product.
  
- B. Flatwork Finisher:
  - 1. Unless otherwise permitted, there shall be at least one ACI-certified Flatwork Finisher on the finishing crew. An equivalent certification shall be considered.

### PART 2 - PRODUCTS – NOT USED

### PART 3 - EXECUTION

#### 3.1 CONCRETE WALL FINISHES

- A. Type WF-1 (Rough-form Finish):
  - 1. Patch tie holes.
  - 2. Chip or rub off projections over 1/2".
  - 3. Leave surfaces with the texture imparted by the forms.
  - 4. Repair defective areas.
  - 5. Inject cracks per Section 03 64 00, CONCRETE REPAIR CRACK INJECTION.
  
- B. Type WF-2 (Smooth-form Finish):
  - 1. Patch tie holes.
  - 2. Grind off projections level to surface.
  - 3. Repair defective areas to provide smooth uniform appearance.
  - 4. Inject cracks per Section 03 64 00, CONCRETE REPAIR CRACK INJECTION.

- C. Type WF-3 (Smooth Rubbed Wall Finish):
  1. Water cure only for this finish type.
  2. Remove forms as early as permitted and patch as required.
  3. Produce finish with one day of removing forms.
  4. Wet surface and rub with carborundum brick or abrasive of equal quality until uniform color and texture are produced.
  5. Use no cement grout other than the paste drawn from the concrete itself.
  6. Float or brush produced paste uniformly over surface.
  7. Continue water cure for the required time as soon as water shall NOT erode the rubbed surface.
  
- D. Type WF-4 (Grout-cleaned Rubbed Wall Finish):
  1. Meet requirements of WF-3, 1 through 3.
  2. Mix grout consisting of one-part Portland cement and one and one-half parts fine sand with enough water to produce the consistency of thick paint – match color of surrounding concrete.
  3. Wet surface of concrete sufficiently to prevent absorption of water from grout and apply uniformly over surface.
  4. Scrub grout into voids and remove excess grout.
  5. When the grout whitens from drying, rub the surface with clean burlap.
  6. Continue to water cure until the curing period is complete.
  
- E. Type WF-5 (Architectural Fractured Fin Wall Finish):
  1. Form with appropriate form liner.
  2. Patch tie holes.
  3. Break off tips of ridges with light bush-hammering, or other approved process.
  4. For consistency of finish, use the same person or people to complete any given structure.
  
- F. Type WF-6 (Architectural Abrasive Blast Wall Finish):
  1. Repair cracks before blasting.
  2. Abrasives shall be clean silica sand free of foreign materials.
  3. Concrete shall have achieved at least 50% of specified strength before blasting.
  4. All surfaces to have the same blast finish shall be worked when the concrete is the same age.
  5. Unless otherwise specified, blasting shall expose fine aggregate with occasional exposure of coarse aggregate, NOT to exceed a reveal of 1/16-inch.
  6. When abrasive grit contains water for dust abatement, wash debris from wall before drying occurs.

### 3.2 CONCRETE SLAB FINISHES

- A. Type SF-1 (Float Slab Finish):
  1. Screed slab with straightedges to create surface at required finish plane.
  2. Float once bleedwater sheen has disappeared and the surface has stiffened sufficiently to permit the operation.
  3. Remove laitance and clean surface.
  
- B. Type SF-2 (Steel Trowel Slab Finish):
  1. Float surface per SF-1.
  2. Hand trowel to produce smooth dense surface, free of trowel marks.
  3. For air-entrained slabs, provide light steel trowel finish, (two trowelings).
  4. For non-air-entrained slabs, provide hard steel trowel finish (ringing sound from the trowel).
  
- C. Type SF-3 (Broomed Slab Finish):
  1. Finish per SF-2, light steel trowel finish, then draw a fine-hair broom lightly across the surface.

2. Broom in consistent direction.
3. For inclined slabs, broom perpendicular to slope.

D. Type SF-4 (Sidewalk Slab Finish):

1. Use broomed finish per SF-3.
2. Slope walks 1/4-inch per foot away from structures, unless shown otherwise.
3. Broom surface at right angles to the direction of traffic.

### 3.3 CONCRETE SLAB TOLERANCES

A. Thickness:

1. Maximum 1/4-inch minus or 1/2-inch plus from thickness and elevation shown.

B. Slab Flatness and Levelness:

1. Finish floor tolerances shall be measured in accordance with ASTM E1155.
2. Levelness tolerances shall NOT apply to inclined or cambered surfaces.
3. Levelness tolerances shall be measured within 72 hours of concrete placement.
4. Flatness  $F_F$  and Levelness  $F_L$  numbers for slabs NOT designated as Flat Slabs:
  - a. Minimum Overall  $F_F = 20$ , Minimum Local  $F_F = 15$ .
  - b. Minimum Overall  $F_L = 15$ , Minimum Local  $F_L = 10$ .
5. Flatness  $F_F$  and Levelness  $F_L$  numbers for slabs designated as Flat Slabs:
  - a. Minimum Overall  $F_F = 30$ , Minimum Local  $F_F = 15$ .
  - b. Minimum Overall  $F_L = 20$ , Minimum Local  $F_L = 10$ .

### 3.4 SCHEDULE OF CONCRETE FINISHES

A. Exterior Wall Surfaces:

1. Below grade – WF-1.
2. Above grade, exposed – WF-2.
3. Above grade, covered – WF-1.

B. Interior Wall Surfaces:

1. Covered water-holding structures, NOT coated – WF-1.
2. Open top water-holding structures, NOT coated – WF-2.
3. Water-holding structures, coated – WF-2 and requirements of Section 09 90 00, PAINTING AND COATING.
4. Dry areas, NOT coated – WF-2.
5. Dry areas, coated – WF-2 and requirements of Section 09 90 00, PAINTING AND COATING.

C. Exterior Slabs:

1. Roof slab, NOT covered – SF-3.
2. Roof slab, covered (roofing material) – SF-2.
3. Water-holding base slabs – SF-2.
4. Top of footing – SF-1.
5. Stairs and landings – SF-3.
6. Sidewalks – SF-4.

D. Interior Slabs:

1. Dry areas – SF-2.
2. Slabs to receive carpet or resilient flooring – SF-2.
3. Slabs to receive mortar bed for tile – SF-1.
4. Hydraulic channels – SF-2.

E. Beams and Columns:

1. Follow instructions for similar areas for slabs and walls.

END OF SECTION

## SECTION 03 39 00 – CONCRETE CURING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Curing Methods.
  - 2. Curing Products.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.

#### 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- B. American Concrete Institute:
  - 1. 308.1, Specification for Curing Concrete.
- C. NSF International:
  - 1. 61 – Drinking Water Components – Health Effects.

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Manufacturer's Product Data:
  - 1. Curing Compound.
  - 2. Evaporation Retardant.
  - 3. Penetrating Water Repellant Sealer.
- C. Curing Methods:
  - 1. For each type of element in the facility such as slabs, walls, beams or columns.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Curing Compound:
  - 1. Water-based, high-solids, white pigmented, nonyellowing curing compound meeting the requirements of ASTM C309, Type 2, Class A.
  - 2. Manufacturers:
    - a. Euclid Chemical; Kurez VOX White Pigmented.
    - b. WR Meadows; 1640 – White.
    - c. Vexcon; Certi-Vex Envio Cure White.
- B. Evaporation Retardant:
  - 1. Manufacturers:
    - a. BASF; MasterKure ER 50.
    - b. Euclid Chemical; Eucobar.
- C. Penetrating Water Repellant Sealer



1. Water-based, single component, silane/siloxane, penetrating, clear water repellent sealer.
2. Manufacturers:
  - a. BASF; MasterProtect H 400.
  - b. Euclid Chemical; Baracade WB 244.

### PART 3 - EXECUTION

#### 3.1 CONCRETE CURING

- A. General:
  1. Cure all concrete per project specifications and ACI 308.1.
  2. Use only water curing procedures where surfaces are to receive paint or other coatings.
  3. Use only water curing procedures on potable water structures.
  4. If the result of the 7-day concrete strength test is less than 50 percent of the specified 28-day strength, extend the moist curing period for an additional 7 days.
  5. Protect concrete from freezing during curing period.
- B. Use one of the following curing methods as approved by the Engineer:
  1. Vertical Surfaces:
    - a. Method 1 – leave concrete forms in place and keep surfaces of forms and concrete wet for 7 days.
    - b. Method 2 – apply curing compound, where allowed, immediately after removal of forms.
  2. Horizontal Surfaces:
    - a. Method 1 – water pond surface for 7 days.
    - b. Method 2 – continuously sprinkle surface for 7 days.
    - c. Method 3 – cover surface with material that will retain moisture such as burlap or cotton mats, sand or sawdust and keep continuously wet for 7 days.
    - d. Method 4 – apply curing compound, where allowed, immediately after final finishing.
- C. All slabs for structures defined as Environmental Structures per ACI 350 – Code Requirements for Environmental Engineering Concrete Structures shall be cured per the Horizontal Surfaces Methods 1, 2 or 3.

#### 3.2 EVAPORATION RETARDANT APPLICATION

- A. Use when environmental conditions will cause rapid drying of the concrete surface. DO NOT use on potable water structures unless NSF 61 approved.
- B. Apply and reapply as required per manufacturer's written instructions.

#### 3.3 PENETRATING WATER REPELLENT SEALER APPLICATION

- A. Apply where indicated on drawings.
- B. Water cure concrete to receive sealer. DO NOT use membrane curing compounds. Keep surface clean and unpainted.
- C. Apply per manufacturer's recommendations for coverage and curing time.

END OF SECTION

## SECTION 03 62 00 – NON-SHRINK GROUTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Cementitious non-shrink grout.
  - 2. Epoxy non-shrink grout.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.

#### 1.2 REFERENCES

- A. ASTM International:
  - 1. C307 – Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts and Monolithic Surfacing.
  - 2. C579 – Standard Test Methods for Compressive Grout Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing and Polymer Concretes.
  - 3. C882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
  - 4. C939 – Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
  - 5. C1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product data and manufacturer's written instructions.
- C. Forming method for fluid grout placements under machinery base plates.
- D. Curing methods.
- E. Qualifications of grout installers for specific grout type(s) selected.

#### 1.4 QUALITY ASSURANCE

- A. Evaluation and Acceptance of Non-Shrink Grout:
  - 1. Inspect the concrete substrates and formwork for conformance with the manufacturer's recommendations.
  - 2. Make three 2-inch by 2-inch cubes for every 25 cubic feet of grout used to perform flow cone tests per ASTM C939.
  - 3. An independent testing laboratory shall prepare, store, cure, and test cubes per ASTM C1107.
  - 4. Grout cubes shall meet specified strength requirements – grout that fails strength test shall be removed and replaced at no additional cost to the Owner.
- B. Evaluation and Acceptance of Epoxy Grout:
  - 1. Inspect the concrete substrates and formwork for conformance with the manufacturer's recommendations.
  - 2. Verify that the consistency of the epoxy grout mix is appropriate for proper field placement at the installed temperatures.

3. Record that the "pot life" of the epoxy grout has NOT been exceeded.
  4. A set of (3) shall be made for testing at 7 days per ASTM C579.
  5. Grout cubes shall meet specified strength requirements – grout that fails strength test shall be removed and replaced at no additional cost to the Owner.
- C. Qualification of Grout NOT Listed Herein:
1. Provide independent laboratory test results conducted within the last 18 months.

## PART 2 - PRODUCTS

### 2.1 CEMENTITIOUS NON-SHRINK GROUT

- A. Use For:
1. Column baseplates
  2. Precast joints
  3. Machine bases 25 hp or less
  4. Tank foundations
  5. Form tie and through bolt patching
- B. Shall Have the Following Properties:
1. Ready to use, requiring only the addition of water.
  2. Non-metallic and non-gas generating.
  3. Test in accordance with ASTM C1107.
  4. Fluid consistency in accordance with ASTM C939.
- C. Manufacturers and Products:
1. BASF Building Systems; MasterFlow 928
  2. Five Star Products; Five Star Fluid Grout 100
  3. Euclid Chemical Co.; Hi Flow Grout

### 2.2 EPOXY GROUT

- A. Use For:
1. Machine bases over 25 hp
  2. Machine baseplates that are anticipated to have vibration or thermal movement.
- B. Shall Have the Following Properties:
1. Premeasured, prepackaged system.
  2. 100 percent solids two-component epoxy resin system.
  3. Flowable, noncorrosive, moisture insensitive.
  4. Minimum compressive strength per ASTM C579 of 9,500 psi at 7 days, 11,000 psi fully cured.
  5. Minimum bond strength per ASTM C882 of 2,000 psi.
  6. Minimum tensile strength per ASTM C307 of 2,000 psi.
  7. Minimum working time of 1.0 hours at 70 degrees F.
- C. Manufacturers and Products:
1. Euclid Chemical Co; E<sup>3</sup> Flowable
  2. BASF Building Systems; MasterFlow 648
  3. Five Star Products, Inc.; DP Epoxy Grout

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. All areas to be grouted shall be clean and free of oil, grease, dirt, and contaminants. All metal components in contact with grout shall be free of rust, paint, and oils.
- B. All concrete slabs shall be fully cured for a minimum of 28 days. Concrete shall be in saturated surface dry condition when placing grout.
- C. Machinery and Tank Foundations:
  - 1. Prepare concrete surface by sandblasting or chipping to remove loose material. Create surface roughness per manufacturer's instructions.
  - 2. Form with watertight forms at least 2 inches higher than the bottom of the plate. Treat any form materials that could absorb water.
  - 3. Place grout at one edge and flow to the opposite edge, if possible. Otherwise, create air vents in plate to prevent air entrapment.

### 3.2 MIXING AND PLACING

- A. Grout shall be mixed with a paddle-type or other mechanical mixer. DO NOT mix more grout than can be placed within the manufacturer's allotted work time.
- B. Place grout immediately after mixing at a temperature range between 45 and 75 degrees F. Place grout per manufacturer's written instructions.

### 3.3 CURING

- A. Per manufacturer's written instructions.

END OF SECTION

## SECTION 03 63 00 – CONCRETE DOWELING - EPOXY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.
  - 2. Section 01 40 00 – Quality Requirements.
  - 3. Section 03 20 00 – Concrete Reinforcing.

#### 1.2 REFERENCES

- A. American National Standards Institute (ANSI)
- B. ASTM International:
  - 1. C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
  - 2. E488 – Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
- C. ICC (International Code Council):
  - 1. BC (International Building Code).
  - 2. Evaluation Services Reports.
- D. NSF International: 61, Drinking Water System Components – Health Effects.

#### 1.3 DEFINITIONS

- A. ICC Evaluation Services Report: Published by ICC for products provided by concrete adhesive anchor manufacturers.
- B. Special Inspection: As defined in the ICC IBC and indicated in the Supplement located at the end of Section 01 40 00, QUALITY REQUIREMENTS.

#### 1.4 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Action Submittals:
  - 1. Product Data: Manufacturer's catalog information.
- C. Informational Submittals:
  - 1. Manufacturer's instructions for preparation, placement, drilling of holes, installation of anchors and adhesive, and handling of cartridges, nozzles, and equipment.
  - 2. ICC Evaluation Services Report: Specific to proposed doweling system manufacturer.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer: At least three similar projects with same products within last 3 years.
  - 2. Installer: Trained and certified by manufacturer.
- B. Adhesive shall be certified as meeting NSF 61 for use in potable water structures where required.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store adhesive components in accordance with manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Adhesive:
  - 1. Approved by an ICC Evaluation Services Report or equal for conformance to IBC requirements for doweling of steel reinforcing bars in cracked concrete.
  - 2. Suitable for long-term loads as well as for wind and seismic loads.
  - 3. Meet requirements of ASTM C881.
  - 4. Disposable, Self-Contained Cartridge System:
    - a. Capable of dispensing both components in proper mixing ratio.
    - b. Fit into manually or pneumatically operated caulking gun.
  - 5. For Potable Water Structures:
    - a. Adhesive shall be acceptable for use by NSF 61.
  - 6. Manufacturers and Products:
    - a. Hilti, Inc., Tulsa, OK; HIT-RE 500 V3 (ESR-3814) or HIT-HY 200 (ESR-3963) Adhesive.
    - b. Powers Fasteners, Brewster, NY; PURE110+ Epoxy (ESR-3298).
    - c. Simpson Strong-Tie Co., Inc., Pleasanton, CA; SET-XP Epoxy Adhesive (ESR-2508 for concrete) or (IAMPO UES ER-265 for masonry).
- B. Mixing Nozzles:
  - 1. Disposable manufactured in several sizes to accommodate size in reinforcing dowels.
- C. Reinforcing Dowels:
  - 1. As specified in Section 03 20 00, CONCRETE REINFORCING.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Drilling Equipment:
  - 1. Electric or pneumatic rotary type with medium or light impact. Hollow drills with flushing air systems are preferred.
  - 2. Where edge distances are less than 2 inches, use lighter impact equipment to prevent microcracking and concrete spalling during drilling process.
- B. Hole Diameter: As recommended by manufacturer.
- C. Obstructions in Drill Path: When existing steel reinforcement is encountered during drilling, obtain Engineer approval for proposed fix.
- D. Doweling:
  - 1. Install per details shown on Drawings and in accordance with adhesive manufacturer's instructions.
- E. Adhesive:
  - 1. Install in accordance with written manufacturer's instructions.
  - 2. Dispense components through specially designed static mixing nozzle that thoroughly mixes components and places mixed adhesive at base of predrilled hole.

### 3.2 FIELD QUALITY ASSURANCE AND QUALITY REQUIREMENTS

- A. Proof Loading:
  - 1. To be performed where continuous inspection of concrete dowels is required.
  - 2. Testing shall be performed by an Independent Testing Agency.
  - 3. Proof loading to be performed only after adhesive has achieved proper cure per manufacturer's requirements.
  - 4. Testing shall be conducted on minimum of 10 percent of installed dowels, with a minimum of two tension tests. A minimum of two cartridges per box or packaging unit shall be tested.
  - 5. Testing shall be conducted in accordance with ASTM E488.
  - 6. Failure of dowel bar or failure within base concrete shall cause dowel to be rejected. For each rejected dowel, two additional dowels shall be tested. Replace rejected dowels as approved by Engineer.
  
- B. Quality Assurance, in accordance with IBC Chapter 17 requirements, is provided in Supplement located at end of Section 01 40 00, QUALITY REQUIREMENTS.

END OF SECTION

## SECTION 03 64 00 – CONCRETE REPAIR CRACK INJECTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Related Sections
  - 1. Section 01 33 00 – Submittal Procedures.
  - 2. Section 01 40 00 – Quality Requirements.
  - 3. Section 03 30 00 – Cast-In-Place Concrete.

#### 1.2 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
  - 1. ASTM International:
    - a. D638 – Standard Test Method for Tensile Properties of Plastics.
    - b. D648 – Standard Test Method for Deflection of Plastics Under Flexural Load.
    - c. D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
    - d. D790 – Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials.
  - 2. National Sanitation Foundation (NSF):
    - a. Standard 61, Standard for Drinking Water System Components – Health Effects.

#### 1.3 DEFINITIONS

- A. Defective Area: Per Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Large Cracks: Wider than 0.015”.
- C. Small Cracks: Width equal to 0.015” or less.
- D. Hydraulic Structure: Structure designed to contain liquid and/or keep liquid from entering.
- E. Leak or Leakage: Crack showing presence of moisture or recent efflorescence.

#### 1.4 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Shop Drawings:
  - 1. Physical and chemical properties for epoxy adhesives.
  - 2. Technical data for metering, mixing, and injection equipment.
- C. Information Submittals:
  - 1. Manufacturer’s recommended surface preparation procedures and application instructions for epoxy adhesives.
  - 2. Installation instructions for repairing core holes with epoxy grout.
  - 3. Manufacturer’s Certificate of Compliance: Certified test results for each batch of epoxy adhesive.
  - 4. Statements of Qualification for Epoxy Adhesive:
    - a. Manufacturer’s site representative.
    - b. Injection applicator.
    - c. Injection pump operating technician.
  - 5. Epoxy adhesive two component ratio and injection pressure test records for concrete crack repair work.



6. Certificate of NSF 61 compliance, if required.

## 1.5 QUALITY ASSURANCE

### A. Qualifications for Epoxy Injection Staff:

1. Manufacturer's Site Representative:
  - a. Capable of instructing successful methods for restoring concrete structures utilizing epoxy injection process.
  - b. Understands and is capable of explaining technical aspects of correct material selection and use.
  - c. Experienced in the operation, maintenance, and troubleshooting of application equipment.
2. Injection crew and job foreman shall provide written and verifiable evidence showing compliance with the following requirements:
  - a. Licensed and certified by epoxy Manufacturer.
  - b. Minimum 3 years' experience in successful epoxy injection for at least 10,000 linear feet of successful crack injection including 2,000 linear feet of wet crack injection to stop water leakage.

## 1.6 DELIVERY, STORAGE, AND HANDLING

### A. Packing and Shipping:

1. Package adhesive material in new sealed containers and label with following information:
  - a. Manufacturer's name.
  - b. Product name and lot number.
  - c. ANSI Hazard Classification (formerly SPI Classification).
  - d. ANSI recommended precautions for handling.
  - e. Mix ratio by volume.

### B. Storage and Protection:

1. Store adhesive containers at ambient temperatures below 120 °F and above 32 °F.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

#### A. Epoxy Manufacturers and Products:

1. Sika Corp., Lyndhurst, NJ; Sikadur 35 Hi-Mod LVPL.
2. Euclid Chemical Co., Cleveland, OH; Eucopoly injection resin.

### 2.2 EPOXY ADHESIVE

- A. Two-component A and B structural epoxy adhesive for injection into cracks or other voids in concrete structures for bonding or grouting.
- B. Adhesive Properties: When cured for 7 days at 77 °F ± 3 °F and conditioned at test temperature 12 hours prior to test, unless otherwise specified.

	Test Method	Large Cracks	Small Cracks
<b>Ultimate Tensile Strength, psi</b>	ASTM D638	8,000 min.	5,000 min.
<b>Tensile Elongation @ Break, percent</b>	ASTM D638	3.7 max.	3.7 max.
<b>Flexural Strength, psi</b>	ASTM D790	10,000 min.	10,000 min.
<b>Flexural Modulus, psi</b>	ASTM D790	5.5 x10 <sup>5</sup> min.	4.5 x10 <sup>5</sup> min.
<b>Compressive Yield Strength, psi</b>	ASTM D695*	15,000 min.	12,000 min.
<b>Compressive Modulus, psi</b>	ASTM D695*	3.8 x10 <sup>5</sup> min.	3.8 x10 <sup>5</sup> min.
<b>Heat Deflection Temperature</b>	ASTM D648*	130 °F min.	140 °F min.
<b>Slant Shear Strength: (5,000 psi Compressive Strength Conc.)</b>	AASHTO T 237**		
<i>Cured 3 days @ 40 °F-Wet Concrete</i>	3,500 psi min		
<i>Cured 1 day @ 77 °F-Dry Concrete</i>	5,000 psi min.		
<i>Cured 3 days @ 77 °F ± 3 °F</i>	5,000 psi min.		
*Cure test specimens so that peak exothermic temperature of adhesive does NOT exceed 100 °F			
**See referenced specifications for preparation method of test specimens			

### 2.3 SURFACE SEAL

- A. Sufficient strength and adhesion for holding injection fittings firmly in-place, and to resist pressures preventing leakage during injection.
- B. Capable of removal after injection adhesive has cured.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Structurally repair cracks in structures as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Cracks: Repair by injection of epoxy adhesive.

#### 3.2 PREPARATION

- A. Free cracks from loose matter, dirt, laitance, oil, grease, salt, and other contaminants.
- B. Clean cracks in accordance with epoxy adhesive manufacturer's instructions.
- C. Clean surfaces adjacent to cracks from dirt, dust, grease, oil, efflorescence, and other foreign matter detrimental to bond of surface seal system.
- D. DO NOT use acids and corrosives for cleaning, unless neutralized prior to injecting epoxy.

#### 3.3 APPLICATION

- A. Sealing:

1. Apply surface seal in accordance with Manufacturer's instructions to designated crack face prior to injection. Seal surface of crack to prevent escape of injection epoxy.
- B. Entry Ports:
1. Establish openings for epoxy entry in surface seal along crack.
  2. Determine space between entry ports equal to thickness of concrete member to allow epoxy to penetrate to the full thickness of the wall.
  3. Provide a means to prevent concrete dusts and fines from contaminating the crack or ports when drilling.
  4. Space entry ports close together to allow adjustment of injection pressure to obtain minimum loss of epoxy to soil at locations where:
    - a. Cracks extend entirely through wall.
    - b. Backfill of walls on one side.
    - c. Difficult to excavate behind wall to seal both crack surfaces.
  5. Core drill to verify epoxy depth where only one side of wall is exposed.
- C. Epoxy Injection:
1. Store epoxy at minimum of 70 °F.
  2. Start injection into each crack at lowest elevation entry port.
  3. Continue injection at first port until adhesive begins to flow out of port at next highest elevation.
  4. Plug first port and start injection at second port until adhesive flows from next port.
  5. Inject entire crack with same sequence.
- D. Finishing:
1. Cure epoxy adhesive after cracks have been completely filled to allow surface seal removal without draining or runback of epoxy material from cracks.
  2. Remove surface seal from cured injection adhesive.
  3. Finish crack face flush with adjacent concrete.
  4. Indentations or protrusions caused by placement of entry ports are NOT acceptable.
  5. Remove surface seal material and injection adhesive runs and spills from concrete surfaces.

### 3.4 EQUIPMENT

- A. Portable, positive displacement type pumps with in-line metering to meter and mix two adhesive components and inject mixture into crack.
- B. Discharge Pressure: Automatic pressure controls capable of discharging mixed adhesive at pressures up to 200 psi,  $\pm 5\%$ , and able to maintain pressure.
- C. Automatic Shutoff Control: Provide sensors on both Component A and B reservoirs for stopping machine automatically when only one component is being pumped to mixing head.
- D. Proportioning Ratio Tolerance: Maintain epoxy adhesive Manufacturer's prescribed mix ratio within a tolerance of  $\pm 5\%$  by volume at discharge pressure (p) to 160 psi.
- E. Ratio/Pressure Check Device:
  1. Two independent valved nozzles capable of controlling flow rate and pressure by opening or closing valve to restrict material flow.
  2. Pressure gauge capable of sensing pressure behind each valve.

### 3.5 FIELD QUALITY REQUIREMENTS

- A. Epoxy Adhesive Two Component Ratio Tests:

1. Disconnect mixing head and pump two adhesive components simultaneously through ratio check device.
  2. Adjust discharge pressure to 160 psi for both adhesive components.
  3. Simultaneously discharge both adhesive components into separate calibrated containers.
  4. Compare amounts simultaneously discharged into calibrated containers during same time period to determine mix ratio.
  5. Complete test at 160 psi discharge pressure and repeat procedure for 0 psi discharge pressure.
  6. Run ratio test for each injection unit at beginning and end of each injection workday, and when injection work has stopped for more than one (1) hour.
  7. Document and maintain complete accurate records of ratios and pressure checks.
- B. Injection Pressure Test:
1. Disconnect mixing head of injection equipment and connect two adhesive component delivery lines to pressure check device.
  2. Pressure Check Device:
    - a. Two independent valved nozzles capable of controlling flow rate and pressure by opening or closing of valve.
    - b. Pressure gauge capable of sensing pressure buildup behind each valve.
  3. Close valves on pressure check device and operate equipment until gauge pressure on each line reads 160 psi.
  4. Stop pumps and observe pressure; DO NOT allow pressure gauge to drop below 150 psi within 3 minutes.
  5. Run pressure test for each injection equipment unit:
    - a. Beginning and end of each injection workday.
    - b. When injection work has stopped for more than 45 minutes.
  6. Check tolerance to verify equipment capable of meeting specified ratio tolerance.
- C. Crack Injection Tests:
1. Initial Cores:
    - a. 4" diameter for full crack depth taken from Engineer selected locations.
    - b. Take three cores in first 100 lineal feet of crack repaired and one core sample for each 500 lineal feet thereafter.
  2. Provide suitable containers for storage, curing, and transportation of test specimens.
  3. Methods of Testing Cores:
    - a. Penetration: Visual examination.
    - b. Bond Strength/Compression Test: Concrete failure prior to adhesive failure.
  4. Test Requirements:
    - a. Penetration: Minimum of 90% of crack shall be full of epoxy adhesive.
    - b. Bond Strength/Compression Test: Concrete failure before adhesive failure, or 6,500 psi with no failure of either concrete or adhesive.
  5. Evaluation and Acceptance of Tests:
    - a. If initial cores pass tests as specified, epoxy adhesive injection Work at area represented by cores will be accepted.
    - b. If initial cores fail either by lack of penetration or bond strength, crack repair Work shall NOT proceed further until areas represented by cores are re-injected or repaired and retested for acceptance.
    - c. Obtain verifying core samples, number and location as selected by Engineer, after rework of areas represented by failed initial core is complete.
  6. Core Hole Repair:
    - a. Correct Work as result of testing upon notification from Engineer.
    - b. Refill initial and verifying core holes with an epoxy grout tamped and rodded in-place to form a dense fill.
    - c. Finish surface to blend with adjacent concrete.

END OF SECTION

DIVISION 4  
MASONRY

## SECTION 04 20 00 – UNIT MASONRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes unit masonry assemblies consisting of:
  - 1. Concrete masonry units (CMUs)
  - 2. Mortar and grout.
  - 3. Reinforcing steel.
  - 4. Masonry joint reinforcement.
  - 5. Miscellaneous masonry accessories.
  
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures.
  - 2. Section 01 40 00 – Quality Requirements.
  - 3. Section 03 20 00 – Concrete Reinforcing.
  - 4. Section 03 30 00 – Cast-in-Place Concrete.
  - 5. Section 05 50 00 – Metal Fabrications.
  - 6. Section 07 92 00 – Joint Sealants.
  
- C. Products installed, but NOT furnished, under this Section include the following:
  - 1. Steel lintels for unit masonry, furnished under Section 05 50 00, METAL FABRICATIONS.
  - 2. Insulation in cavity walls, Division 07.
  - 3. Control joint sealing, Division 07.

#### 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. A153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
  - 2. A580 – Standard Specification for Stainless Steel Wire
  - 3. A951 – Standard Specification for Steel Wire for Masonry Joint Reinforcement.
  - 4. A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
  - 5. C90 – Standard Specification for Loadbearing Concrete Masonry Units.
  - 6. C91 – Standard Specification for Masonry Cement.
  - 7. C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.
  - 8. C144 – Standard Specification for Aggregate for Masonry Mortar.
  - 9. C150 – Standard Specification for Portland Cement.
  - 10. C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
  - 11. C270 – Standard Specification for Mortar for Unit Masonry.
  - 12. C404 – Standard Specification for Aggregates for Masonry Grout.
  - 13. C476 – Standard Specification for Grout for Masonry.
  - 14. C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
  - 15. C780 – Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
  - 16. C1019 – Standard Test Method for Sampling and Testing Grout.
  - 17. C1093 – Standard Practice for Accreditation of Testing Agencies for Masonry.
  - 18. C1314 – Standard Test Method for Compressive Strength of Masonry Prisms.
  - 19. C1623 – Standard Specification for Manufactured Concrete Masonry Lintels.
  - 20. D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
  - 21. D1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.
  - 22. D2000 – Standard Classification System for Rubber Products in Automotive Applications.
  - 23. E514 – Standard Test Method for Water Penetration and Leakage Through Masonry.

- B. The Masonry Society (TMS):
  - 1. TMS 402/602 – Building Code Requirements and Specification for Masonry Structures.

### 1.3 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

### 1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry assemblies that develop net-area compressive strengths ( $f'_m$ ) of 2000 psi at 28 days (assumes 2000 psi CMU).
- B. Determine net-area compressive strength ( $f'_m$ ) of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to the current adopted edition of the TMS 402/602.

### 1.5 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product data for each type of product indicated.
- C. Shop Drawings for the following:
  - 1. Masonry Units:
    - a. Show sizes, profiles, coursing, and locations of special shapes.
  - 2. Reinforcing Steel:
    - a. Detail bending and placement of unit masonry reinforcing bars.
    - b. Comply with ACI 315R, Guide to Presenting Reinforcing Steel Design Details.
  - 3. Accessories.
- D. Qualification Data: For testing agency.
- E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
  - 1. Concrete masonry units:
    - a. Include material test reports substantiating compliance with ASTM C90.
  - 2. Cementitious materials:
    - a. Include brand, type, and name of manufacturer.
  - 3. Pre-blended, dry mortar mixes:
    - a. Include description of type and proportions of ingredients.
  - 4. Grout mixes.
    - a. Include description of type and proportions of ingredients.
  - 5. Reinforcing bars.
  - 6. Joint reinforcement.
  - 7. Anchors, ties, and metal accessories.
- F. Mix Designs:
  - 1. For each type of mortar and grout:
    - a. Include description of type and proportions of ingredients.
    - b. Include test reports, per ASTM C780, for mortar mixes required to comply with property specification.
    - c. Include test reports, per ASTM C1019, for grout mixes required to comply with compressive strength requirement.

- G. Method of Placing Grout: High lift or low lift.

## 1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials:
  - 1. Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
  - 2. As detailed in TMS 402/602.
- D. Contractor/Fabricator Qualifications: Provide documentation of prior work experience with projects of similar size, design, and unit type as this project and whose work has resulted in construction projects with a record of successful in-service performance.
  - 1. Masonry Contractor/Installer: A firm with a minimum of 5 years' experience in CMU installations with a minimum of 5 commercial type projects similar in size to this specific project and able to provide references and similar project information if so requested.
- E. Conduct initial preinstallation conference to review Contract Documents and requirements prior to any submittal. Required representatives of each entity directly concerned with Unit Masonry shall attend, including but NOT limited to:
  - 1. Engineer or representative.
  - 2. Contractor's superintendent.
  - 3. Independent testing agency responsible for masonry testing.
  - 4. Unit masonry Subcontractor.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units and face brick on elevated platforms in a dry location. If units are NOT stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, DO NOT install until they are dry. Store and handle to avoid chipping.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. DO NOT use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.8 PROJECT CONDITIONS

- A. Protection of Masonry:



1. During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
  2. Cover partially completed masonry when construction is NOT in progress.
    - a. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. DO NOT apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention:
1. Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted.
    - a. Immediately remove grout, mortar, and soil that come in contact with such masonry.
    - b. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
    - c. Protect sills, ledges, and projections from mortar droppings.
    - d. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
    - e. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements:
1. DO NOT use frozen materials or materials mixed or coated with ice or frost.
  2. DO NOT build on frozen substrates.
  3. Remove and replace unit masonry damaged by frost or by freezing conditions.
  4. Comply with cold-weather construction requirements contained in TMS 402/602.
- E. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40° F and above and shall remain so until masonry has dried, but NOT less than 7 days after completing cleaning.
- F. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are NOT limited to, products specified.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, manufacturers specified.

### 2.2 CONCRETE MASONRY UNITS (CMUS)

- A. Shapes: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide square-edged units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
  2. Weight Classification: Normal weight.
  3. Size (Width): Unless otherwise indicated, 2 cell units 7-5/8" x 15-5/8" x width indicated.
  4. DO NOT use damaged units in the work.
  5. DO NOT use chipped units in exposed locations.
- C. Integral Water Repellent: Provide units made with integral water repellent for exterior units.
1. Liquid polymeric, integral water-repellent admixture that does NOT reduce flexural bond strength.
  2. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
    - a. Available Products:
      - 1) Addiment Incorporated; Block Plus W-10.
      - 2) Grace Construction Products, a unit of W. R. Grace & Co. – Conn.; Dry-Block.
      - 3) BASF Construction Chemicals.; MasterPel.

## 2.3 CONCRETE AND MASONRY LINTELS

- A. Provide masonry lintels complying with requirements below.
1. Masonry Lintels: Built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with grout. Temporarily support built-in-place lintels until cured.
- B. Provide concrete lintels complying with requirements below.
1. ASTM C1623, matching CMU's in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength NOT less than CMU's.
  2. Precast or formed-in-place concrete lintels complying with requirements in Section 03 30 00, CAST-IN-PLACE CONCRETE, and with reinforcing bars indicated.

## 2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C150, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.
- D. Masonry Cement: ASTM C91.
1. Available Products:
    - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
    - b. Essroc, Italcementi Group; Brixment or Velvet.
    - c. Holcim (US) Inc.; Mortamix Masonry Cement, Rainbow Mortamix Custom Buff Masonry Cement, or White Mortamix Masonry Cement.
    - d. Lafarge North America Inc.; Magnolia Masonry Cement, Lafarge Masonry Cement Florida Super Masonry, Trinity Super White Masonry Type S, or Trinity White Masonry Type N.
    - e. Lehigh Cement Company; Lehigh Masonry Cement or Lehigh White Masonry Cement.
    - f. National Cement Company, Inc.; Coosa Masonry Cement.

- E. Aggregate for Mortar: ASTM C144.
  - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. For joints less than 1/4-inch-thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  - 3. Sand shall be clean, well screened, natural, ASTM C144.
- F. Aggregate for Grout: ASTM C404.
- G. Water: Potable.
- H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
  - 1. Available Products:
    - a. Addiment Incorporated; Mortar Tite.
    - b. Grace Construction Products, a unit of W.R. Grace & Co. – Conn; Dry-Block Mortar Admixture.
    - c. BASF Construction Chemicals, MasterPel.

## 2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: Per Section 03 20 00, CONCRETE REINFORCING.
- B. Masonry Joint Reinforcement, General: ASTM A951.
  - 1. Walls: Hot-dip galvanized, carbon steel.
  - 2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter
  - 3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
  - 4. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
  - 5. Spacing of Cross Rods, Tabs, and Cross Ties: NOT more than 16 inches o.c.
  - 6. Provide in lengths of NOT less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement:
  - 1. Standard, diagonally braced, galvanized, “Dur-O-Wall or approved equal, widths to fit concrete block walls in which used. Reinforcement shall meet ASCE/ACI Building Code requirements for Masonry Structures for design, materials, and coating (1.5 oz./sq. ft. ASTM A153 Class B2). Use if face brick is laid at same time as block.
  - 2. For Single-Wythe Masonry: ladder type with single pair of side rods.
  - 3. For Multi-Wythe Masonry: Adjustable (two-piece) type, ladder design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

## 2.6 TIES AND ANCHORS

- A. Brick to Block Backup Walls:
  - 1. Galvanized “pintle and eye” adjustable wall ties, equal to “Dur-O-Wall”, with proper length pintle and eye sections for the cavity dimension indicated.
  - 2. Ties shall be “Dur-O-Wall D/A 515” or approved equal, meeting TMS Building Code Requirements for Masonry Structures.
  - 3. Use if face brick is laid at different time than block.
- B. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with either subparagraph below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064; with ASTM A153, Class B-2 coating.
2. Stainless-Steel Wire: ASTM A580, Type 304 or 316.

C. Wire Ties, General:

1. Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
2. Outer ends of wires are bent 90 degrees and extend 4 inches minimum parallel to face of veneer.

D. Individual Wire Ties: Rectangular units with closed ends and NOT less than 4 inches wide.

1. Use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
2. Wire: Fabricate from minimum 0.148-inch-diameter, hot-dip galvanized steel or stainless-steel wire.

## 2.7 CLEAR SURFACE TREATMENT REPELLENTS

A. In addition to the integral water repellent provided within the concrete masonry units and the integral water repellent provided within the mortar, provide a compatible clear surface treatment repellent post applied in accordance with the manufacturers' recommendations to all concrete masonry work.

1. Water-based, clear, specially formulated VOC compliant penetrating sealer consisting of water-based blends of silanes and siloxanes to provide maximum water repellency when post applied to integrally water-repellent -treated concrete masonry unit construction.

B. Available Products:

1. FININISEAL ® DB by Grace Construction Products.
2. BASF: MasterProtect H 185.
3. Approved Equal.

## 2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

B. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D226, Type I (No. 15 asphalt felt).

D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells.

1. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication.
2. Provide units with either two loops or four loops as needed for number of bars indicated.
  - a. Available Products:
    - 1) Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    - 2) Heckmann Building Products Inc.; No. 376 Rebar Positioner.
    - 3) Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
    - 4) Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.9 EXPANSION AND CONTROL JOINT MATERIALS

- A. Backer rod and sealant in expansion joints and sealant in control joints as specified in Section 07 92 00, JOINT SEALANTS.
- B. Preformed Control Joints:
  - 1. Dayton Superior: DA 2001 Control Joint Regular Rubber.
  - 2. Hohmann and Barnard: #RS Standard.

## 2.10 THROUGH-WALL FLASHING

- A. Where shown built into masonry, and unless noted otherwise, use 5 oz. copper fabric flashing. Seal all laps with flashing mastic.

## 2.11 WEEP HOLE/VENT PRODUCTS

- A. Weeps: Mortar Net USA, Ltd. "Mortar Net Weeps Vents" or approved equal.

## 2.12 MASONRY-CELL INSULATION

- A. Molded-Polystyrene Insulation Units: Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C578, Type I. Provide specially shaped units designed for installing in cores of masonry units.
  - 1. Available Products:
    - a. Concrete Block Insulating Systems; Korfil.
    - b. Shelter Enterprises Inc.; Omni Core.

## 2.13 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  - 1. Available Manufacturers:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

## 2.14 MORTAR AND GROUT MIXES

- A. General: DO NOT use admixtures, including pigments, air-entraining agents, accelerators, retarders, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. DO NOT use calcium chloride in mortar or grout.
  - 2. Limit cementitious materials in mortar to Portland cement and lime.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

- D. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
  - 1. For masonry below grade or in contact with earth, use Type S.
  - 2. For reinforced masonry, use Type S.
  - 3. For interior non-load-bearing partitions, use Type S.
- E. Mortar Mixing:
  - 1. Proportion and mix according to ASTM C270.
- F. Grout for Unit Masonry: Comply with ASTM C476.
  - 1. Use grout of type indicated or, if NOT otherwise indicated, of type (fine or coarse) that complies with TMS 402/602 for dimensions of grout spaces and pour height.
  - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C143.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. No masonry work when ambient temperature is below 35 degrees Fahrenheit; DO NOT build on frozen work or surface with water or frost film; protect masonry from freezing for 48 hours after being laid.
- B. Lay out coursing with story pole prior to laying masonry to insure joints of uniform thickness.
- C. Lay in plumb, true to line level course, head joints aligned; adjust to final position before mortar stiffens.
- D. Keep cavities, chases, etc., free of debris or mortar droppings.
- E. Unless otherwise required, completely fill spaces around built-in items with mortar; fill heads and jambs of hollow metal frames with mortar as the wall is laid. Install anchors, flashing, etc., as the wall is laid.
- F. Tolerance of offset between vertical faces of block masonry: 1/8".
- G. Rake control joints to depth of 3/8" and leave ready for sealant.
- H. Step back unfinished work for joining with new; DO NOT "tooth" unless specifically approved. Protect tops or openings in exposed masonry walls from rain or snow with a strong waterproof membrane, adequately secured in place.

- I. DO NOT use mortar that has begun to set; DO NOT use mortar more than 2-1/2 hours after mixing when air temperature is 80 Degrees Fahrenheit or higher or more that 3-1/2 hours after mixing when air temperature is less than 80 Degrees Fahrenheit.
- J. Brace walls to resist all lateral loads that may be encountered.
- K. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- L. Build chases and recesses to accommodate items specified in this and other Sections.
- M. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- N. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- O. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
- P. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- Q. Comply with construction tolerances in TMS 402 and with the following:
  - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, DO NOT vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
  - 2. For vertical alignment of exposed head joints, DO NOT vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
  - 3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, DO NOT vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
  - 4. For exposed bed joints, DO NOT vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. DO NOT vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
  - 5. For exposed head joints, DO NOT vary from thickness indicated by more than plus or minus 1/8 inch. DO NOT vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
  - 6. For faces of adjacent exposed masonry units, DO NOT vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
  - 7. For exposed bed joints and head joints of stacked bond, DO NOT vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.3 LAYING MASONRY WALLS

- A. Laying Concrete Block:
  - 1. General: Cut block with masonry saws. Set head joints in running bond. For other joints, provide full mortar coverage in joints on horizontal and vertical face shells, none on web edges. Bond each course at corners. Remove sharp edges and irregularities at exposed corners of concrete block work with an abrasive block.
  - 2. Joints: 3/8" wide, struck flush.

3. Lintels: Unless otherwise noted or indicated, construct of U-shape units filled with 3000 psi concrete, extending at least 8" beyond each side of opening. Reinforce as indicated, but NOT less than one No. 5 bar.
  4. Joint Reinforcing: Place in first (continuous) and second bed joints (to 2 feet each side of opening) above and below openings and continuous in every second bed joint throughout remainder of structure, Lap splices 6". Bend longitudinal wires around corners to provide a continuous bond.
  5. Anchors: Space NOT more than 16 inches o. c. vertically and 24" o. c. horizontally, with NOT less than 1 anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, NOT exceeding 8 inches around the perimeter.
- B. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
  - C. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; DO NOT use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - D. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. DO NOT use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - E. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; DO NOT tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
  - F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
  - G. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
  - H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
    1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
    2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
- 3.4 MORTAR BEDDING AND JOINTING
- A. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
  - B. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.
  - C. Lay hollow brick and concrete masonry units as follows:
    1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
    2. With webs fully bedded in mortar in grouted masonry, including starting course on footings.



3. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are NOT grouted.

- D. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. DO NOT deeply furrow bed joints or slush head joints.

### 3.5 MASONRY-CELL INSULATION

- A. Install molded-polystyrene insulation units into masonry unit cells NOT grouted before laying units.

### 3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap joint reinforcement a minimum of 6 inches.
  1. Space reinforcement NOT more than 16 inches o.c.
  2. Space reinforcement NOT more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement NOT more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. DO NOT allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
  1. Install preformed control-joint gaskets designed to fit standard sash block.
  2. Unless indicated or noted otherwise, on the exterior, control joints shall occur at all interior corners of intersecting masonry walls.
  3. Square rake mortar cleanly to depth of 3/8" to receive sealant as specified in Division 07.
- C. Provide expansion joints in exterior above grade masonry walls NOT to exceed 40' o. c., placed as shown on drawings or as located and directed by Engineer.
- D. Use specified expansion joint materials in all expansion joints unless otherwise directed.

### 3.8 THROUGH-WALL FLASHING

- A. Install continuous, embedded in mortar or a troweled-on layer of bituminous mastic, with end joints lapped 6" and sealed with manufacturer's mylar tape, and with ends adjacent to opening jambs turned up to form a pan. Outer edge shall extend completely to face of mortar joint.

- B. At rear of through-wall flashing between stud walls and brick veneer, extend through cavity and build in as shown. Extend up between sheathing and building wrap.
- C. Required Locations: Install through-wall flashing at heads and sills of windows, heads of doors in exterior walls, continuous under weep holes in brick veneer, and where shown.
- D. Where grade slopes and weep holes above grade step with the slope, through-wall flashing shall step correspondingly and shall overlap at the stepped ends a minimum of 24". Turn up ends approximately 2" and turn into head joints of masonry.

### 3.9 LINTELS

- A. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

### 3.11 REINFORCED UNIT MASONRY INSTALLATION

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

### 3.12 FIELD QUALITY REQUIREMENTS

- A. Inspectors: Owner shall engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
  1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
  2. Comply with Level C Quality Assurance in TMS 602 Latest Edition and International Building Code Chapter 17 Structural Tests and Inspection, Latest Edition and as follows:
    - a. Testing Frequency: One set of tests for each 1500 sq. ft. of wall area or portion thereof.
    - b. Mortar Test (Property Specification): For each mix provided, per ASTM C780. Test mortar for mortar air content and compressive strength.
    - c. Grout Test (Compressive Strength): For each mix provided, per ASTM C1019.

### 3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that DO NOT match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
  3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

### 3.14 CLEAR SURFACE TREATMENT REPELLENTS

- A. In addition to the integral water repellent provided within the concrete masonry units and the integral water repellent provided within the mortar, provide a compatible clear surface treatment repellent post applied in accordance with the manufacturers' recommendations to all concrete masonry work.

### 3.15 CLEANING

- A. Clean off loose mortar without damage to brick and CMU. Cut out defective joints, re-point and tool to match adjacent work.
- B. Insure adequate water supply for presoaking and rinsing. Delay cleaning of any section at least 28 days after topping out.
- C. Use "Sure Klean" or approved equal in strict accordance with manufacturer's instructions. Specific product shall be as recommended by the manufacturer for the type of masonry involved.
- D. Protect non-masonry surfaces. Masonry below the working area shall be kept wet by flushing with water.
- E. High pressure water cleaning methods are NOT permitted unless approved by the Engineer.

### 3.16 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed. DO NOT dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that can NOT be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

## SECTION 04 26 13 – MASONRY VENEER

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes unit masonry assemblies consisting of:
1. Concrete masonry veneer.
  2. Facing brick.
  3. Natural stone.
  4. Cast stone.
  5. Mortar and grout.
  6. Thru-wall flashing.
  7. Seismic anchors.
  8. Miscellaneous masonry accessories.
- B. Related Sections:
1. Section 01 33 00 – Submittal Procedures.
  2. Section 01 40 00 – Quality Requirements.
  3. Section 03 30 00 – Cast-in-Place Concrete.
  4. Section 05 50 00 – Metal Fabrications
  5. Section 07 92 00 – Joint Sealants.
- C. Products installed, but NOT furnished, under this Section include the following:
1. Steel lintels for unit masonry, furnished under Section 05 50 00, METAL FABRICATIONS.
  2. Insulation in cavity walls, Division 07.
  3. Control-joint sealing, Division 07.

#### 1.2 REFERENCES

- A. ASTM International:
1. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  2. A580 – Standard Specification for Stainless Steel Wire
  3. A951 – Standard Specification for Steel Wire for Masonry Joint Reinforcement.
  4. A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
  5. C67 – Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
  6. C90 – Standard Specification for Loadbearing Concrete Masonry Units.
  7. C91 – Standard Specification for Masonry Cement.
  8. C144 – Standard Specification for Aggregate for Masonry Mortar.
  9. C150 – Standard Specification for Portland Cement.
  10. C207 – Standard Specification for Hydrated Lime for Masonry Purposes.
  11. C216 – Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
  12. C270 – Standard Specification for Mortar for Unit Masonry.
  13. C780 – Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
  14. C1093 – Standard Practice for Accreditation of Testing Agencies for Masonry.
  15. C1623 – Standard Specification for Manufactured Concrete Masonry Lintels.
  16. D1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.
  17. D2000 – Standard Classification System for Rubber Products in Automotive Applications.
  18. E514 – Standard Test Method for Water Penetration and Leakage Through Masonry.
- B. The Masonry Society (TMS):
1. 402/602 – Building Code Requirements and Specification for Masonry Structures.

### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data: For each type of product indicated.
- C. Samples of masonry veneer used for approval of Engineer.
- D. Shop Drawings for the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  - 2. Anchors and other accessories
- E. Qualification Data: For testing agency.
- F. Material Certificates Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:
  - 1. Masonry units:
    - a. Include material test reports substantiating compliance with requirements.
  - 2. Cementitious materials. Include brand, type, and name of manufacturer.
  - 3. Pre-blended, dry mortar mixes. Include description of type and proportions of ingredients.
  - 4. Anchors, ties, and metal accessories.
- G. Mix Designs: For each type of mortar:
  - 1. Include description of type and proportions of ingredients.
  - 2. Include test reports, per ASTM C780, for mortar mixes required to comply with property specification.

### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency qualified according to ASTM C1093 for testing indicated.
- B. Source Limitations for Masonry Veneer: Obtain masonry veneer of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for masonry veneer, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Contractor/Fabricator Qualifications: Provide documentation of prior work experience with projects of similar size, design, and unit type as this project and whose work has resulted in construction projects with a record of successful in-service performance.
  - 1. Masonry Contractor/Installer: A firm with a minimum of 5 years' experience in masonry veneer installations with a minimum of five commercial type projects similar in size to this specific project and able to provide references and similar project information if so requested.
- E. Conduct initial pre-installation conference to review Contract Documents and requirements prior to any submittal. Require representatives of each entity directly concerned with Masonry Veneer shall attend, including, but NOT limited to:
  - 1. Engineer or representative.
  - 2. Contractor's superintendent.
  - 3. Independent testing agency responsible for masonry testing.

4. Masonry veneer Subcontractor.

- F. Mockups: Create a sample panel for each type of veneer on site showing bond pattern and method of finishing joints. The panel shall be a minimum of 4 feet high and 6 feet long. The approved sample panel shall serve as the basis of acceptance for color, pattern, texture and workmanship of permanent construction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry veneer on elevated platforms in a dry location. If units are NOT stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, DO NOT install until they are dry. Store and handle to avoid chipping.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. DO NOT use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.
- D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

- A. Protection of Masonry:
1. During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
  2. Cover partially completed masonry when construction is NOT in progress.
  3. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Prevent mortar and soil from staining the face of masonry veneer.
1. Immediately remove mortar and soil that encounter such masonry.
  2. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  3. Protect sills, ledges, and projections from mortar droppings.
  4. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  5. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements:
1. DO NOT use frozen materials or materials mixed or coated with ice or frost.
  2. DO NOT build on frozen substrates.
  3. Remove and replace masonry veneer damaged by frost or by freezing conditions.
  4. Comply with cold-weather construction requirements contained in TMS 402/602.
- D. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40° F and above and shall remain so until masonry has dried, but NOT less than 7 days after completing cleaning.

- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are NOT limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, manufacturers specified.
- B. Regional Materials: Provide Masonry Veneer that has been manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

### 2.2 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. DO NOT use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, shall be exposed in the completed Work or shall impair the quality of completed masonry.
- B. Color, texture, and pattern: Match submitted approved samples.
- C. DO NOT use damaged units in the work.
- D. DO NOT use chipped units in exposed locations.

### 2.3 CONCRETE MASONRY VENEER

- A. Shapes: Provide shapes indicated and as follows:
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  - 2. Provide square-edged units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Unit Veneer:
  - 1. Conform to ASTM C90
  - 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
  - 3. Weight Classification: Normal weight.
- C. Integral Water-Repellent: Provide units made with integral water-repellent.
  - 1. Liquid polymeric, integral water-repellent admixture that does NOT reduce flexural bond strength. Units made with integral water-repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
    - a. Available products:
      - 1) Addiment Incorporated; Block Plus W-10.
      - 2) Grace Construction Products, a unit of W.R. Grace & Co. – Conn.; Dry-Block.



3) Master Builders, Inc.; Rheopel.

2.4 FACE BRICK

- A. Regional Materials: Provide brick from materials that have been manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Brick to be selected by the Engineer or Owner. Brick to be modular. Material cost to be included in the base bid.
- C. Submit samples of selected brick for the Engineer's approval.
- D. Face brick shall conform to ASTM C216, Grade SW, Type FBS.
- E. Furnish matching solid brick for all locations where holes would otherwise be exposed.
- F. Deliver to job stacked. DO NOT use chipped brick in exposed locations.

2.5 NATURAL STONE

- A. Size, color, texture, and pattern similar to approved samples.

2.6 CAST STONE

- A. General:
  - 1. Precast from Portland cement concrete. Units should be homogeneous and of the same composition from piece to piece.
  - 2. Furnish with all holes, reglets and other features required for installation.
  - 3. Fully cure prior to delivery.
  - 4. Coat each stone with an acrylic textured coating.
    - a. BASF Corp: MasterProtect HB 400.
  - 5. Manufacturers:
    - a. Advanced Architectural Stone, Fort Worth, TX.
    - b. Florida Architectural Precast, Fort Pierce, FL.
    - c. Architectural Facades, Gilroy, CA.

2.7 CONCRETE LINTELS

- A. Provide concrete lintels complying with requirements below.
  - 1. ASTM C1623, per architectural specifications for color and texture and with reinforcing bars indicated. Provide lintels with net-area compressive strength NOT less than masonry veneer.
  - 2. Precast or formed-in-place concrete lintels complying with requirements in Section 03 30 00, CAST-IN-PLACE CONCRETE, with reinforcing bars indicated.

2.8 MORTAR MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of Portland Cement complying with ASTM C150, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.

- D. Masonry Cement: ASTM C91.
  - 1. Available Products:
    - a. Capital Materials Corporation; Flamingo Color Masonry Cement.
    - b. Essroc, Italcementi Group; Brixment or Velvet.
    - c. Holcim (US) Inc.; Mortamix Masonry Cement, Rainbow Mortamix Custom Buff Masonry Cement, or White Mortamix Masonry Cement.
    - d. Lafarge North America Inc.; Magnolia Masonry Cement, Lafarge Masonry Cement Florida Super Masonry, Trinity Super White Masonry Type S, or Trinity White Masonry Type N.
    - e. Lehigh Cement Company; Lehigh Masonry Cement or Lehigh White Masonry Cement.
    - f. National Cement Company, Inc.; Coosa Masonry Cement.
  - 2. Regional Materials: Provide aggregate for mortar, cement, and lime that have been extracted, harvested, or recovered, as well as manufacture, within 500 miles of Project site.
  
- E. Aggregate for Mortar: ASTM C144.
  - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  - 2. For joints less than 1/4-inch-thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  - 3. Sand shall be clean, well screened, natural, ASTM C144.
  
- F. Water: Potable.
  
- G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water-repellent by same manufacturer.
  - 1. Available Products:
    - a. Addiment Incorporated; Mortar Tite.
    - b. Grace Construction Products, a unit of W.R. Grace & Co. – Conn; Dry-Block Mortar Admixture.
    - c. BASF Corp., MasterPel.

## 2.9 REINFORCEMENT

- A. Masonry Joint Reinforcement, General: ASTM A951.
  - 1. Walls: Hot-dip galvanized, carbon-steel.
  - 2. Wire Size for Side Rods: 86A (3/16).
  - 3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
  - 4. Wire Size for Veneer Ties: W1.7 or 0.148-inch diameter.
  - 5. Spacing of Cross Rods, Tabs, and Cross Ties: NOT more than 16 inches o.c.
  - 6. Provide in lengths of NOT less than 10 feet, with prefabricated corner and tee units.
  
- B. Masonry Joint Reinforcement:
  - 1. For Multi-Wythe Masonry: Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

## 2.10 TIES AND ANCHORS

- A. Brick to Block Backup Walls: Galvanized “pintle and eye” adjustable wall ties for the cavity dimension indicated.
  - 1. Ties shall be Hohmann & Barnard 270-ML Ladder Adjustable Eye-Wire or approved equal, meeting TMS 402/602.
  - 2. Use if face brick is laid at different time than block.

- B. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with either subparagraph below, unless otherwise indicated.
  - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064; with ASTM A153, Class B-2 coating.
  - 2. Stainless-Steel Wire: ASTM A580, Type 304 or 316.
- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face.
  - 1. Outer ends of wires are bent 90 degrees and extend 4 inches minimum parallel to face of veneer.
- D. Individual Wire Ties: Rectangular units with closed ends and NOT less than 4 inches wide.
  - 1. Use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
  - 2. Wire: Fabricate from minimum 0.148-inch-diameter, hot-dip galvanized steel or stainless-steel wire.
- E. Anchors for Seismic Applications
  - 1. Hohmann & Barnard, Inc., 270-ML Ladder with Welded Seismic Clip.

#### 2.11 CLEAR SURFACE TREATMENT REPELLENTS FOR CONCRETE MASONRY VENEER

- A. In addition to the integral water-repellent provided within the concrete masonry units and the integral water-repellent provided within the mortar, provide a compatible clear surface treatment repellent post applied in accordance with the manufacturers' recommendations to all concrete masonry work.
  - 1. Water-based, clear, specially formulated VOC compliant penetrating sealer consisting of water-based blends of silanes and siloxanes to provide maximum water repellency when post applied to integrally water-repellent -treated concrete masonry unit construction.
- B. Available Products:
  - 1. INFINISEAL® DB by Grace Construction Products.
  - 2. Approved Equal.

#### 2.12 MISCELLANEOUS MASONRY ACCESSORIES

- A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
  - 1. Hohmann & Barnard: #RS Standard.
- B. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

#### 2.13 EXPANSION AND CONTROL-JOINT MATERIALS

- A. Backer rod and sealant in expansion joints and sealant in control joints as specified in Section 07 92 00, JOINT SEALANTS.

#### 2.14 THROUGH-WALL FLASHING

- A. Where shown built into masonry, and unless noted otherwise, use 5 oz. copper fabric flashing. Seal all laps with flashing mastic.

## 2.15 WEEP HOLE/VENT PRODUCTS

- A. Weeps: Mortar Net USA, Ltd. "Mortar Net Weeps Vents" or approved equal.

## 2.16 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
  - 1. Available Manufacturers:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

## 2.17 MORTAR MIXES

- A. General: DO NOT use admixtures, including pigments, air-entraining agents, accelerators, retarders, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. DO NOT use calcium chloride in mortar.
  - 2. Limit cementitious materials in mortar to Portland cement and lime.
- B. Pre-blended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a pre-blended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar Mixing:
  - 1. Proportion and mix according to ASTM C270.

## PART 3 - PRODUCTS

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. No masonry work when ambient temperature is below 35 degrees Fahrenheit; DO NOT build on frozen work or surface with water or frost film; protect masonry from freezing for 48 hours after being laid.
- B. Lay out coursing with story pole prior to laying masonry to insure joints of uniform thickness.
- C. Lay in plumb, true to line level course, head joints aligned; adjust to final position before mortar stiffens.

- D. Keep cavities, chases, etc., free of debris or mortar droppings.
- E. Unless otherwise required, completely fill spaces around built-in items with mortar; fill heads and jambs of hollow metal frames with mortar as the wall is laid. Install anchors, flashing, etc., as the wall is laid.
- F. Tolerance of offset between vertical faces of block masonry: 1/8".
- G. Rake control joints to depth of 3/8" and leave ready for sealant.
- H. Step back unfinished work for joining with new; DO NOT "tooth" unless specifically approved. Protect tops or openings in exposed masonry walls from rain or snow with a strong waterproof membrane, adequately secured in place.
- I. DO NOT use mortar that has begun to set; DO NOT use mortar more than 2-1/2 hours after mixing when air temperature is 80 Degrees Fahrenheit or higher or more than 3-1/2 hours after mixing when air temperature is less than 80 Degrees Fahrenheit.
- J. Brace walls to resist all lateral loads that may be encountered.
- K. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- L. Build chases and recesses to accommodate items specified in this and other Sections.
- M. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- N. Use full-size units without cutting if possible.
  - 1. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges.
  - 2. Allow units to dry before laying unless wetting of units is specified.
  - 3. Install cut units with cut surfaces and, where possible, cut edges concealed.
- O. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
- P. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- Q. Comply with construction tolerances in TMS 402 and with the following:
  - 1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, DO NOT vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
  - 2. For vertical alignment of exposed head joints, DO NOT vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
  - 3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, DO NOT vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
  - 4. For exposed bed joints, DO NOT vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. DO NOT vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
  - 5. For exposed head joints, DO NOT vary from thickness indicated by more than plus or minus 1/8 inch. DO NOT vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

6. For faces of adjacent exposed masonry units, DO NOT vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, DO NOT vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.3 MASONRY WALL INSTALLATION

#### A. Concrete Masonry Veneer Installation:

1. General:
  - a. DO NOT install cracked, broken, or chipped masonry units exceeding ASTM C216 allowances.
  - b. Thoroughly wet masonry just before laying except in freezing weather where units are laid dry.
  - c. Prewetting may also be omitted if the units at the time of laying has a rate of absorption NOT exceeding 0.025 ounce of water per square inch of surface after being placed in 1/8 inch of water for 1 minute.
    - 1) Coordinate installation with backup walls, through wall flashing, and other construction. Use masonry saws to cut and fit exposed units. Lay units plumb, true to line, with level courses accurately spaced, and DO NOT furrow bed joints.
    - 2) Finish horizontal run by racking back in each course; toothing NOT permitted. Adjust all units to final position while mortar is soft and plastic. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar, and relay with fresh mortar.
    - 3) Bond unexposed units in wythe by lapping a minimum of 2 inches. Adjust ledger support members to keep Work level at proper elevation. Provide pressure relieving joints by placing a continuous compressible pad under ledger support members.
    - 4) When joining fresh masonry to set or partially set masonry:
      - a) Remove loose concrete masonry unit and mortar.
      - b) Clean and lightly wet exposed surface of set masonry prior to laying fresh masonry.

#### B. Brick Veneer Installation:

1. Determine on the job, with the Engineer present, if brick needs to be wet before laying.
  - a. Use ASTM C67 test or as directed by Engineer.
  - b. If bricks have absorption rate high enough to require wetting, they shall be wet in piles by hose stream until water runs from all sides, then allowed to surface dry before laying.
2. Lay brick so that mortar oozes out at top of joints.
  - a. Completely fill horizontal and vertical joints with mortar when laying.
  - b. Practice of filling head-joint from front only shall NOT be acceptable; all head and bed joints are to be flushed full.
  - c. Make all vertical joints same width except where inconspicuous variations may be necessary to maintain the bond.
  - d. Lay brick in running bond except where soldier, rowlock or other coursing is indicated.
3. Joints:
  - a. Make all exposed mortar joints in brickwork approximately 3/8" wide. The average thickness of three adjacent joints shall NOT be less than 1/4" or more than 1/2". After mortar is "thumb print" hard, finish exposed joints with a 24" long pointing tool, using sufficient pressure to compact mortar and provide smoothly finished joint with mortar in positive contact with brick.
  - b. Tool exposed joints slightly concave when "thumb print" hard.

- c. Unexposed joints below grade shall be trowel pointed; other unexposed joints shall be cut off flush.
  - 4. Anchoring Face Brick to Block Backup Walls:
    - a. Build eye section of anchor into backup walls spaced 16" o.c. vertically (in alternate courses to backup reinforcing) and 16" horizontally, one tie per 1.77 sq. ft.
    - b. Build pintle sections into face wall at same locations, as the brick is laid.
    - c. Both eye and pintle sections shall extend into bed joints of solidly grouted block and into brick joint a minimum of 1-1/2".
    - d. Tie ends shall engage outer shell of hollow block back-up at least 1/2".
    - e. Maximum misalignment of bed joints from one wythe to the other shall be 1-1/4".
  - 5. Anchoring Face Brick to Stud Walls: Anchor with corrugated-metal veneer anchors space 16" o.c. vertically and 16" o.c. horizontally, one tie per 1.77 sq. ft. Embed anchors in brick joints for distances at least one-half of brick thickness.
  - 6. Cavities:
    - a. Keep cavity spaces free of mortar.
    - b. Fill cavity solid with mortar only where indicated.
  - 7. Weep Holes: Provide weep holes 48" o.c. in exterior wythe of masonry walls, and in brick veneer walls, above foundation and at all through-wall flashing and other waterstops in wall.
- C. Natural Stone Veneer Installation:
  - 1. Lay stone veneer with NOT less than 1 inch of mortar between stone and backing wall. Bond between stone and mortar shall be sufficient to withstand a shearing strength of 50 psi after curing for 28 days. Fill and rake all joints, fill solidly with mortar the space between stone and backing.
  - 2. Place stone in its intended position and allow to remain at rest before mortar is applied around and behind. Use no outside mechanical support or anchor ties other than the veneer beneath it and the backing wall. DO NOT exceed 11 inches in the overall distance from the backing wall to the exposed face.
  - 3. Cut all wires off beneath the surface used for tying the stone in place during the mortaring, and exercise care in covering all such ends properly to prevent occurrence of rust.
  - 4. Install felt over sheathing, lapping NOT less than 2 inches at horizontal joints and NOT less than 6 inches at vertical joints. Attach wire mesh to studs with NOT less than 2-inch-long nails, 1 1/8 inches minimum penetration, 6 inches on center and 8d common nails at 8 inches on center at top and bottom plates.
- D. Cast Stone Veneer Installation:
  - 1. Clean stone immediately before setting.
  - 2. Set each piece accurately, true to line, level, and plumb, in full bed of fresh mortar. Completely fill all joints and beds with fresh mortar.
  - 3. Install anchor system as shown.
  - 4. After stones are set in mortar, DO NOT move or disturb in any manner that might destroy bond between cast stone and mortar. Cast stones that have been disturbed shall be removed and reset in fresh mortar.
  - 5. Keep faces of cast stone free of mortar. Promptly remove mortar splashed on stone faces and other surfaces.
  - 6. Upon completion, clean face of stone with stiff fiber brushes and detergent and water. Rinse thoroughly with fresh water.
- E. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- F. Bond Pattern for Masonry Veneer: Unless otherwise indicated, lay masonry veneer in running bond; DO NOT use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- G. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; DO NOT tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- H. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

#### 3.4 MORTAR BEDDING AND JOINTING

- A. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- B. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.
- C. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. DO NOT deeply furrow bed joints or slush head joints.

#### 3.5 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. DO NOT allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Provide expansion joints in exterior above grade masonry walls NOT to exceed 40' o. c., placed as shown on drawings or as located and directed by Engineer.
- C. Use specified expansion joint materials in all expansion joints unless otherwise directed.
- D. Form expansion joints in brick made from clay or shale as follows:
  1. Build in compressible joint fillers where indicated.
  2. Form open joint full depth of brick wythe and of width indicated, but NOT less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00, JOINT SEALANTS.

#### 3.6 THROUGH-WALL FLASHING

- A. Install continuous, embedded in mortar or a troweled-on layer of bituminous mastic, with end joints lapped 6" and sealed with manufacturer's mylar tape, and with ends adjacent to opening jambs turned up to form a pan. Outer edge shall extend completely to face of mortar joint.
- B. At rear of through-wall flashing between stud walls and brick veneer, extend through cavity and build in as shown. Extend up between sheathing and building wrap.
- C. Required Locations: Install through-wall flashing at heads and sills of windows, heads of doors in exterior walls, continuous under weep holes in brick veneer, and where shown.
- D. Where grade slopes and weep holes above grade step with the slope, through-wall flashing shall step correspondingly and shall overlap at the stepped ends a minimum of 24". Turn up ends approximately 2" and turn into head joints of masonry.



### 3.7 LINTELS

- A. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.8 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

### 3.9 FIELD QUALITY REQUIREMENTS

- A. Inspectors: Owner shall engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
  - 1. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
  - 2. Comply with Level C Quality Assurance in TMS 602 Latest Edition and International Building Code Chapter 17 Structural Tests and Inspection, Latest Edition and as follows:
- B. Testing Frequency: One set of tests for each 1500 sq. ft. of wall area or portion thereof.
- C. Mortar Test (Property Specification): For each mix provided, per ASTM C780. Test mortar for mortar air content and compressive strength.

### 3.10 REPAIR, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that DO NOT match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

### 3.11 CLEAR SURFACE TREATMENT REPELLENTS

- A. In addition to the integral water-repellent provided within the mortar, provide a compatible clear surface treatment repellent post applied in accordance with the manufacturers' recommendations to all concrete masonry work.

### 3.12 CLEANING

- A. Clean off loose mortar without damage to masonry veneer. Cut out defective joints, re-point and tool to match adjacent work.
- B. Insure adequate water supply for presoaking and rinsing. Delay cleaning of any section at least 28 days after topping out.
- C. Use "Sure Klean" or approved equal in strict accordance with manufacturer's instructions. Specific product shall be as recommended by the manufacturer for the type of masonry involved.
- D. Protect non-masonry surfaces. Masonry below the working area shall be kept wet by flushing with water.
- E. High pressure water cleaning methods are NOT permitted unless approved by the Engineer.

### 3.13 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed. DO NOT dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that CANNOT be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

DIVISION 5  
METALS



## SECTION 05 05 19 – POST-INSTALLED ANCHORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Post-installed concrete anchors
  - 2. Post-installed masonry anchors
  
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 01 40 00 – Quality Requirements

#### 1.2 REFERENCES

- A. The following is a list of standards which may be referenced in this Section:
  - 1. American Concrete Institute (ACI):
    - a. 355.2, Qualification of Post-Installed Mechanical Anchors in Concrete.
    - b. 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
  - 2. American Iron and Steel Institute (AISI):
    - a. Stainless Steel Type 316.
  - 3. ANSI
  - 4. ASTM International:
    - a. A123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - b. A143 – Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
    - c. A153 – Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - d. A194 – Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both.
    - e. A380 – Practice for Cleaning, Descaling, and Passivation of Stainless-Steel Parts, Equipment, and Systems.
    - f. A385 – Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
    - g. A780 – Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
    - h. A967 – Specification for Chemical Passivation Treatments for Stainless Steel Parts.
    - i. E488 – Standard Test Methods for Strength of Anchors in Concrete Elements.
    - j. F436 – Specification for Hardened Steel Washers.
    - k. F593 – Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
    - l. F594 – Specification for Stainless Steel Nuts.
    - m. F1554 – Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
  - 5. International Association of Plumbing and Mechanical Officials Uniform Evaluation Service (IAPMO-UES):
    - a. Evaluation Reports for Concrete and Masonry Anchors.
  - 6. International Code Council Evaluation Service (ICC-ES):
    - a. Evaluation Reports for Concrete and Masonry Anchors.
    - b. AC01, Acceptance Criteria for Expansion Anchors in Masonry Elements.
    - c. AC70, Acceptance Criteria for Fasteners Power-driven into Concrete, Steel, and Masonry Elements.
    - d. AC106, Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements.
    - e. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
    - f. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements. Evaluation Reports for Concrete and Masonry Anchors.
  - 7. NSF International:

- a. 61, Drinking Water System Components - Health Effects.
- 8. Specialty Steel Industry of North America (SSINA):
  - a. Specifications for Stainless Steel.
  - b. Design Guidelines for the Selection and Use of Stainless Steel.
  - c. Stainless Steel Fabrication.
  - d. Stainless Steel Fasteners.

### 1.3 DEFINITIONS

- A. Corrosive Area: Containment area or area exposed to delivery, storage, transfer, or use of chemicals.
- B. Exterior Area: Location NOT protected from weather by a building or other enclosed structure.
- C. Interior Dry Area: Location inside building or structure NOT subject to liquid spills or wash down with no water or earth-retaining walls.
- D. Interior Wet Area: Location inside building or structure that is subject to liquid spills or wash down, or with water or earth-retaining walls.
- E. Submerged: Location at or below top of water surface, either interior or exterior, of an environmental structure.

### 1.4 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Action Submittals:
  - 1. Shop Drawings: Specific instructions for anchor installation, including drilled hole size and depth, preparation, placement, dust mitigation, procedures, and instructions for safe handling of anchoring systems.
- C. Informational Submittals:
  - 1. Concrete and/or Masonry Anchors:
    - a. Manufacturer's product description and installation instructions.
    - b. Current ICC-ES or IAPMO-UES Report for each type of post-installed anchor to be used.
    - c. Adhesive Anchor Installer Certification.
  - 2. Passivation method for stainless steel anchors.
  - 3. Hot-Dip Galvanizing: Certificate of Compliance signed by galvanizer, with description of material processed and ASTM standard used for coating.

### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installers of adhesive anchors horizontally or upwardly inclined to support sustained tension loads shall be certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Installer Certification Program or equivalent.
  - 2. Galvanized Coating Applicator: Company specializing in hot-dip galvanizing after fabrication and following procedures of Quality Assurance Manual of the American Galvanizers Association.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Package stainless steel items in a manner to provide protection from carbon impregnation.
- B. Protect hot-dip galvanized finishes from damage because of metal banding and rough handling.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Unless otherwise indicated, meet the following requirements:
  - 1. Stainless Steel:
    - a. Threaded Rods: F593, AISI Type 316, Condition CW.
    - b. Nuts: F594, AISI Type 316, Condition CW.
  - 2. Carbon Steel:
    - a. Threaded Rods: F1554, Grade 55.
    - b. Flat and Beveled Washers (Hardened): F436.
    - c. Nuts: A194, Grade 2H.
  - 3. Galvanized Steel:
    - a. All: A153.
- B. Bolts, Washers, and Nuts: Use stainless steel, hot-dip galvanized steel, and zinc-plated steel material types as indicated in the Fastener Schedule at the end of this Section.

### 2.2 POST-INSTALLED CONCRETE ANCHORS

- A. General:
  - 1. AISI Type 316 stainless, hot-dip galvanized or zinc-plated steel, as shown in the Fastener Schedule at the end of this Section.
  - 2. Post-installed anchor systems used in concrete shall be approved by ICC Evaluation Services Report or IAPMO-UES Report for use in cracked concrete and for short-term and long-term loads including wind and earthquake.
  - 3. Mechanical Anchors: Comply with the requirements of ICC-ES AC193 or ACI 355.2.
  - 4. Adhesive Anchors: Comply with the requirements of ICC-ES AC308 or ACI 355.4.
  - 5. Where required, anchors shall be acceptable for use in potable water structures per EPA and local health agencies or NSF 61.
- B. Torque-Controlled Expansion Anchors (Wedge Anchors):
  - 1. Manufacturers and Products:
    - a. Hilti, Inc., Kwik Bolt TZ, or Kwik Bolt TZ SS 316.
    - b. DeWalt/Powers Fasteners, Power-Stud+SD2, or Power-Stud+SD4.
    - c. Simpson Strong-Tie Co., Inc., Strong-Bolt 2.
- C. Undercut Anchors:
  - 1. Manufacturers and Products:
    - a. Hilti, Inc., HDA-T, or HDA-TR.
    - b. Simpson Strong-Tie Co., TCA.
    - c. DeWalt/Powers Fasteners, Atomic+.
- D. Self-Tapping Concrete Screw Anchors:
  - 1. Manufacturers and Products:
    - a. DeWalt/Powers Fasteners, Wedge-Bolt (SS), or Screw-Bolt+.
    - b. Hilti, Inc., KH-EZ.
    - c. Simpson Strong-Tie Co., Titen HD.

- E. Adhesive Anchors:
1. Threaded Rod:
    - a. Diameter as shown on Drawings.
    - b. Length as required to provide minimum depth of embedment indicated and thread projection required.
    - c. Clean and free of grease, oil, or other deleterious material.
  2. Adhesive:
    - a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments.
    - b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
  3. Packaging and Storage:
    - a. Disposable, self-contained system capable of dispensing both components in proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
    - b. Store adhesive on pallets or shelving in a covered storage area.
    - c. Package Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
    - d. Dispose of When:
      - 1) Shelf life has expired.
      - 2) Stored other than in accordance with manufacturer's instructions.
  4. Manufacturers and Products:
    - a. Hilti, Inc., HIT-RE 500 V3, or HIT-HY 200-R.
    - b. Simpson Strong-Tie Co., SET-XP, AT-XP for low temp, or SET-3G for high temp.
    - c. DeWalt/Powers Fasteners, Pure 110+, or AC200+ for low temp.

- F. Adhesive Threaded Inserts:
1. Type 316 stainless steel, internally threaded inserts.

## 2.3 POST-INSTALLED MASONRY ANCHORS

- A. General: AISI Type 316 stainless, hot-dip galvanized, or zinc-plated steel, as shown in Fastener Schedule at the end of this Section.
- B. Current ICC Evaluation Report or IAPMO-UES Report indicating acceptance for anchors at structural applications in masonry.
- C. Manufacturers and Products:
1. Hilti, Inc., Kwik-Bolt-3 HDG, for grout-filled masonry, HIT-HY 270 for all masonry materials.
  2. Simpson Strong-Tie Co., Strong-Bolt 2 for grout filled CMU, Titen-HD for grout-filled or hollow CMU, AT-XP for grout-filled CMU.
  3. DeWalt/Powers Fasteners, Power-Stud+SD1 for grout-filled masonry.

## PART 3 - EXECUTION

### 3.1 CONCRETE AND MASONRY ANCHORS

- A. Begin installation only after concrete or masonry to receive anchors has attained design strength.
- B. Locate existing reinforcing with Ground Penetrating Radar or other method approved by Engineer prior to drilling. Coordinate with Engineer to adjust anchor locations where installation would result in hitting reinforcing.
- C. Install in accordance with written manufacturer's instructions.



- D. Provide minimum embedment, edge distance, and spacing as indicated on Drawings.
- E. Use only drill type and bit type and diameter recommended by anchor manufacturer.
- F. Clean hole of debris and dust per manufacturer's requirements.
- G. When unidentified embedded steel, rebar, or other obstruction is encountered in drill path, slant drill to clear obstruction. If drill must be slanted more than indicated in manufacturer's installation instructions to clear obstruction, notify Engineer for direction on how to proceed.
- H. Adhesive Anchors:
  - 1. Unless otherwise approved by Engineer and adhesive manufacturer:
    - a. DO NOT install adhesive anchors when temperature of concrete or masonry is below 40 degrees F or above 100 degrees F.
    - b. DO NOT install prior to concrete attaining an age of 21 days.
    - c. Remove any standing water from hole with oil-free compressed air. Inside surface of hole shall be dry.
    - d. DO NOT disturb anchor during recommended curing time.
    - e. DO NOT exceed maximum torque as specified in manufacturer's instructions.
  - 2. For hollow-unit masonry, install screen tube in accordance with manufacturer's instructions.
- I. Prestressed Concrete: DO NOT use drilled-in anchors in prestressed or post-tensioned concrete members without Engineer's prior approval unless specifically shown on Drawings.

### 3.2 FIELD QUALITY ASSURANCE AND QUALITY REQUIREMENTS

- A. Owner-Furnished Quality Assurance, in accordance with IBC Chapter 17 requirements, is provided in the Statement of Special Inspections Plan in Supplement located at end of Section 01 40 00, QUALITY REQUIREMENTS.
- B. Contractor-Furnished Quality requirements: Inspection and testing as required in Section 01 40 00, QUALITY REQUIREMENTS.

### 3.3 MANUFACTURER'S SERVICES

- A. Conduct Site Training of installation personnel for proper installation, handling, and storage of anchor systems.

### 3.4 FASTENER SCHEDULE

- A. Unless indicated otherwise on Drawings, provide fasteners as follows:
  - 1. General:
    - a. Verify product acceptability and manufacturer's requirements if anchor installation will occur in an overhead application.
    - b. Adhesive Anchors for hollow concrete masonry units shall be installed with screen tubes.
  - 2. Interior Dry Areas:
    - a. Match material being anchored.
  - 3. Submerged, Exterior, Interior Wet, and Corrosive Areas:
    - a. Stainless steel.
  - 4. Anti-Seize Lubricant:
    - a. Use on all stainless-steel threads.
  - 5. DO NOT use adhesive anchors to support fire-resistive construction or where ambient temperature will exceed 120 degrees F.

END OF SECTION

## SECTION 05 05 23 – WELDING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Welding.
- B. Related Specifications:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 01 40 00 – Quality Requirements.

#### 1.2 REFERENCE STANDARDS

- A. The following is a list of standards that may be referenced in this section:
  - 1. ASME:
    - a. BPVC.V, Nondestructive Examination.
    - b. BPVC.IX, Welding and Brazing Qualifications.
  - 2. ASNT:
    - a. SNT TC 1A, Personnel Qualification and Certification in Nondestructive Testing.
  - 3. ASTM International:
    - a. A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
  - 4. AWS:
    - a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
    - b. A3.0, Standard Welding Terms and Definitions.
    - c. D1.1, Structural Welding Code - Steel.
    - d. D1.8, Structural Welding Code - Seismic Supplement.
    - e. D1.2, Structural Welding Code - Aluminum.
    - f. D1.3, Structural Welding Code - Sheet Steel.
    - g. D1.4, Structural Welding Code - Reinforcing Steel.
    - h. D1.6, Structural Welding Code - Stainless Steel.
    - i. QC1, Standard for AWS Certification of Welding Inspectors.

#### 1.3 DEFINITIONS

- A. CJP: Complete Joint Penetration.
- B. CWI: Certified Welding Inspector.
  - 1. Contractor's Welding Inspector:
    - a. Contractor's CWI acts for, and on behalf of, the Contractor for all inspection and quality matters within the scope of the Contract Documents.
    - b. Contractor is required to provide a welding inspector to oversee welding operations and be responsible for visual inspection and necessary correction of all deficiencies in materials and workmanship required to meet referenced welding codes.
    - c. This type of Quality requirements Inspection is NOT classified as Special Inspection.
  - 2. Verification Inspector:
    - a. CWI who acts on behalf of the Owner.
    - b. This type of independent inspection and testing is the prerogative of the Owner, who may perform this function, or waive independent verification inspection if it is NOT required by the building official and building code.
- C. MT: Magnetic Particle Testing.

- D. NDE: Nondestructive Examination.
  - E. NDT: Nondestructive Testing.
  - F. PJP: Partial Joint Penetration.
  - G. PQR: Procedure Qualification Record.
  - H. PT: Liquid Penetrant Testing.
  - I. Special Inspection:
    - 1. Nondestructive examination exclusive of VT.
    - 2. Special inspection includes NDE such as MT, PT, UT, RT, and Verification Inspection. Special Inspection personnel report to and are retained by the Owner or the Engineer on behalf of the Owner.
    - 3. See additional requirements in Section 01 40 00, QUALITY REQUIREMENTS.
  - J. RT: Radiographic Testing.
  - K. UT: Ultrasonic Testing.
  - L. VT: Visual Inspection/Testing.
  - M. WPQ: Welder/Welding Operator Performance Qualification Record.
  - N. WPS: Welding Procedure Specification.
- 1.4 SUBMITTALS
- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
  - B. Action Submittals:
    - 1. Shop Drawings:
      - a. Shop and field WPSs and PQRs.
      - b. NDT procedure specifications prepared in accordance with ASME BPVC.V.
      - c. Welding Data (Shop and Field): Submit welding data together with Shop Drawings as a complete package.
        - 1) Show on Shop Drawings, or on a weld map, complete information regarding base metal specification designation, location, type, size, and extent of welds with reference called out for WPS and NDE numbers in tails of combined welding and NDE symbols as indicated in AWS A2.4.
        - 2) Clearly distinguish between shop and field welds.
        - 3) Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for welds.
        - 4) Welding and NDE Symbols: In accordance with AWS A2.4.
        - 5) Welding Terms and Definitions: In accordance with AWS A3.0.
  - C. Informational Submittals:
    - 1. WPQs.
    - 2. CWI credentials.
    - 3. Testing agency personnel credentials.
    - 4. CWI visual inspection (VT) reports.
    - 5. Welding Documentation: Submit on forms in referenced welding codes.

## 1.5 QUALIFICATIONS

- A. WPSs: In accordance with AWS D1.1 for shop or field welding or ASME BPVC.IX (Forms QW 482 and QW 483) for shop welding only.
- B. WPQs: In accordance with AWS D1.1 or ASME BPVC.IX (Form QW 484).
- C. CWI: Certified in accordance with AWS QC1, and having prior experience with specified welding codes. Alternate welding inspector qualifications require prior approval by Engineer.
- D. Testing Agency: Personnel performing tests shall be NDT Level II certified in accordance with ASNT SNT TC 1A.

## 1.6 SEQUENCING AND SCHEDULING

- A. Unless otherwise specified, Submittals required in this Section shall be submitted and approved prior to commencement of welding operations.

## PART 2 - PRODUCTS

### 2.1 SOURCE QUALITY REQUIREMENTS

- A. CWI shall be present whenever shop welding is performed. CWI shall perform inspection at suitable intervals, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1 or referenced welding code and as follows:
  - 1. Verifying conformance of specified job material and proper storage.
  - 2. Monitoring conformance with approved WPS.
  - 3. Monitoring conformance of WPQ.
  - 4. Inspecting weld joint fit-up and performing in-process inspection.
  - 5. Providing 100 percent visual inspection of welds.
  - 6. Coordinating with nondestructive testing personnel and reviewing NDE test results.
  - 7. Maintaining records and preparing reports documenting that results of CWI VT and subsequent NDE testing comply with the Work and referenced welding codes.

## PART 3 - EXECUTION

### 3.1 NONDESTRUCTIVE WELD TESTING REQUIREMENTS

- A. Quality requirements Inspection:
  - 1. All Welds: 100 percent VT by Contractor's CWI.
  - 2. Acceptance Criteria:
    - a. Structural Pipe and Tubing: AWS D1.1, Paragraph 9.25.
    - b. All Other Structural Steel: AWS D1.1, Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.
    - c. Stud Connections: AWS D1.1, Paragraph 7.8.1.
- B. Nondestructive Testing Requirements:
  - 1. NDT frequency shall be as specified below, as required by referenced welding codes, or as specified in the attached table. In case there is a conflict, the higher frequency level of NDT shall apply.
    - a. Nontubular Connections:
      - 1) CJP Butt Joint Groove Welds: 10 percent random RT. Use UT for CJP butt joint groove welds that can NOT be readily radiographed.
      - 2) All Other CJP Groove Welds: 10 percent random UT.
      - 3) Fillet Welds and PJP Groove Welds: 10 percent random PT or MT.

- b. Tubular Connections:
  - 1) CJP butt joint groove welds made from one side without backing: 100 percent RT or UT in accordance with AWS D1.1, Paragraph 9.26.2 requirements.
  - 2) CJP Butt Joint Groove Welds made without backing or back-gouging: 10 percent random RT. Use UT for CJP butt joint groove welds that can NOT be readily radiographed.
  - 3) All Other CJP Groove Welds: 10 percent random UT.
  - 4) Fillet Welds and PJP Groove Welds: 10 percent random PT or MT.
- 2. NDT Procedures and Acceptance Criteria:
  - a. Nontubular Connections:
    - 1) RT: Perform in accordance with AWS D1.1, Clause 6, Part E. Acceptance criteria per AWS D1.1, Paragraph 6.12.1.
    - 2) UT: Perform in accordance with AWS D1.1, Clause 6, Part F. Acceptance criteria per AWS D1.1, Paragraph 6.13.1.
    - 3) PT and MT:
      - a) Perform on fillet and PJP groove welds in accordance with AWS D1.1, Paragraph 6.14.4 and Paragraph 6.14.5.
      - b) Acceptance criteria per AWS D1.1, Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.
  - b. Tubular Connections:
    - 1) RT: Comply with requirements for Nontubular Connections and additional requirements of AWS D1.1, Clause 9, Paragraph 9.28 and Paragraph 9.29.
    - 2) UT: Comply with requirements for Nontubular Connections and additional requirements of AWS D1.1, Clause 9, Paragraph 9.27.
    - 3) PT and MT:
      - a) Perform on fillet and PJP groove welds in accordance with AWS D1.1, Paragraph 6.14.4 and Paragraph 6.14.5.
      - b) Acceptance criteria per AWS D1.1, Paragraph 9.25.

### 3.2 FIELD QUALITY REQUIREMENTS

- A. CWI shall be present whenever field welding is performed. CWI shall perform inspection, at suitable intervals, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1 or referenced welding code and as follows:
  - 1. Verify conformance of specified job material and proper storage.
  - 2. Monitor conformance with approved WPS.
  - 3. Monitor conformance of WPQ.
  - 4. Inspect weld joint fit-up and perform in-process inspection.
  - 5. Provide 100 percent visual inspection of all welds in accordance with Subparagraph Quality requirements Inspection.
  - 6. Supervise nondestructive testing personnel and evaluating test results.
  - 7. Maintain records and prepare report confirming results of inspection and testing comply with the Work.

### 3.3 WELD DEFECT REPAIR

- A. Repair and retest rejectable weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

END OF SECTION

## SECTION 05 12 00 – STRUCTURAL STEEL

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Structural steel.
  - 2. Grout.
  
- B. Related Sections:
  - 1. Section 01 10 00 – Summary.
  - 2. Section 01 30 00 – Administrative Requirements.
  - 3. Section 01 33 00 – Submittal Procedures.
  - 4. Section 01 40 00 – Quality Requirements.
  - 5. Section 03 62 00 – Non-Shrink Grouting.
  - 6. Section 09 90 00 – Painting and Protective Coatings.

#### 1.2 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC “Code of Standard Practice for Steel Buildings and Bridges,” that support design loads.

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Include embedment drawings.
  - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pre-tensioned and slip-critical high-strength bolted connections.
- D. Welding certificates.
- E. Qualification Data: For Installer and fabricator.
- F. Mill Test Reports: Signed by Manufacturers certifying that the following products comply with requirements:
  - 1. Structural steel including chemical and physical properties.
  - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 3. Shop primers.
  - 4. Non-shrink grout.
- G. Source quality-control test reports.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who regularly erects structural steel with scope and complexity similar to that of this project.

- B. Fabricator Qualifications: A qualified fabricator who regularly fabricates structural steel with scope and complexity like that of this project.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- D. Comply with applicable provisions of the following specifications and documents:
  1. AISC "Code of Standard Practice for Steel Buildings and Bridges."
  2. AISC "Seismic Provisions for Structural Steel Buildings" and "Supplement No.2."
  3. AISC "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
  4. AISC "Specification for the Design of Steel Hollow Structural Sections."
  5. AISC "Specification for Allowable Stress Design of Single-Angle Members".
  6. RCSC "Specifications for Structural Joints Using ASTM F3125 Bolts.
- E. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01 10 00, SUMMARY, and Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
  1. Store fasteners in a protected place. Re-lubricate bolts and nuts that become dry.
  2. DO NOT store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
  3. DO NOT clean and use rusty bolts.

#### 1.6 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

### PART 2 - PRODUCTS

#### 2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992.
- B. Channels, Angles, and Shapes: ASTM A36 unless otherwise noted.
- C. Plate and Bar: ASTM A36 unless otherwise noted.
- D. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B structural tubing.
- E. Steel Pipe: ASTM A53, Type E or S, Grade B.
  1. Weight Class: Standard unless otherwise indicated.
  2. Finish: Black, except where indicated to be galvanized.
- F. Welding Electrodes: Comply with AWS requirements. Tensile strength should be the same or greater than base metal.



## 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM F3125 Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon steel nuts; and ASTM F436 hardened carbon-steel washers.
  - 1. Finish: Plain unless noted or indicated otherwise.
- B. Un-headed Anchor Rods: ASTM F1554, Grade 36, unless otherwise indicated.
  - 1. Configuration: as indicated.
  - 2. Nuts: ASTM A563, heavy hex carbon steel.
  - 3. Plate Washers: ASTM A36 carbon steel.
  - 4. Washers: ASTM F436, hardened carbon steel.
  - 5. Finish: Plain, unless noted or indicated otherwise.
- C. Threaded Rods: ASTM A36.
  - 1. Nuts: ASTM A563 heavy hex carbon steel.
  - 2. Washers: ASTM F436 hardened carbon steel.
  - 3. Finish: Plain, unless noted or indicated otherwise.
- D. Clevises or turnbuckles: ASTM A108, Grade 1035, cold-finished carbon steel.
- E. Eye Bolts and Nuts: ASTM A108, Grade 1030, cold-finished carbon steel.
- F. Sleeve Nuts: ASTM A108, Grade 1018, cold-finished carbon steel.

## 2.3 PRIMER

- A. Primer: Fabricator's standard lead and chromate free non-asphaltic rust inhibiting primer.
- B. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

## 2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time and complying with Section 03 62 00, NON-SHRINK GROUTING.

## 2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC "Code of Standard Practice for Steel Buildings and Bridges" and AISC "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design".
  - 1. Camber structural-steel members where indicated.
  - 2. Identify high-strength structural steel according to ASTM A6 and maintain markings until structural steel has been erected.
  - 3. Mark and match-mark materials for field assembly.
  - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."
- F. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.
- G. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk, cross-recessed head machine screws, uniformly spaced NOT more than 10" o.c., unless otherwise indicated.
- H. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces.
  - 2. Base-Plate Holes: Cut, drill, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

## 2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC "Specification for Structural Joints Using ASTM F3125 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

## 2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2".
  - 2. Surfaces to be field welded.
  - 3. Surfaces to be high-strength bolted with slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials.
  - 5. Galvanized surfaces.
- B. Surface Preparation: Clean the surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to Manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of NOT less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint comers, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

- D. Painting: Apply a 1-coat, non-asphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of NOT less than 1.5 mils.

## 2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123.
  - 1. Fill vent holes and grind smooth after galvanizing.
  - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
  - 1. DO NOT remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design".
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.
  - 1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of base plate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. DO NOT remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and base or bearing; plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow it to cure. Comply with Manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly clean bearing surfaces and other surfaces that will be in permanent

contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. DO NOT use thermal cutting during erection unless approved by Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1.

G. DO NOT enlarge unfair holes in members by burning or using drift pins. Ream holes that shall be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC "Specification for Structural Joints Using ASTM F3125 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened, unless noted or indicated otherwise.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design", for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

### 3.5 FIELD QUALITY REQUIREMENTS

A. Testing Agency: Owner shall engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC "Specification for Structural Joints Using ASTM F3125 Bolts."

C. Welded Connections: Field welds shall be visually inspected according to AWS D1.1.

D. Correct deficiencies in Work that test reports and inspections indicate does NOT comply with the Contract Documents.

### 3.6 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780 and Manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

- C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 90 00, PAINTING AND PROTECTIVE COATINGS.

END OF SECTION

## SECTION 05 21 00 – STEEL JOIST FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Long-span steel joists.
    - a. K-Series.
    - b. LH-Series
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 03 30 00 – Cast-in-Place Concrete
  - 3. Section 05 50 00 – Metal Fabrications
  - 4. Section 09 90 00 – Painting and Protective Coatings

#### 1.2 DEFINITIONS

- A. SJI Specifications: Steel Joist Institute's Standard Specifications, Load Tables, and Weight Tables for Steel Joists and Joist Girders.
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support non-uniform, unequal, or special loading conditions that invalidate load tables in the SJI Specifications.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance:
  - 1. Provide special joists and connections capable of withstanding design loads indicated.
- B. Design special joists to withstand design loads with live load deflections no greater than the following:
  - 1. Roof Joists: Vertical deflection of 1/240 of the span.

#### 1.4 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data: For each type of joist, accessory, and product indicated.
- C. Shop Drawings: Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.
  - 1. Indicate locations and details of bearing plates to be embedded in other construction.
  - 2. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional Engineer responsible for its preparation.
- D. Welding certificates.
- E. Manufacturer Certificates: Signed by manufacturers certifying that joists comply with requirements.
- F. Mill Certificates: Signed by bolt manufacturers certifying that bolts comply with requirements.
- G. Qualification Data: For manufacturer.

H. Field quality-control test and inspection reports.

I. Research/Evaluation Reports: For joists.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables of SJI Specifications.

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. SJI Specifications: Comply with standard specifications in SJI Specifications that are applicable to types of joists indicated.

C. Welding: Qualify procedures and personnel according to AWS D1.1, Structural Welding Code - Steel.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI Specifications.

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

## 1.7 SEQUENCING

A. Deliver steel bearing plates to be built into masonry construction.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Steel: Comply with SJI Specifications for web and steel-angle chord members.

1. Recycled Content: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is NOT less than 25 percent.

B. Steel Bearing Plates: ASTM A36.

C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A307, Grade A (Property Class 4.6), carbon-steel, hex-head bolts, and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.

1. Finish: Plain, uncoated.

D. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts.

1. Finish: Plain.

E. Welding Electrodes: Comply with AWS standards.

### 2.2 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

- B. Primer: Provide shop primer that complies with Section 09 90 00, PAINTING AND PROTECTIVE COATINGS.
- C. Ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

### 2.3 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI Specifications, with steel-angle top and bottom-chord members, underslung ends and parallel top-chord.
  - 1. Joist Type: K-series steel joists.
- B. Steel Joist Substitutes: "manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI Specifications, with steel-angle or channel members.
- C. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds and methods used in correcting welding work.
- D. Provide holes in chord members for connecting and securing other construction to joists.
- E. Top-Chord Extensions: Extend top chords of joists with SJI Type S top-chord extensions wither indicated, complying with SJI Specifications.
- F. Extended Ends: Extend bearing ends of joists with SJI Type R extended ends where indicated, complying with SJI Specifications.
- G. DO NOT camber joists.
- H. Camber joists according to SJI Specifications.
- I. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/3 inch per 12 inches (1:48).

### 2.4 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI Specifications, with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
  - 1. Joist Type: LH-series steel joists.
  - 2. End Arrangement: Underslung.
  - 3. Top-Chord Arrangement: Parallel.
- B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Camber long-span steel joists according to SJI Specifications.
- E. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).



## 2.5 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal and/or diagonal bridging of material, size, and type required by SJI Specifications for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Bridging: Schematically indicated. Detail and fabricate according to SJI Specifications. Furnish additional erection bridging if required for stability.
- C. Bridging: Fabricate as indicated and according to SJI Specifications. Furnish additional erection bridging if required for stability.
- D. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.
- E. Steel bearing plates with integral anchorages are specified in Section 05 50 00, METAL FABRICATIONS.
- F. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface, unless otherwise indicated.
- G. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

## 2.6 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by power-tool cleaning, SSPC-SP3.
- B. Apply 1 coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film NOT less than 1 mil (0.025 mm) thick.
- C. Shop priming of joists and joist accessories is specified in Section 09 90 00.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. DO NOT install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI Specifications, joist manufacturer's written recommendations, and requirements in this Section.
  - 1. Before installation, splice joists delivered to Project site in more than one piece.
  - 2. Space, adjust, and align joists accurately in location before permanently fastening.

3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
  4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.
- C. Field weld joists to supporting steel bearing plates. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

### 3.3 FIELD QUALITY REQUIREMENTS

- A. Testing Agency: Owner shall engage a qualified independent testing and inspecting agency to inspect field welds and bolted connections and to perform field tests and inspections and prepare test and inspection reports.
- B. Field welds shall be visually inspected according to AWS D1.1/D1.1M.
- C. In addition to visual inspection, field welds shall be tested according to AWS D1.1/D1.1M and the following procedures, as applicable:
1. Radiographic Testing: ASTM E94.
  2. Magnetic Particle Inspection: ASTM E709.
  3. Ultrasonic Testing: ASTM E164.
  4. Liquid Penetrant Inspection: ASTM E165.
- D. Bolted connections shall be visually inspected.
- E. High-strength, field-bolted connections shall be tested and verified according to procedures in RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.
- F. Correct deficiencies in Work that test and inspection reports have indicated are NOT in compliance with specified requirements.
- G. Additional testing shall be performed to determine compliance of corrected Work with specified requirements.

### 3.4 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates and accessories.
1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
  2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

- C. Touchup Painting: Cleaning and touchup painting are specified in Division 09, FINISHES.
- D. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer. Ensure joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION

## SECTION 05 31 00 – STEEL DECK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Galvanized roof deck with prime-painted bottom surface.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 01 40 00 – Quality Requirements.

#### 1.2 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data: For each type of deck, accessory, and product indicated.
- C. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.
- D. Product Certificates: For each type of steel deck, signed by product manufacturer.

#### 1.3 QUALITY ASSURANCE

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI “North American Specification for the Design of Cold-Formed Steel Structural Members.”

#### 1.4 DELIVERY, STORAGE, AND HANDLING

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

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers:
  - 1. ASC Profiles, Inc.
  - 2. Canam Steel Corp.; The Canam Manac Group.
  - 3. Consolidated Systems, Inc.
  - 4. DACS, Inc.
  - 5. D-Mac Industries Inc.
  - 6. Epic Metals Corporation.
  - 7. Marlyn Steel Decks, Inc.
  - 8. New Millennium Building Systems, LLC.
  - 9. Nucor Corp.; Vulcraft Division.
  - 10. Roof Deck, Inc.
  - 11. United Steel Deck, Inc.
  - 12. Valley Joist; Division of EBSCO Industries, Inc.
  - 13. Verco Manufacturing Co.

14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
15. Approved equal.

## 2.2 ROOF DECK

- A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
  1. Galvanized Steel Sheet: ASTM A653, Structural Steel, Grade 33, and G90 zinc coating.
  2. Prime paint underside of galvanized deck with manufacturer's standard baked on, rust inhibited primer.
  3. Deck Profile: As shown on drawings.
  4. Profile Depth: As shown on drawings.
  5. Design Uncoated-Steel Thicknesses: As indicated.
  6. Span Condition: Furnish in longest practical lengths with no individual sheet shorter than that required to span 3 joists.
  7. Side Laps: Overlapped or interlocking seam at Contractor's option.

## 2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, NOT less than 0.0359" design, uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.
- G. Flat Sump Plate: Single-piece steel sheet, 0.0747" thick, of same material and finish as deck. For drains, cut holes in the field.
- H. Galvanizing Repair Paint: ASTM A780, SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94% zinc/dust by weight.
- I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

### 3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. DO NOT stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

### 3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members using Buildex #12 screws or approved equal.
  - 1. As shown on drawings.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals NOT exceeding the lesser of 1/2 of the span or 18", and as follows:
  - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
  - 2. Minimum 2 fasteners per span.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2", with end joints as follows:
  - 1. End Joints:
    - a. Lapped 2" minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
- E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

### 3.4 FIELD QUALITY REQUIREMENTS

- A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field connections will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Engineer.
- D. Remove and replace work that does NOT comply with specified requirements.

- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### 3.5 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.
- B. Repair Painting:
  - 1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation and apply repair paint.
  - 2. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
- C. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

## SECTION 05 40 00 – COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Interior wall-framing.
- B. Related Sections:
  - 1. Section 01 10 00 – Summary.
  - 2. Section 01 33 00 – Submittal Procedures
  - 3. Section 01 40 00 – Quality Requirements.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
  - 1. Design Loads:
    - a. Dead Loads: Weights of materials and construction.
    - b. Wind Loads: 5 psf.
    - c. Seismic Loads: As required by the International Building Code Latest Edition and shall NOT be less than 0.182WP (total weight of partition).
  - 2. Deflection Limits:
    - a. Design interior wall-framing systems to withstand design loads without deflections greater than horizontal deflection of 1/360 of the wall height under horizontal loads.
  - 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F (67 degrees C).
  - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
    - a. Upward and downward movement of 1 1/2 inches (38mm), unless noted or indicated otherwise.
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- C. Shop Drawings:
  - 1. Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing.
  - 2. Show fabrication, fastening and anchorage details, including mechanical fasteners.
  - 3. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
  - 4. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional Engineer responsible for their preparation.
- D. Welding certificates.



- E. Qualification Data: For professional Engineer.
- F. Product Test Reports:
  1. From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
    - a. Steel sheet.
    - b. Expansion anchors.
    - c. Power-actuated anchors.
    - d. Mechanical fasteners.
    - e. Vertical deflection clips.
    - f. Horizontal drift deflection clips.
    - g. Miscellaneous structural clips and accessories.
- G. Research/Evaluation Reports: For cold-formed metal framing.

#### 1.4 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional Engineer.
- B. Professional Engineer Qualifications: A professional Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are like those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 to conduct the testing indicated.
- D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," and AWS D1.3, "Structural Welding Code - Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
  1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
  2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One/Two-Family Dwellings."
- I. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Section 01 10 00, SUMMARY.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers:
  - 1. Subject to compliance with requirements, available manufacturers offering cold-formed metal framing that may be incorporated into the work include, but are NOT limited to, the following:
    - a. Allied Studco.
    - b. AllSteel Products, Inc.
    - c. California Expanded Metal Products Company.
    - d. Clark Steel Framing.
    - e. Consolidated Fabricators Corp.; Building Products Division.
    - f. Craco Metals Manufacturing, LLC.
    - g. Custom Stud, Inc.
    - h. Dale/Incor.
    - i. Design Shapes in Steel.
    - j. Dietrich Metal Framing; a Worthington Industries Company.
    - k. Formetal Co. Inc. (The).
    - l. Innovative Steel Systems.
    - m. MarinoWare; a division of Ware Industries.
    - n. Quail Run Building Materials, Inc.
    - o. SCAFCO Corporation.
    - p. Southeastern Stud & Components, Inc.
    - q. Steel Construction Systems.
    - r. Steeler, Inc.
    - s. Super Stud Building Products, Inc.
    - t. United Metal Products, Inc.

### 2.2 MATERIALS

- A. Steel Sheet:
  - 1. ASTM A1003, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
    - a. Grade: As required by structural performance, or as indicated.
    - b. Coating: G90 (Z725) or equivalent.
- B. Steel Sheet for Clips:
  - 1. ASTM A653, structural steel, zinc coated, of grade and coating as follows:
    - a. Grade: As required by structural performance.
    - b. Coating: G90 (Z275).

### 2.3 WALL-FRAMING

- A. Steel Studs:
  - 1. Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

- a. Minimum Base-Metal Thickness: 68 Mil (.0713 inch).
  - b. Flange Width: 1 5/8 inches.
  - c. Section Properties: As required for loading conditions.
- B. Steel Track:
- 1. Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
    - a. Minimum Base-Metal Thickness: 68 Mil (.0713 inch).
    - b. Flange Width: 1 1/4 inches (32 mm) minimum and as required for loading conditions.
- C. Vertical Deflection Clips:
- 1. Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
    - a. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, but are NOT limited to, the following:
      - 1) Dietrich Metal Framing; a Worthington Industries Company
      - 2) MarinoWare, a division of Ware Industries
      - 3) SCAFCO Corporation
      - 4) The Steel Network, Inc.
      - 5) Or approved equal.
- D. Double Deflection Tracks:
- 1. Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.
    - a. Outer Track:
      - 1) Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:
        - a) Minimum Base-Metal Thickness: As required for loading conditions and minimum thickness shall be 68 Mils (.0713 inch).
        - b) Flange Width: 1 inch (25mm) plus twice the design gap for other applications
    - b. Inner Track:
      - 1) Of web depth indicated, and as follows:
        - a) Minimum Base-Metal Thickness: As required for loading conditions and minimum thickness shall be 68 Mils (.0713 inch)
        - b) Flange Width: As required for loading condition and vertical deflection noted.
- E. Drift Clips:
- 1. Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure.
- 2.4 FRAMING ACCESSORIES
- A. Fabricate steel-framing accessories from steel sheet, ASTM A1003, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
- 1. Supplementary framing.
  - 2. Bracing, bridging, and solid blocking.
  - 3. Web stiffeners.
  - 4. Anchor clips.
  - 5. End clips.

6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

## 2.5 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36, zinc coated by hot-dip process according to ASTM A123.
- B. Anchor Bolts:
  1. ASTM F1554, Grade 55 threaded carbon-steel hex-headed bolts and carbon-steel nuts.
  2. Flat, hardened-steel washers.
  3. Zinc coated by hot-dip process according to ASTM A153, Class C unless noted or indicated otherwise.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to five times design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors:
  1. Fastener system of type suitable for application indicated.
  2. Fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to ten times design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners:
  1. ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
  2. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

## 2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint:
  1. SSPC-Paint 20.
- B. Cement Grout: Portland cement, ASTM C150, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.7 FABRICATION

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; DO NOT torch cut.
  - 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is NOT permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by NOT less than three exposed screw threads.
  - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances:
  - 1. Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
    - a. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall NOT exceed minimum fastening requirements of sheathing or other finishing materials.
    - b. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete, steel, or masonry construction.
- B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field-fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels NOT exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.
1. Cut framing members by sawing or shearing; DO NOT torch cut.
  2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is NOT permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. DO NOT bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified elsewhere, in built-up framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work and as noted or indicated.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances:
1. Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
    - a. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall NOT exceed minimum fastening requirements of sheathing or other finishing materials.
- K. Install horizontal bridging in stud system, spaced as indicated on Shop Drawings. Fasten at each stud intersection.
1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip-angle for framing members up to 6 inches (150 mm) deep.
  2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- L. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

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

### 3.4 WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Install single-leg deflection tracks and anchor to building structure.
  - 2. Install double deep-leg deflection tracks and anchor outer track to building structure.
  - 3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
  - 4. Connect drift clips to cold-formed metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but NOT more than 48 inches (1220 mm) apart. Fasten at each stud intersection.
  - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    - a. Install solid blocking at centers indicated on Shop Drawings.
  - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  - 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  - 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

### 3.5 FIELD QUALITY REQUIREMENTS

- A. Testing: Owner shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds shall be subject to testing and inspecting.
- C. Testing agency shall report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does NOT comply with specified requirements.

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

### 3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION



## SECTION 05 50 00 – METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Steel framing and supports for overhead doors.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are NOT specified in other Sections.
4. Shelf angles.
5. Loose bearing and leveling plates.
6. Loose lintels.
7. Steel welded plates and angles for casting into concrete NOT specified in other Sections.
8. Miscellaneous steel trim including steel angle corner guards and steel edgings.
9. Metal ladders.
10. Metal bollards.
11. Pipe guards.
12. Metal floor plate and supports.
13. Abrasive metal nosing, treads, and thresholds.

##### B. Products furnished, but NOT installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

##### C. Related Sections:

1. Section 01 33 00 – Submittal Procedures
2. Section 03 30 00 – Cast-In-Place Concrete
3. Section 03 62 00 – Non-Shrink Grouting
4. Section 07 92 00 – Joint Sealants
5. Section 09 90 00 – Painting and Protective Coatings

#### 1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 °F, ambient; 180 °F, material surfaces.

#### 1.3 SUBMITTALS

A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.

##### B. Product Data:

1. Metal nosing and treads
2. Paint products
3. Grout
4. Fall Protection (ladder)

5. Metal Floor Plate and support

C. Shop Drawings:

1. Show fabrication and installation details for metal fabrications.
2. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
3. Provide templates for anchors and bolts specified for installation under other Sections.
4. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional Engineer responsible for their preparation.

D. Samples for Verification: For each type and finish of extruded nosing and tread.

E. Mill Certificates:

1. Signed by Manufacturers of stainless-steel sheet certifying that products furnished comply with requirements.

F. Welding Certificates.

#### 1.4 QUALITY ASSURANCE

A. Welding:

1. Qualify procedures and personnel according to the following:
  - a. AWS D1.1 – Structural Welding Code – Steel
  - b. AWS D1.2 – Structural Welding Code – Aluminum
  - c. AWS D1.3 – Structural Welding Code – Sheet Steel
  - d. AWS D1.6 – Structural Welding Code – Stainless Steel

#### 1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements can NOT be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

#### 1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are NOT limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, manufacturers specified.

### 2.2 METALS, GENERAL

- A. Metal Surfaces, General:
  - 1. Provide materials with smooth, flat surfaces, unless otherwise indicated.
  - 2. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

### 2.3 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A36.
- B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304.
- C. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.
- D. Steel Tubing: ASTM A500, cold-formed steel tubing.
- E. Steel Pipe: ASTM A53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.
- F. Cast Iron: ASTM A48, Class 30, unless another class is indicated or required by structural loads.

### 2.4 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
- C. Aluminum-Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.
- D. Aluminum Castings: ASTM B26, Alloy 443.0-F.

### 2.5 FASTENERS

- A. General:
  - 1. Unless otherwise indicated, provide Type, 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, at exterior walls.
  - 2. Provide stainless-steel fasteners for fastening aluminum.
  - 3. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A, with hex nuts, ASTM A563; and, where indicated, flat washers.

1. Finish: Plain or Hot Dip Zinc-coated ASTM A153 Class C, as indicated.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F593, AISI Type 316, Condition CW for bolts and ASTM F594 for AISI Type 316, Condition CW nuts.
1. All threads on stainless steel rods/bolts shall be protected with antiseize lubricant suitable for submerged stainless bolts and complying with Federal Specification MIL-A-907E.
- D. Anchor Bolts: ASTM F1554, Grade 36.
1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- E. Machine Screws: ASME B 18.6.3.
- F. Lag Bolts: ASME B 18.2.1.
- G. Wood Screws: Flat head, ASME B18.6.1.
- H. Plain Washers: Round, ASME B 18.22.1.
- I. Lock Washers: Helical, spring type, ASME B 18.21.1.
- J. Cast-in-Place Anchors in Concrete:
1. Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
  2. Threaded or wedge type; galvanized ferrous castings either: ASTM A47 malleable iron or ASTM A27, cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A153.
- K. Expansion Anchors:
1. Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.
  2. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
  3. Material for Anchors in Exterior Locations: ASTM F593, AISI Type 316, Condition CW for bolts and ASTM F594 for AISI Type 316, Condition CW nuts.
  4. Expansion anchors shall NOT be substituted for adhesive anchors.
- L. Adhesive Anchors:
1. Threaded Rod:
    - a. ASTM F593 stainless steel threaded rod, diameter as shown on Drawings.
    - b. Length as required to provide minimum depth of embedment.
    - c. Clean and free of grease, oil, or other deleterious material.
    - d. For hollow-unit masonry, provide galvanized or stainless-steel wire cloth screen tube to fit threaded rod.
  2. Adhesive:
    - a. Two-component, insensitive to moisture, designed to be used in adverse freeze/thaw environments, with gray color after mixing.
    - b. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
    - c. Nonsag, with selected viscosity based on installation temperature and overhead application where applicable.

- d. HILTI HIT HY-150 or approved equal.
- 3. Packaging:
  - a. Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and fitting into a manually or pneumatically operated caulking gun.
  - b. Cartridge Marking: Include manufacturer's name, product name, material type, batch serial number, and adhesive expiration date.
- 4. Manufacturers and Products:
  - a. Hilti, Inc., Tulsa, OK; HIT Doweling Anchor System, HIT HY 150 (HIT HY 20 for hollow masonry).
  - b. Approved Equal.

## 2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9.
- C. Universal Shop Primer:
  - 1. Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
  - 2. Use primer with a VOC content of 420 g/L (3.5 lb/gal.), or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Zinc-Rich Primer:
  - 1. Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
  - 2. Use primer with a VOC content of 420 g/L (3.5 lb/gal.), or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Available Products:
    - a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18119.
    - b. Carboline Company; Carbozinc 621.
    - c. ICI Devoe Coatings; Catha-Coat 313.
    - d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
    - e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
    - f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
    - g. Tnemec Company, Inc.; Theme-Zinc 90-97.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds in steel, complying with SSPC-Paint 20.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
- G. Non-shrink, Nonmetallic Grout:
  - 1. Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C1107.
  - 2. Provide grout specifically recommended by Manufacturer for interior and exterior applications and complying with Section 03 62 00, NON-SHRINK GROUTING.
- H. Concrete Materials and Properties: Comply with requirements in Section 03 30 00, CAST-IN-PLACE CONCRETE for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

## 2.7 FABRICATION, GENERAL

- A. Shop Assembly:
  - 1. Preassemble items in the shop to greatest extent possible.
  - 2. Disassemble units only as necessary for shipping and handling limitations.
  - 3. Use connections that maintain structural value of joined pieces.
  - 4. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately.
- C. Remove burrs and ease edges to a radius of approximately 1/32", unless otherwise indicated.
- D. Remove sharp or rough areas on exposed surfaces.
- E. Form bent-metal comers to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- G. Weld comers and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- I. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- K. Provide for anchorage of type indicated; coordinate with supporting structure, and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
  - 1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8" x 1-1/2", with a minimum 6" embedment and 2" hook, NOT less than 8" from ends and corners of units and 24" o.c., unless otherwise indicated.

## 2.8 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Design and provide steel framing and supports NOT specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated.
  - 1. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports.
  - 2. Cut, drill, and tap units to receive hardware, hangers, and similar items.
  - 3. Fabricate units from slotted channel framing where indicated.

4. Furnish inserts if units are installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

#### 2.9 LOOSE STEEL LINTEL

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but NOT less than 8", unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

#### 2.10 LOOSE BEARING AND LEVELING PLATES

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

B. Galvanize plates after fabrication.

C. Prime plates with zinc-rich primer.

#### 2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles NOT specified in other Sections, for items supported from concrete construction as needed to complete the Work.

B. Provide each unit with NOT less than two integrally welded steel strap anchors for embedding in concrete.

#### 2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime interior miscellaneous steel trim, with zinc-rich primer.

#### 2.13 METAL LADDERS

A. General:

1. Comply with the more stringent requirements of OSHA and ANSI A14.3, unless indicated otherwise.
  2. Space side rails 16" clear apart, unless otherwise indicated.
  3. Support each ladder at top and bottom and NOT more than 60" o.c, with welded or bolted brackets, made from same metal as ladder.
  4. All ladders including ladders less than 20 feet in height shall be equipped with an integral fall protection system.
- B. Design Live Loads:
1. Side rail loads: Ladder rails shall be designed to withstand a minimum of two (2) 300-pound loads plus 30 percent impact concentrated between any two consecutive attachments.
  2. Rung loads: Ladder rungs shall be designed to withstand a minimum live load of 300 pounds plus 30 percent impact.
- C. Ladder Deflection:
1. Limit rung deflection to span divided by 360.
- D. Extension (Pop-up):
1. Every ladder that does NOT have an exterior hand hold shall be equipped with a pop-up extension designed by the ladder manufacturer.
  2. Pop-up extension shall be of the same material and finish as the ladder with telescoping tubular section that locks automatically when fully extended.
  3. Upward and downward movement shall be controlled by stainless steel spring balancing mechanisms.
  4. Units shall be completely assembled with fasteners for securing to the ladder rungs in accordance with the manufacturer's recommendations.
- E. Fall Prevention System (Ladder):
1. All ladders, including ladders less than 20 feet in height, shall be equipped with an integral fall prevention system. The fall prevention system at each ladder shall include a permanent metal carrier rung/rail, carrier rung/rail extension as required, sliding sleeve arresting unit, ladder rung clamps, full body harness, dismount section and all other components as necessary for complete installation and system to comply with OSHA and ANSI A14.3 standards and requirements.
    - a. The fall prevention system manufacturer shall design each fall prevention system, coordinate with the ladder manufacturer, and submit the fall prevention system design and detailed plans to the Engineer for approval.
    - b. The carrier rung/rail shall be Type 316 stainless steel or aluminum-alloy 6105-T5.
    - c. Carrier rung/rail extensions shall be provided for safe ladder access and egress. The total carrier rung/rail length shall be as designed by the fall prevention system manufacturer.
      - 1) Available Manufacturers:
      - 2) Sellstorm Manufacturing
      - 3) North Safety Products, Ltd.
      - 4) Or approved equal.
- F. Steel Ladders:
1. Side rails: Continuous, 1/2" x 2-1/2" steel flat bars, with eased edges.
  2. Rungs: 3/4" steel bars.
  3. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.
  4. Rung spacing shall NOT exceed 12 inches on center.
  5. Provide non-slip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
  6. Provide non-slip surfaces on top of each rung by coating with abrasive material metallurgically bonded to rung by a proprietary process.



7. Available Products:
  - a. IKG Industries, a Harsco company; Mebac.
  - b. W. S. Molnar Company; SlipNOT.
8. Galvanize exterior ladders and interior ladders, where indicated, including brackets and fasteners.

G. Aluminum Ladders:

1. Side rails: Continuous extruded-aluminum channels or tubes, NOT less than 2-1/2" deep, 3/4" wide, and 1/8" thick.
2. Rungs: Extruded-aluminum tubes, NOT less than 3/4" deep and NOT less than 1/8" thick, with ribbed tread surfaces.
3. Fit rungs in centerline of side rails; fasten by welding or with stainless-steel fasteners or brackets and aluminum rivets.
4. Rung spacing shall NOT exceed 12 inches on center.

2.14 ALUMINUM PLANK

A. Acceptable Manufacturers include, but are NOT limited to the following:

1. Ohio Gratings Inc.
2. McNichols Co.
3. Amico, a Gibraltar Industries Co.
4. Harsco Industrial IKG.
5. Or approved equal.

B. Materials: Plank and banding are Aluminum type 6061-T6, ASTM B221.

1. Description:
  - a. Unpunched, Aluminum Heavy Duty Plank Grating: Six-inch-wide extruded aluminum plank with support bars spaced 1.2" on center, fabricated with banding into panels of standard width to fill areas shown on the drawings.
    - 1) Top Surface: Slip resistant
    - 2) Finish: Mill finished
    - 3) Plank Type: Unpunched
    - 4) Plank Depth: based on loading requirements and clear span.

2.15 METAL FLOOR PLATE

- A. Also referenced as "Checkered" or "Check" Plate, with raised lugs on one side and smooth surface on other side.
- B. Fabricate from roller-aluminum-alloy 6061-T6, ASTM B632 plate of thickness indicated below. Raised lug pattern shall be on top and start at 45° angle to edge of plate or tread.
- C. Design and provide stainless steel or aluminum angle and/or aluminum beam supports, as indicated or required and NOT indicated.
- D. Include stainless steel or aluminum angle stiffeners and fixed and removable sections, as indicated or required.
- E. Provide flush stainless steel bar drop handles for lifting removable sections one at each end of each section.
- F. Floor plate, including all support members, reinforcement ribs, stiffeners, edge members, supports and all structural requirements shall be designed by a Professional Engineer licensed in the State of the Work and provided by the manufacturer/fabricator of the floor plate.

- G. Design of the floor plate, including all supports, connections and integral members shall be for the actual dead load plus a live load consisting of:
  - 1. The uniform live load of the adjacent floor, or
  - 2. A uniform live load of 200 lbf/sq. ft., whichever load produces the greater effects. Design shall use the loading and pattern loading for multiple spans which produces the greatest loading, stresses, and deflection with the floor plate system.
- H. The maximum fiber stress shall NOT exceed that which is allowed by the Aluminum Association.
- I. The maximum total load deflection shall be limited to the span divided by 180 (L/180), NOT to exceed 0.25 inch between supporting members.
- J. Contractor shall submit sealed shop drawings complete with details and calculations to the Engineer for review prior to fabrication. Submittal data shall be complete with detail and calculations to determine all components of the floor plate system, including plate, reinforcing ribs, supports, rib pattern, connections, and others as necessary.
- K. All ends and openings shall be banded.
- L. Provide 1/4-inch neoprene gaskets for all sealed or odor control floor plate coverings as/where indicated.
- M. The weight of a floor plate section shall NOT exceed 80 pounds.
- N. Aluminum surfaces in contact with concrete, grout, or dissimilar metals shall be protected with a coat of bituminous paint, Mylar isolators or other protective system, as approved by the Engineer.
- O. Available Manufacturers
  - 1. Thompson Fabricating, LLC; Tarrant, AL.
  - 2. Or approved equal.

#### 2.16 METAL BOLLARDS

- A. Fabricate metal bollards from steel shapes as indicated.

#### 2.17 ABRASIVE METAL NOSINGS AND TREADS

- A. Cast-Metal Units: Cast aluminum, with an integral abrasive finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.
  - 1. Manufacturers:
    - a. American Safety Tread Co., Inc.
    - b. Baleo Inc.
    - c. Barry Pattern & Foundry Co., Inc.
    - d. Granite State Casting Co.
    - e. Safe-T-Metal Co.
    - f. Wooster Products Inc.
  - 2. Nosing: Cross-hatched units, 4" wide with 1/4" lip, for casting into concrete steps.
  - 3. Nosing: Cross-hatched units, 1-1/2" x 1-1/2", for casting into concrete curbs.
  - 4. Treads: Cross-hatched units, full depth of tread with 3/4" x 3/4" nosing, for application over bent plate treads or existing stairs.
- B. Extruded Units: Aluminum, with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in sizes and configurations indicated and in lengths necessary to accurately fit openings or conditions.

1. Available Manufacturers:
    - a. ACL Industries, Inc.
    - b. American Safety Tread Co., Inc.
    - c. Amstep Products.
    - d. Armstrong Products, Inc.
    - e. Baleo Inc.
    - f. Granite State Casting Co.
    - g. Wooster Products Inc.
  2. Provide ribbed units, with abrasive filler strips projecting 1/16" above aluminum extrusion.
  3. Provide solid-abrasive-type units without ribs.
  4. Nosing: Square-back units, 3" wide, for casting into concrete steps.
  5. Nosing: Beveled-back units, 3" wide with 1-3/8" lip, for surface mounting on existing stairs.
  6. Nosing: Two-piece units, 3" wide, with sub channel for casting into concrete steps.
  7. Treads: Beveled-back units, full depth of tread with 1-3/8" lip, for application over existing stairs.
- C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with Manufacturer.
- D. Drill for mechanical anchors and countersink. Locate NOT more than 4" from ends and NOT more than 12" o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by Manufacturer.
1. Provide two rows of holes for units more than 5" wide, with two holes aligned at ends and intermediate holes staggered.
- E. Apply bituminous paint, Mylar isolators or other protective system as approved by the Engineer to concealed bottoms, sides, and edges of cast-metal units set into concrete.

#### 2.18 FINISHES, GENERAL

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

#### 2.19 STEEL AND IRON FINISHES

- A. Hot-dip galvanize items as indicated to comply with applicable standard listed below:
  1. ASTM A123 for galvanizing steel and iron products.
  2. ASTM A153 for galvanizing steel and iron hardware.
- B. Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich primer: SP 6/NACE No.3, "Commercial Blast Cleaning."
  2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No.1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.20 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines or blend into finish.
- B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
- C. Bright, Directional Satin Finish: No.4.
- D. Dull Satin Finish: No.6.
- E. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## 2.21 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).
- C. Class 1, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: non-specular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class 1, clear coating 0.018 mm or thicker) complying with AAMA 611.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement:
  - 1. Perform cutting, drilling, and fitting required for installing metal fabrications.
  - 2. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are NOT to be left as exposed joints but canNOT be shop welded because of shipping size limitations. DO NOT weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction:
  - 1. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
  - 2. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Protection: Coat concealed surfaces of aluminum that will encounter grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including Manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

### 3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces.
- B. Clean bottom surface of plates.
- C. Set bearing and leveling plates on wedges, shims, or leveling nuts.
- D. After bearing members have been positioned and plumbed, tighten anchor bolts.
- E. DO NOT remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Use non-shrink grout, nonmetallic, in concealed locations where NOT exposed to moisture; use non shrink, nonmetallic grout in exposed locations, unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 INSTALLING METAL BOLLARDS

- A. Anchor bollards in concrete as indicated.
- B. Anchor bollards in place with concrete footings.
- C. Center and align bollards in holes 3" above bottom of excavation.
- D. Place concrete and vibrate or tamp for consolidation.
- E. Support and brace bollards in position until concrete has cured.
- F. Fill bollards solidly with concrete, mounding top surface to shed water.
  - 1. DO NOT fill removable bollards with concrete.

### 3.5 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

- A. Center nosing on tread widths.
- B. For nosing embedded in concrete steps or curbs, align nosing flush with riser faces and level with tread surfaces.
- C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 07 92 00, JOINT SEALANTS, to provide a watertight installation.

### 3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 90 00.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

## SECTION 05 51 00 – METAL STAIRS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Pre-engineered industrial-type stairs with Aluminum grating treads.
  - 2. Aluminum railings attached to metal stairs.
  - 3. Aluminum handrails attached to walls adjacent to metal stairs.
  - 4. Railing gates at the level of exit discharge.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 03 30 00 – Cast-in-Place Concrete
  - 3. Section 05 50 00 – Metal Fabrications
  - 4. Section 05 52 13 – Pipe and Tube Railings

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Comply with the more stringent of IBC, OSHA and as follows.
- B. Structural Performance of Stairs: Design and provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform Load: 100 lbf/sq. ft.
  - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
  - 3. Uniform and concentrated loads need NOT be assumed to act concurrently.
  - 4. Stair tread, 250psf for tread itself.
  - 5. Platform and landings: Aluminum tread with uniform live load of 200 psf or a concentrated load of 1000 lbf over 1 sq. ft. applied at midspan, whichever produces the greater effect.
  - 6. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
  - 7. Limit deflection of treads, platforms, and framing members to  $L/360$  or  $1/4"$  whichever is less.
- C. Structural Performance of Railings: As specified in Section 05 52 13, PIPE AND TUBE RAILING.
- D. Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures"; Section 9, "Earthquake Loads."

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data: For metal stairs and the following:
- C. Shop Drawings: Include sealed calculations, plans, elevations, sections, details, and attachments to other work.
  - 1. Provide templates for anchors and bolts specified for installation under other Sections.
  - 2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional Engineer responsible for their preparation, licensed in the State where the work is located.

- D. Samples for Initial Selection: For products involving selection of color, texture, or design.
- E. Samples for Verification: For the following products, in Manufacturer's standard sizes:
  1. Grating treads.
  2. Abrasive nosings.
- F. Welding certificates.
- G. Qualification Data: For professional Engineer and testing agency.
- H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for stairs and railings.
  1. Test railings according to ASTM E894 and ASTM E935.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
  1. Industrial-Type Stairs: Industrial class.
- C. Welding: Qualify procedures and personnel according to the following:
  1. AWS D1.2 – Structural Welding Code – Aluminum.
- D. Professional Engineer qualifications.

#### 1.5 COORDINATION

- A. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are NOT limited to, products specified.
  2. Available Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into the Work include but are NOT limited to; Manufacturers specified.

#### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated, for components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Aluminum Extrusions: ASTM B221, Alloy 6063- T6.



- C. Aluminum Castings: ASTM B26, Alloy 443.0-F.

## 2.3 ABRASIVE NOSINGS

- A. As specified in Section 05 50 00, METAL FABRICATIONS.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with Manufacturer.
- C. Apply bituminous paint to concealed bottoms, sides, and edges of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed bottoms, sides, and edges of extruded units set into concrete.

## 2.4 FASTENERS

- A. As specified in Section 05 50 00, METAL FABRICATIONS.

## 2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Bituminous Paint: Cold, applied asphalt emulsion complying with ASTM D1187.
- C. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by Manufacturer for interior and exterior applications.
- D. Concrete Materials and Properties: Comply with requirements in Section 03 30 00, CAST-IN-PLACE CONCRETE for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
- E. Non-slip Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and non-glazing; unaffected by freezing, moisture, or cleaning materials.
- F. Welded Wire Fabric: ASTM A185, 6" X 6" W1.4 X W1.4, unless otherwise indicated.

## 2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding, unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
  - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32", unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

- D. Form bent-metal comers to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed comers and seams continuously, unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flathead (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that shall be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

## 2.7 ALUMINUM-FRAMED STAIRS

- A. Manufacturers:
  - 1. Alfab, Inc.
  - 2. American Stair, Inc.
  - 3. Sharon Companies Ltd. (The).
  - 4. Approved Equal.
- B. Stair Framing:
  - 1. Fabricate stringers of Aluminum channels.
    - a. Provide closures for exposed ends of channel stringers.
    - b. Minimum stringer size shall be C 12x10.37.
  - 2. Construct platforms of Aluminum channel headers and miscellaneous framing members as needed to comply with performance requirements.
  - 3. Weld or bolt stringers to headers; weld or bolt framing members to stringers and headers. If using bolts, fabricate and join so bolts are NOT exposed on finished surfaces.
  - 4. Columns shall be aluminum tube as required, minimum size AL 3x3x3/16.
  - 5. Treads shall be aluminum from rolled aluminum alloy tread, alloy T6061-T6, ATM B632 or aluminum grating as indicated. Tread plate shall have raised lugs on the top surface. Grating for treads shall have integral corrugated nosing.
    - a. Form treads with integral nosing and back edge stiffener. Form risers of same material as treads.
    - b. Weld supporting brackets to stringers and weld treads to brackets.
    - c. Fabricate platforms with integral nosings matching treads and weld to platform framing.
  - 6. Provide lateral support and bracing as required by design.
- C. Metal Bar-Grating Stairs: Form treads and platforms to configurations shown from metal bar grating; fabricate to comply with NAAMM MBG 531, "Metal Bar Grating Manua1."
  - 1. Fabricate treads and platforms from welded Aluminum grating with 1-1/2" by 3/16" bearing bars at 15/16" o.c. and crossbars at 4" o.c., NAAMM designation: W-15-4 (1-1/4"x 3/16") STEEL.
  - 2. Surface: Serrated.

3. Fabricate grating treads with cast abrasive nosing and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
4. Fabricate grating platforms with nosing matching that on grating treads. Provide toe plates at open-sided edges of grating platforms. Weld grating to platform framing.

## 2.8 STAIR RAILINGS

- A. As specified in Section 05 52 13, PIPE AND TUBE RAILINGS for railings.

## 2.9 FINISHES

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

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are NOT to be left as exposed joints but cannot be shop welded because of shipping size limitations. DO NOT weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Place and finish concrete till for treads and platforms to comply with Section 03 30 00, CAST-IN-PLACE CONCRETE.
  1. Install abrasive nosings with anchors fully embedded in concrete, center nosings on tread width.
- G. Install pre-cast concrete treads with adhesive supplied by Manufacturer.

### 3.2 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of baseplates.
- B. Set stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. **DO NOT** remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
  - 1. Use nonmetallic, non-shrink grout, unless otherwise indicated.
  - 2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

END OF SECTION

## SECTION 05 52 13 – PIPE AND TUBE RAILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Aluminum pipe railings.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 05 50 00 – Metal Fabrications
  - 3. Section 09 90 00 – Painting and Protective Coatings

#### 1.2 PERFORMANCE REQUIREMENTS

- A. General:
  - 1. In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
    - a. For aluminum, the lesser of minimum yield strength divided by 1.65 or minimum ultimate tensile strength divided by 1.95.
- B. Structural Performance:
  - 1. Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
    - a. Handrails:
      - 1) Uniform load of 50 lbf/ ft. applied in any direction.
      - 2) Concentrated load of 200 lbf applied in any direction.
      - 3) Uniform and concentrated loads need NOT be assumed to act concurrently.
    - b. Top Rails of Guards:
      - 1) Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
      - 2) Concentrated load of 200 lbf applied in any direction.
      - 3) Uniform and concentrated loads need NOT be assumed to act concurrently.
    - c. Infill of Guards:
      - 1) Concentrated load of 200 lbf (0.89 kN) applied horizontally on an area of 1 ft<sup>2</sup>.
      - 2) Uniform load of 25 lbf / ft<sup>2</sup> applied horizontally.
      - 3) Infill load and other loads need NOT be assumed to act concurrently.
- C. Thermal Movements:
  - 1. Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 2. Base the engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 3. Temperature Change (Range): 120 °F, ambient; 180 °F, material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Product Data for the following:

1. Manufacturer's product lines of mechanically connected railings.
  2. Grout, anchoring cement, and paint products.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional Engineer responsible for their preparation.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design.
- E. Samples for Verification for each type of exposed finish required:
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  2. Fittings and brackets.
  3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need NOT be full height.
    - a. Show method of finishing and connecting members at intersections.
- F. Mill Certificates: Signed by Manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- G. Welding certificates.
- H. Qualification Data: For testing agency.
- I. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E894 and ASTM E935.
- 1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain each type of railing through one source from a single Manufacturer.
- B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
  2. AWS D1.2, "Structural Welding Code--Aluminum."
  3. AWS D1.6, "Structural Welding Code--Stainless Steel."
- 1.5 PROJECT CONDITIONS
- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements canNOT be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
  2. Provide allowance for trimming and fitting at site.
- 1.6 COORDINATION AND SCHEDULING
- A. Coordinate installation of anchorages for railings.
1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.
  2. Deliver such items to Project site in time for installation.

- B. Schedule installation so wall attachments are made only to completed walls. DO NOT support railings temporarily by any means that DO NOT satisfy structural performance requirements.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers:
  - 1. Subject to compliance with requirements, provide products by one of the following:
    - a. Thompson Fabricating LLC, Tarrant, AL.
    - b. Approved equal.

### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

### 2.3 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with NOT less than the strength and durability properties of alloy and temper designated below for each aluminum form required.
- B. Extruded Structural Pipe and Round Tubing: ASTM B429, Alloy 6063-T6.
  - 1. Provide Standard Weight (Schedule 40) pipe, unless otherwise indicated.
- C. Drawn Seamless Tubing: ASTM B210, Alloy 6063-T832.
- D. Plate and Sheet: ASTM B209, Alloy 6061-T6.
- E. Die and Hand Forgings: ASTM B247, Alloy 6061-T6.
- F. Castings: ASTM B26, Alloy A356.0-T6.

### 2.4 RAIL AND POSTS

- A. Nominal 1-1/2" diameter.
- B. Rails: 1.900" outside diameter by 0.145" wall thickness. Schedule 40.
- C. Posts: 1.900" outside diameter by 0.200" wall thickness. Schedule 80.

### 2.5 FITTINGS

- A. Top Mount Base:
  - 1. Cast Aluminum
  - 2. For holes in base for concrete anchors.
  - 3. For narrow walls or curbs, furnish two holes in base for concrete anchors with required edge distance.
  - 4. Manufacture and Products:
    - a. Thompson Fabricating LLC.; Part No. TBF-3.4
    - b. Thompson Fabricating LLC.; Part No. TBF-3.2 for narrow walls and curbs.

- B. Handrail and Post Fittings:
  - 1. Extruded, machined bar stock, permanent mold casting, or die castings of sufficient strength to meet load requirements.
  - 2. Fittings shall match color of pipe in handrails.
  - 3. Sand cast parts NOT permitted.
  
- C. Side Mounted Handrail Bracket:
  - 1. Extruded aluminum, Alloy 6063-T6 with four holes for bolts or concrete anchors.
  - 2. Manufacturer and Product: Thompson Fabricating LLC; Part TSM-1.50
  
- D. Handrail Connections to Metal Stairway Stringers:
  - 1. Extruded aluminum bracket, Alloy 6060-T6
  - 2. Brackets and bolts 1/2" diameter Type 304 or 316 stainless steel bolts.
  - 3. Offset adjustable stir fitting of cast Al-mag, Part No. ASF
  
- E. Handrail Connections to Metal Beams:
  - 1. Extruded aluminum bracket, Alloy 6060-T6
  - 2. Bracket bolts 1/2" diameter Type 304 stainless steel bolts.
  - 3. Manufacturer and Products: Thompson Fabricating LLC; Part Nos. SMB-2 or SMB-3. Use part no. TSM-1.50 if bracket is attached to flat side of a channel.
  
- F. Handrail Wall Brackets:
  - 1. Cast Al-mag aluminum bracket, Par No. AWF adjustable wall fitting, with provision for three 3/8" Type 304 stainless steel bolts or concrete anchors.
  - 2. Manufacturer and Product: Thompson Fabricating LLC; Part No. AWF.
  
- G. Miscellaneous Rail to Post Fitting:
  - 1. Cast Aluminum Tee Fitting: Part Nos. TF-1 and TX-1
  - 2. Cast Aluminum Ell Fitting: Part Nos. TE-1, TE-2, and TE-3
  - 3. Aluminum Splice Lock: Part No. SL-1
  - 4. Aluminum Expansion Joint Splice: Part No. CF-2
  - 5. Manufacturer: Thompson Fabricating LLC
  
- H. Handrail Gate:
  - 1. Furnish 6063-T6, 6105-T5, or 6061-T6 extruded aluminum
  - 2. Manufacturer: Thompson Fabricating LLC
  
- I. Toeboards and Accessories: Molded or extruded 6063 or 60621 aluminum
  - 1. Manufacturer: Thompson Fabricating LLC
  
- J. Casting for Handrails: Cast Al-mag with sufficient strength to meet load and test requirements. Anodizable grade finish with excellent resistance to corrosion when subject to exposure of sodium chloride solution intermittent spray and emersion.
  
- K. Concrete Embedded Metal Anchorage: In accordance with Section 05 50 00, METAL FABRICATIONS.

## 2.6 FASTENERS

- A. General:
  - 1. Provide the following:
    - a. In accordance with Section 05 50 00, METAL FABRICATIONS
    - b. Aluminum Railings: Type 304 or 316 stainless-steel fasteners.
  
- B. Locknuts, Washers, and Screws:



1. Elastic Locknuts, Steel Flat Washers, RHMS Rounded Head Machine Screws; Type A 304 or A 316 stainless steel.
  2. Flat Washers: Molded Nylon
  3. Manufacturer: Mc-Master-Carr Supply Co.
- C. Concrete Anchors: Stainless steel Type 304 or 316. Use ICBO approved service load allowable values for size, length, embedment, spacing, and edge distance to match required loads shown in calculations.
- D. Epoxy Anchors Heavy Duty 1/2-inch diameter, for exterior use only.

## 2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but NOT less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32" unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that shall be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Non-welded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is Manufacturer's standard splicing method.
- H. Close exposed ends of railing members with prefabricated end fittings.
- I. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4" or less.
- J. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- K. For railing posts set in concrete, provide steel sleeves NOT less than 6" long with inside dimensions NOT less than 1/2" greater than outside dimensions of post, with steel plate forming bottom closure.
- L. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to NOT more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated.
2. Fabricate from same metal as railings.

M. Toeboards:

1. Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms.
2. Fabricate to dimensions and details indicated.
3. Dimension between bottom of toeboard and walking surface NOT to exceed 1/4-inch.

## 2.8 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work:
  1. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples.
  2. Noticeable variations in the same piece are NOT acceptable.
  3. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

## 2.9 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
  1. Handrail Pipe and Posts: In accordance with AA 45, designation AA-M32-C22-A41.
  2. Cast Fittings and Toeboards: In accordance with AA 45, designation AA-M10-C22-A41.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if NOT already done.

### 3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints and in accordance with Manufacturers written instructions.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  1. DO NOT weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  2. Set posts plumb within a tolerance of 1/16" in 3'.

3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members DO NOT exceed 1/4" in 12'.
  - C. Corrosion Protection: Prevent galvanic action and other forms of corrosion caused from direct contact with concrete and dissimilar metals by coating metal surfaces in accordance with manufacturers' recommendations and Section 09 90 00, PAINTING AND PROTECTIVE COATINGS.
  - D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
  - E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.
  - F. Mount handrails only on completed walls. Do not support handrails temporarily by means not satisfying structural performance requirements.

### 3.3 RAILING CONNECTIONS

- A. Set rails horizontal or parallel to slope of steps. Install posts and rails in the same plane. Remove projects or irregularities and provide smooth surface for sliding hand continuously along top rail. Use offset rail for use on stairs and platforms if post is attached to web of stringers or structural platform supports.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement, maximum interval of 54 feet on center and at structural joints. Provide slip-joint internal sleeve extending 2" beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6" of post.

### 3.4 ANCHORING POSTS

- A. Where indicated, use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves fill annular space between the post and sleeve with non-shrink, nonmetallic grout, or anchoring cement mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes NOT less than 5" deep and 3/4" larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material per Manufacturer's written instructions.
- C. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8" buildup, sloped away from post.
- D. Where indicated, anchor posts with fittings engineered for anchoring posts to concrete.
- E. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.
- G. Anchor bolts shall be stainless steel.

### 3.5 ANCHORING RAILING ENDS

- A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

### 3.6 ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2" clearance from inside face of handrail and finished wall surface.
  - 1. Use type of bracket with predrilled hole for exposed bolt anchorage.
- B. Locate brackets as indicated or, if NOT indicated, at spacing required to support structural loads.
- C. Secure wall brackets to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.

### 3.7 ADJUSTING AND CLEANING

- A. Clean aluminum by washing thoroughly with clean water and soap and rinsing with clean water.

### 3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing Manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that can NOT be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION

## SECTION 05 53 00 – METAL GRATINGS AND PLANK

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Metal gratings and aluminum plank.
- B. Related Sections:
  - 1. Section 01 33 00 – Submittal Procedures
  - 2. Section 01 40 00 – Quality Requirements.
  - 3. Section 05 50 00 – Metal Fabrications
  - 4. Section 05 51 00 – Metal Stairs
  - 5. Section 09 90 00 – Painting and Protective Coatings

#### 1.2 GENERAL REQUIREMENTS

- A. Contractor, and/or Subcontractor, is responsible for field verifying all grating and plank locations, dimensions, obstructions, openings, and any other pertinent coordination issues prior to bidding. For existing items marked to be reused, Contractor is responsible for field verifying existing condition and determining whether replacement is required prior to bidding.

#### 1.3 SUBMITTALS

- A. Section 01 33 00, SUBMITTAL PROCEDURES, specifies requirements for submittals.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, details, supports and attachment to other work.
  - 2. Grating and Plank: Show dimensions, weight, and location of connections to adjacent grating, supports, and other Work.
  - 3. Grating and Plank Supports: Show dimensions, size, location, and anchorage to supporting structure.
  - 4. Catalog information and catalog cuts.
  - 5. Manufacturer's specifications, to include coatings.
- C. Quality requirements Submittals:
  - 1. Special handling and storage requirements.
  - 2. Installation instructions.
  - 3. Factory test reports.
  - 4. Manufacturer's Certification of Compliance for specified products.
  - 5. Written Test Report that swaged crossbars, if used on grating, meet the requirements of the specified test and additional requirements of these Specifications.

#### 1.4 REFERENCES

- A. AASHTO:
  - 1. Standard Specifications for Highway Bridges, latest edition.
- B. ASTM International:
  - 1. A36 – Standard Specification for Structural Steel.
  - 2. A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware (R 1987).

4. A193 – Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials for High-Temperature Service.
5. A194 – Standard Specification for Carbon and Alloy-Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
6. A307 – Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
7. A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. A1011/A1011M-17, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High-Strength.
9. B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
10. F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.

C. National Association of Architectural Metal Manufacturers (NAAMM):

1. ANSI MBG 531, Metal Bar Grating Manual.
2. ANSI MBG 532, Heavy-Duty Metal Bar Grating Manual.

1.5 PREPARATION FOR SHIPMENT

- A. Factory assemble items to insure proper fit before shipping to job site.
- B. Package and clearly tag parts and assemblies that are of necessity shipped unassembled and protect the materials from damage and facilitate identification and final assembly in the field.

PART 2 - PRODUCTS

2.1 FOOT TRAFFIC GRATING

- A. Size: As indicated on the drawings.
- B. Type: A-19-4, unless indicated otherwise.
- C. Weight: No section shall weigh more than 150 pounds.
- D. Material:
  1. Aluminum Bar Type Grating:
    - a. Swage locked aluminum I-bar grating, as manufactured by:
      - 1) Thompson Fabricating, LLC, Tarrant, AL
      - 2) Ohio Gratings, Inc., Canton, OR
      - 3) Approved equal.
  2. Galvanized Steel Bar Type Grating:
    - a. Press-locked, deep rectangular crossbar design, as manufactured by:
      - 1) IKG/Borden, Clark, NJ; Type B or Type F.

2.2 LIGHT VEHICULAR TRAFFIC GRATING

- A. Size: As indicated on the drawings.
- B. Type: W-15-4, unless indicated otherwise.
- C. Weight: No section shall weigh more than 150 pounds.

- D. Material:
  - 1. Aluminum Bar Type Grating:
    - a. Press-locked deep rectangular crossbar design as manufactured by:
      - 1) IKG/Borden, Clark, NJ, IKG/Borden; Type B or Type F.
  - 2. Galvanized Steel Bar Type Grading:
    - a. After Fabrication: ASTM A123, zinc coating.
    - b. Heavy-weld type HWF or type HWB or press-locked, rectangular crossbar design as manufactured by:
      - 1) IKG/Borden, Clark, NJ; IKG/Borden, Type FJ or BJ.

### 2.3 HEAVY VEHICULAR TRAFFIC GRATING

- A. Size: As indicated on the drawings.
- B. Type: High Load Capacity (HLC), unless indicated otherwise.
- C. Material:
  - 1. Galvanized Steel Bar Type:
    - a. After Fabrication: ASTM A123, zinc coating.
    - b. Heavy-weld type HWF or type HWB or press-locked, rectangular crossbar design as manufactured by:
      - 1) IKG/Borden, Clark, NJ; IKG/Borden, Type FJ or BJ.

### 2.4 ALUMINUM PLANK

- A. Acceptable Manufacturers, subject to the requirements, which may have acceptable products include, but are NOT limited to, the following:
  - 1. Ohio Gratings Inc.
  - 2. Grating Pacific, Inc.
  - 3. Harsco Industrial IKG.
  - 4. McNichols Co.
  - 5. Or Approved Equal.
- B. Materials: Planks and banding are Aluminum-Alloy 6063-T6, ASTM B221.
  - 1. Description: Heavy-Duty, Extruded Aluminum Plank.
    - a. All ends to be banded.
  - 2. Type(s): As indicated on the drawings, include:
    - a. Interlocking and Unpunched
    - b. Unpunched
    - c. Diagonally punched with approximately 8% openings.
  - 3. Top Surface: Manufacturer's standard slip-resistant finish.
  - 4. Finish: Mill Finish.
  - 5. Fabrication and Tolerances: In accordance with NAAM Metal Bar Grating Manual.
  - 6. Depth: As indicated on the drawings.
  - 7. Loading: As indicated on the drawings.
  - 8. Weight: No section shall weigh more than 150 pounds.

### 2.5 ACCESSORIES

- A. Anchor Bolts and Nuts:
  - 1. Carbon Steel: ASTM A307 or A36.
  - 2. Stainless Steel: ASTM A193 and ASTM A194, Type 316.
  - 3. Galvanized Steel Bolts and Nuts: ASTM A153, zinc coating for ASTM A307 or A36.
- B. Flat Washers (Unhardened): ASTM F844; use ASTM A153 for zinc coating.

- C. Removable Fastener Clips and Bolts:
  - 1. Removable from above grating walkway surface.
  - 2. Material: To match Plank or Grating material
  - 3. Type(s):
    - a. Saddle clips
    - b. Z clips
    - c. Plank clips
    - d. Plank lugs
    - e. Countersunk land

## 2.6 FABRICATION

- A. General:
  - 1. Exposed Surfaces: Smooth finish and sharp, well-defined lines.
  - 2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in a neat, substantial manner.
  - 3. Conceal fastenings where practical.
  - 4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
  - 5. Weld Connections: NOT permitted on grating except at banding bars.
- B. Sizing:
  - 1. Field measure areas to receive grating, verify dimensions of new fabricated supports, and fabricate to dimension required for specified clearances.
  - 2. Section Length: Sufficient to prevent falling down through clear opening when oriented in the span direction when one end is touching either the concrete or the vertical leg of grating support.
  - 3. Minimum Bearing: ANSI/NAAMM MBG 531.
  - 4. Metal Crossbar Spacing: 4" maximum, unless otherwise shown or specified.
  - 5. Crossbars: Flush with top of main bar and extend downward a minimum of 50% of the main bar depth.
    - a. Swaged Crossbars:
      - 1) Within 1/4" of top of grating with 1/2" minimum vertical dimension after swaging, and minimum before swaging dimension of 5/16" square.
      - 2) Crossbar Dimension After Swaging: Minimum 1/8" wider than the opening at minimum of two comers at each side of each square opening in main bar.
      - 3) Crossbars may be a special extruded shape so that after swaging the top shall be flat, 3/16" wide and shall be flush with the top surface of the bearing bars for a minimum of 5/8" at center between bearing bars.
      - 4) Flush crossbar meeting all the above except that after swaging shall overlap one comer by a minimum of 1/8". A sample of one bearing bar and one crossbar shall be tested by holding the bearing bar and pulling on the crossbar. The crossbar to bearing bar shall sustain a minimum of 300 pounds without pullout of the bearing bar.
      - 5) Tightly fit main bars and crossbars allowing no differential movement.
  - 6. DO NOT use weld type crossbars.
  - 7. Banding: All ends to be banded with same material as grating or plank; ANSI/NAAMM MBG 531 and ANSI/NAAMM MBG 532.
  - 8. Furnish stainless steel Type 316 threaded anchor studs, as fasteners for grating or plank attachment to metal supports either NOT embedded or partially embedded in concrete.
- C. Supports:
  - 1. Seat angles and beams where shown:
    - a. Material: To match grating or plank.
    - b. Extruded aluminum frame with slot for recessed grating clips.
  - 2. Coordinate dimensions and fabrication with grating or plank to be supported.



3. Welded Frames with Anchors: Continuously welded.
- D. Slip-Resistant Surface:
1. Rectangular Aluminum Bar Grating as manufactured by:
    - a. IKG/Borden, Clark, NJ; EZ Weldslip-Resistant Coating.
    - b. Seidelhuber Metal Products, Inc., Hayward, CA; Safety Grit Non-Slip System.
    - c. Ohio Gratings, Inc., Canton, OH with "Slip-Not" Safety Surface manufactured by W.S. Molnar Co., Detroit, MI.
  2. I-Bar grating aluminum shall incorporate a striated anti-skid walking surface produced during the extrusion process, as manufactured by:
    - a. IKG/Borden, Clark, NJ.
    - b. Seidelhuber Metal Products, Inc., Hayward, CA.
    - c. Klemp Corp., Chicago, IL.
- E. Aluminum:
1. ASTM B221 extruded shapes.
  2. Fabricate as shown and in accordance with Manufacturer's recommendations.
  3. Grind smooth sheared edges exposed in the finished work.
  4. Swage crossbars, if used, with equipment strong enough to deform crossbars.
  5. Eliminate any loose crossbar intersections on swaged grating.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Electrolytic Protection:
1. Aluminum in contact with dissimilar metals, other than stainless steel, or in contact with masonry, grout, or concrete shall be coated with a bituminous coating as specified in Section 09 90 00, PAINTING AND PROTECTIVE COATINGS.
  2. Allow paint to dry before installation of the material.

### 3.2 INSTALLATION

- A. Install supports such that grating or plank sections have a solid bearing on both ends, and that rocking or wobbling movement does NOT occur under designed traffic loading.
- B. Install plumb or level as applicable.
- C. Install welded frames with anchors to straight plane without offsets.
- D. Anchor grating or plank securely to supports using minimum of four fastener clips and bolts per grating or plank section.
- E. Use stainless steel anchors and accessories with aluminum gratings.
- F. Completed installation shall be rigid and neat in appearance.
- G. Wherever grating or plank is pierced by pipes, ducts, and structural members, cut openings neatly and accurately to size and weld a rectangular band bar of the same height and material as bearing bars.
- H. Cutouts for circular openings are to be 2" larger in diameter than the obstruction. Cutouts for all piping 4" or less shall be made in the field.

- I. All rectangular cutouts are to be made to the next bearing bar beyond the penetration with a clearance NOT to exceed bearing bar spacing.
  
- J. Commercially Manufactured Products:
  - 1. Install in accordance with Manufacturer's recommendations.
  - 2. Secure grating or plank to support members with fasteners.
  - 3. Fasteners: Field locate and install.
  - 4. Permit each grating section or plank style grating assembly to be easily removed and replaced.
  
- K. Protect all painted surfaces during installation.
  
- L. Should coating become marred, prepare and touch up surface in accordance with paint Manufacturer's instructions.

END OF SECTION

DIVISION 7  
THERMAL AND MOISTURE PROTECTION



## SECTION 07 21 00 – BUILDING INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Rigid insulation.
  - 2. Perimeter insulation.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product test reports.
- C. Research/evaluation reports.

### PART 2 - PRODUCTS

#### 2.1 RIGID INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
  - 1. Thicknesses: 2" at exterior CMU walls.
  - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, the following:
    - a. DiversiFoam Products.
    - b. Dow Chemical Company (The).
    - c. Owens Corning.
    - d. Pactiv Building Products.
- B. Rigid Perimeter Insulation: Expanded or extruded polystyrene plastic foam in rigid board form, 1" thick, meeting Federal Specification HH-I-524C. Board shall be in 24" widths or as shown.

#### 2.2 INSULATION: GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, the following:
  - 1. CertainTeed Corporation.
  - 2. Guardian Building Products, Inc.
  - 3. Johns Manville.
  - 4. Knauf Insulation.
  - 5. Owens Corning.
- B. Sound Insulation Batts: Unfaced, Glass-Fiber Blanket Insulation: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics, 6" thickness.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has NOT been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.2 INSTALLATION OF PERIMETER INSULATION

- A. On horizontal surfaces under slabs, loosely lay insulation units as shown on the drawings and according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
  - 1. If NOT otherwise indicated, extend insulation a minimum of 24 inches (610 mm) in and 4" down from exterior walls.

### 3.3 INSTALLATION OF CAVITY-WALL INSULATION

- A. Rigid Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

### 3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Rigid Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that shall produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures NOT rated for or protected from contact with insulation.
  - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation.

END OF SECTION

## SECTION 07 41 13 – METAL ROOF AND WALL PANELS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Metal roof panels.
  - 2. Metal wall panels.
- B. Related Sections
  - 1. 01 30 00 – Administrative Requirements.
  - 2. 01 33 00 – Submittal Procedures.

#### 1.2 SYSTEM DESCRIPTION

- A. Materials:
  - 1. G90 hot-dipped galvanized Grade A structural quality steel in accordance with ASTM A653 or ASTM A792.
- B. Performance requirements:
  - 1. Wind uplift in compliance with UL Classification 580 for UL Classified 90 rated assemblies.
  - 2. Static air infiltration of 0.06 cubic feet per minute/square feet (0.028 liters/second) with 6.24 pounds per square inch (43 kilopascals) air pressure differential as tested in accordance with ASTM E283, E 1592, E 1646, and E 1680.
  - 3. No water infiltration at inward static air pressure differential of NOT less than 6.24 pounds per square inch (43 kilopascals) and NOT more than 12 pounds per square inch (83 kilopascals) as tested in accordance with ASTM E331.

#### 1.3 ACTION SUBMITTALS

- A. General: Submit listed action submittals in accordance with Conditions of the Contract and as specified in Section 01 33 00, SUBMITTAL PROCEDURES.
- B. Shop drawings: Indicate information on shop drawings as follows:
  - 1. Layout, profiles and product components including dimensions, anchorage, erection details, flashing details, elevations, plans and sections required to indicate conditions.
- C. Samples: Submit as follows:
  - 1. 12-inch by 12-inch (305 by 305 millimeters) samples of each roofing soffit and flashing product to show selected colors, finishes, and textures used on project.
- D. Product data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products.
  - 1. MSDS (Material Safety Data Sheets).

#### 1.4 INFORMATION SUBMITTALS

- A. Quality Assurance:
  - 1. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  - 2. Manufacturer's instructions: Manufacturer's installation instructions.
  - 3. Manufacturer's field reports: Manufacturer's field reports specified.



## 1.5 CLOSEOUT SUBMITTALS

- A. Warranty: Submit warranty documents specified.
- B. Operation and Maintenance Data: Submit Operation and Maintenance Data for installed products.
  - 1. Include:
    - a. Manufacturer's instructions covering maintenance requirements.

## 1.6 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer experienced in performing work of this Section who has specialized in installation of work similar to that required for this project.
  - 2. Manufacturer qualifications: Manufacturer capable of providing field service representation during construction and approving erection method.
- B. Regulatory requirements:
  - 1. FM Class I-90.
  - 2. SMACNA Architectural Sheet Metal Manual.
  - 3. UL 263.
  - 4. UL 580.
  - 5. UL 790.
  - 6. UL 1897.
  - 7. UL 2218.
- C. Pre-installation meetings: Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions, and manufacturer's warranty requirements. As specified in Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.

## 1.7 DELIVERY, STORAGE & HANDLING

- A. Delivery:
  - 1. Deliver materials in manufacturer's original packaging with identification labels intact.
- B. Storage and protection:
  - 1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
  - 2. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting.
  - 3. Elevate one end of each skid to allow for moisture runoff.
  - 4. Prevent contact with material that may cause corrosion, discoloration, or staining.
  - 5. Provide factory-installed strippable vinyl film protective coating to panels.

## 1.8 PROJECT AMBIENT CONDITIONS

- A. Installation location: Assemble and erect components only when temperatures are above 40 degrees Fahrenheit (4 degrees Celsius).

## 1.9 SEQUENCING

- A. Sequence with other work: Comply with manufacturer's written recommendations for sequencing construction operations.

#### 1.10 WARRANTY

- A. Project warranty: Refer to Conditions of the Contract for project warranty provisions. Provide 20-year coastal finish warranty.
- B. Manufacturer's warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and NOT a limitation of, other rights Owner may have under Contract Documents.
- C. Warranty: Commencing on date of acceptance by Owner.

#### 1.11 MAINTENANCE

- A. Comply with manufacturer's written instructions to maintain installed product.

#### 1.12 EXTRA MATERIALS

- A. Provide maintenance materials as specified in Section 01 33 00, SUBMITTAL PROCEDURES.

### PART 2 - PRODUCTS

#### 2.1 METAL ROOF PANELS

- A. Trapezoidal-Rib, Standing-Seam Metal Roof Panels: Formed with raised trapezoidal ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.
  - 1. Material: Zinc-coated (galvanized) or Aluminum-zinc alloy-coated steel sheet, 22 gauge.
    - a. Exterior Finish: Fluoropolymer.
    - b. Color: As selected by Owner or Engineer from manufacturer's full range.
  - 2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from zinc-coated (galvanized) steel, aluminum-zinc alloy-coated steel, or stainless-steel sheet.
  - 3. Joint Type: Mechanically seamed, folded according to manufacturer's standard.
  - 4. Panel Coverage: 24 inches.
  - 5. Panel Height: 3 inches.
  - 6. Uplift Rating: UL 60.
- B. Finishes:
  - 1. Exposed Coil-Coated Finish:
    - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing NOT less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Two-coat Fluoropolymer shall be in addition to the manufacturer's prime/adhesive coat.
    - b. PVDF finish shall be equal to, or exceed, Kynar 500 or Hylar 500 specifications.
  - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

#### 2.2 INTERIOR AND EXTERIOR METAL WALL PANELS

- A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be

installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Interior wall panels also noted as interior liner panels.

1. Material: Zinc-coated (galvanized) or Aluminum-zinc alloy-coated steel sheet.
  - a. Exterior thickness 24 gauge
  - b. Interior thickness 28 gauge
  - c. Exterior Finish:
    - 1) Exposed Coil-Coated Finish
      - a) Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing NOT less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions. Two-coat Fluoropolymer shall be in addition to the manufacturer's prime/adhesive coat.
      - b) PVDF finish shall be equal to, or exceed, Kynar 500 or Hylar 500 specifications.
    - d. Interior Finish: Manufacturers standard siliconized polyester or approved equal.
    - e. Color: As selected by Owner or Engineer from manufacturer's full range.
2. Major-Rib Spacing: 12 inches o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1.5 inches.

B. Materials:

1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A755.
  - a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 coating designation; structural quality.
  - b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, Class AZ50 coating designation, Grade 40; structural quality.
  - c. Surface: Smooth, flat finish.

## 2.3 ACCESSORIES

- A. General: Provide all accessories as standard with metal building system manufacturer and as required, whether specified or not, whether indicated or not. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.
1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
- B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or cross-linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weather tight construction.
- C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure

strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
  2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  3. Closure Strips: Closed-cell, expanded, cellular, rubber or cross-linked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or pre-molded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weather tight construction.
- D. Flashing and Trim: Formed from 24 gauge nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating; finished to match adjacent metal panels.
1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are NOT limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
- E. Gutters: 6" K style, formed from 24 gauge nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."
1. Gutter Supports: Fabricated from same material and finish as gutters.
  2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.
- F. Downspouts: Formed from 24 gauge nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.
1. Mounting Straps: Fabricated from same material and finish as gutters.
- G. Roof Curbs: Fabricated from minimum 0.052-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil-coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.
1. Curb Subframing: Fabricated from 0.064-inch nominal-thickness, angle-, C-, or Z-shaped metallic-coated steel sheet.
  2. Insulation: 1-inch- thick, rigid type.
- H. Materials:
1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
    - a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
    - b. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with EPDM sealing washers bearing on weather side of metal panels.
    - c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
    - d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
  2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
4. Metal Panel Sealants:
  - a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
  - b. Joint Sealant: ASTM C920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weather tight; and as recommended by metal building system manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

### 3.3 METAL PANEL INSTALLATION, GENERAL

- A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.
  1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.
- B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.
    - a. Field cutting of metal panels by torch is NOT permitted unless approved in writing by manufacturer.
  2. Install metal panels perpendicular to structural supports unless otherwise indicated.
  3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
  4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Locate metal panel splices over, but NOT attached to, structural supports with end laps in alignment.
  6. Lap metal flashing over metal panels to allow moisture to run over and off the material.
- C. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.
1. Arrange and nest side-lap joints so prevailing winds blow over, NOT into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weather tight enclosure. Avoid "panel creep" or application NOT true to line.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
- E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if NOT indicated, provide types recommended by metal panel manufacturer.
1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
  2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00, JOINT SEALANTS.

### 3.4 METAL ROOF PANEL INSTALLATION

- A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
1. Install ridge caps as metal roof panel work proceeds.
  2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.
- B. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.
1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
  2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
  3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
  4. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

### 3.5 METAL WALL PANEL INSTALLATION

- A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
  2. Shim or otherwise plumb substrates receiving metal wall panels.
  3. When two rows of metal panels are required, lap panels 4 inches minimum.
  4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
  5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
  6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
  7. Install screw fasteners in predrilled holes.
  8. Install flashing and trim as metal wall panel work proceeds.
  9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if NOT indicated, as necessary for waterproofing.
  10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
  11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.
- B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.
- C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and on location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

END OF SECTION

## SECTION 07 50 00 – ROOFING, INSULATION, DAMP PROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes all materials, labor, insurance, etc., to complete insulation, membrane vapor barrier, cants, damproofing, installation and securing of all flashings, lead flashings, counter flashings, pitch pockets, flashings and waterproofing of roof penetrations, etc., as required for a complete installation as shown on drawings or called for in the specifications. All work shall be completed in a manner which is acceptable for installing roofing membrane system.
- B. Related Sections:
  - 1. Section 01 40 00 – Quality Requirements.

#### 1.2 DESCRIPTION

- A. Description of Systems. Roofing shall consist of a granule-surfaced fiberglass mat reinforced asphalt elastomer membrane, secured to a prepared substrate. Adhere to Siplast Inc. – Specification 2030 I H-A.
- B. Furnish all materials, labor, insurance, etc. for installing a complete 20301H-A Modified Bitumen membrane, completely and securely adhered to Densdeck substrate.

#### 1.3 SUBMITTALS

- A. The following items shall be submitted and approved by the Engineer prior to delivery of materials to the job site 60 days before roofing work begins.
  - 1. Certificates. Evidence of acceptance of roof applicator by the roofing system Manufacturer.
  - 2. Samples and Manufacturer's Literature.
    - a. Two 12" x 12" samples of each sheet component of the roofing and flashing membranes.
    - b. Latest edition of the roofing system manufacturer's material specifications and installation instructions.
    - c. Descriptive list of materials proposed for use.

#### 1.4 WORK INCLUDED IN OTHER SECTIONS

- A. Wood nailers, sheet metal flashings and sheet metal gravel guards.

#### 1.5 WARRANTY

- A. Furnish in writing, a fifteen (15) year Siplast Inc. Roof Membrane Guarantee. Guarantee shall be signed and notarized by Siplast Corporate Officer.
- B. Any detail shown on drawings which does NOT conform to watertight installation shall be brought to the attention of the Architect before bidding.
- C. Roofing membrane and insulation shall be installed by a Siplast certified roofing Contractor. Siplast shall state in writing before beginning work that roofing Contractor is an approved applicator.
- D. Siplast representative shall inspect and supervise the installation of roofing and insulation installation. Provide field reports during application.



## 1.6 QUALITY ASSURANCE

- A. Quality Assurance
  - 1. Acceptable Products. Products of Siplast conforming to the specified requirements are acceptable.
  - 2. Acceptable Applicator. Roofing applicator shall be approved by the material manufacturer.
- B. Product Delivery, Storage and Handling
  - 1. Delivery. Material shall be delivered in the manufacturer's original sealed and labeled containers and in quantities required to allow continuity of application.
  - 2. Storage. Material shall be stored out of direct exposure to the elements. Roll goods shall be stored on end on a clean flat surface. Material shall be protected against moisture.
  - 3. Handling. Material shall be handled in such a manner as to preclude damage and contamination with moisture or foreign matter.
- C. Job Conditions
  - 1. Existing Conditions
    - a. Siplast representative shall inspect installation of substrate insulation to make certain it is acceptable for roofing membrane application.
  - 2. Environmental Requirements
    - a. Roofing shall NOT be applied during precipitation and shall NOT be started in the event there is a probability of precipitation during application.
    - b. Roofing shall NOT be applied when ambient temperature is below 35 °F. NOTE: Siplast should be consulted in regard to material and application for lower temperature installations.
  - 3. Protection
- D. Protection against staining and mechanical damage shall be provided for adjacent surfaces during application of roofing.

## PART 2 - PRODUCTS

### 2.1 ROOFING MEMBRANE SYSTEM

- A. Materials
  - 1. Roofing to consist of:
    - a. ASTM Type IV Asphalt shall be used for all moppings.
    - b. Siplast – Paradiene 20 – Applied with PA-100 asphalt.
    - c. Siplast – Paradiene 30 FR – Applied with PA-311M adherent
    - d. Siplast – Veral Flashing – Torch Applied
  - 2. Flashing to consist of:
    - a. Glass reinforced aluminum faced asphalt elastomer sheet of 90 pounds/square minimum weight, type Veral.
    - b. Glass reinforced asphalt sheet of 70 pounds/square minimum weight, type Irex.
    - c. Lead flashing where shown.
  - 3. Asphalt shall be certified for full compliance with the requirements for Type IV asphalt listed in Table I, ASTM D312-71. Each container or bulk shipping ticket shall indicate the equiviscous temperature (EVT), the finished blowing temperature (FBT), and the flash point (F.P.)
  - 4. Roof Insulation:
    - a. First Layer: 1-1/2" + 1-1/2" polyisocyanurate board. Roof Insulation – mechanically attached.
    - b. Second Layer: 1/4" thick Densdeck Duraguard (thoroughly and completely adhered with hot asphalt).
    - c. Water Trough: 2" thick polyisocyanurate board. Insulation (thoroughly and completely adhered). Mechanical fasteners slope to roof drains.

5. Mechanical Fasteners: Fiberglass Glasfast Hexcel Mechanical Fasteners at 18" o.c. each way. Securely attached to metal deck.
  6. Joint Tape: Densdeck Fiberglass 8" wide joint tape.
  7. Moisture/Vapor Vents: .063 gauge spin aluminum moisture relief vents having breathable core tex fabric for one-way venting. Jinco UF-13. Install one per 800 SF.
  8. Veral Flashing by Siplast: Aluminum metal-clad asphalt elastomer sheet; woven glass mat reinforced – Install at vertical flashing and perimeter of roof.
  9. Damproofing moistop membrane under slabs: Moistop Two as manufactured by the Fortifiber Corp. – ASTM E96. 96" width with minimum of 6" laps. All laps and projections thru membrane shall be sealed with Fortifiber Grade 495 pressure sensitive tape. Punctures to be sealed with tape.
- B. Inspection
1. A pre-job conference including the Engineer's Representative, Roofer and Siplast representative shall be conducted prior to the application of roofing.
  2. Contractor shall verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.
- C. Preparation
1. General. All surfaces shall be swept or vacuumed prior to commencement of roofing.
  2. Insulation. Insulation layer shall present a smooth surface to accept the roof membrane. No more insulation shall be installed than can be covered in the same day. Insulation shall be fiberglass substrate.
- D. Application
1. General. Application shall be in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing shall immediately follow application of insulation (where applicable) as a continuous operation.
  2. Prime metal flanges and concrete and masonry surfaces with a uniform coating of asphalt primer (ASTM D4173).
  3. Kettles and tankers shall be equipped with accurate, fully readable thermometers. Asphalt shall NOT be heated to or above its FP. Avoid heating at or above the FBT; should conditions make this prohibition impractical, and exception is granted by the Engineer, heating above the FBT shall NOT be done for more than four (4) hours. Application temperatures shall be no more than 25 °F (14 °C) below the EVT or more than 25 °F (14 °C) above the EVT.
    - a. If EVT information is NOT provided, the following asphalt temperature limits shall be observed. Maximum heating temperature shall be: Type IV – 525 °F. Minimum application temperature shall be 400°F.
    - b. Cutting or alteration of bitumens shall NOT be permitted.
    - c. All moppings shall be a maximum of 25 pounds/square, and shall be total in coverage, leaving no breaks or voids.
  4. All layers of roofing shall be laid free of wrinkles, creases or fishmouth, and shall be laid at right angles to the slope of the deck. Sheets shall be laid directly behind the torch/asphalt application. Sufficient pressure shall be exerted on the roll during application to ensure prevention of air pockets. Plies shall be fully bonded to the prepared surface and shall have minimum 4" side laps and 6" end laps.
  5. Flashing shall be accomplished using Irex reinforcing membrane and Veral flashing membrane. The reinforcing sheet shall be lapped a minimum of 3" to itself, and shall extend a minimum of 4" onto the Paradiene 30 sheet and as shown up the parapet. The flashing sheet shall be lapped a minimum of 3" to itself and shall extend a minimum of 6" onto the Paradiene 30 sheet and 10" up the parapet.
  6. At end of day's work, or when precipitation is imminent, a water cut-off shall be built at all open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of services. Cut-offs shall be completely removed prior to the resumption of roofing.

7. Finished membrane shall be kept clean of unsightly asphalt residues with lap fully but neatly installed. Where asphalt laps on surface, it shall be sprinkled with granular Paradiene 30 surfacing.
8. Upon completion of roofing and flashing installation, Siplast representative shall inspect roofing system and state in writing that installation is acceptable and waterproofing according to their requirements.
9. Blisters or bubbles shall NOT be allowed during the guarantee period. They shall be corrected during this period.
10. Contractor shall provide one-way roofing vent to top of vapor barrier; one per 800 SF. Vents shall be thoroughly flashed.
11. Provide lead Veral flashing at roof drains and vertical and edge of roof termination.

E. Substitute Roof System

1. The following substitute roof systems are approved for use in lieu of the specified roof system.
  - a. MANUFACTURER: Johns Manville, Denver, CO
    - 1) Base Ply – DynaPly
    - 2) Finish Ply – DynaKap FR
    - 3) Flashing Sheet – DynaClad
    - 4) Stripping Ply and Flashing Reinforcing Sheet – DynaPly
    - 5) Adhesive – MBR Cold Application Adhesive
  - b. MANUFACTURER: Tamko Roofing Products, Inc., Joplin, MO
    - 1) Base Ply – Awaplan Versa-Smooth
    - 2) Finish Ply – Awaplan Premium FR
    - 3) Flashing Sheet – Awaplan Heat Welding
    - 4) Stripping Ply and Flashing Reinforcing Sheet – Awaplan Versa-Smooth
    - 5) Adhesive – Tam-Pro CPA Premium SBS Adhesive
  - c. MANUFACTURER: GAF Materials Corp., Wayne, NJ
    - 1) Base Ply – Ruberoid Mop Smooth
    - 2) Finish Ply – Ruberoid Mop Plus
    - 3) Flashing Sheet – Ruberoid Ultraclad SBS
    - 4) Stripping Ply and Flashing Reinforcing Sheet – Ruberoid Mop Smooth
    - 5) Adhesive – Matrix 101 System Pro SBS Adhesive

F. Roofing Accessories

1. Roofing Adhesives
  - a. Mopping Asphalt: Type IV asphalt certified for full compliance with the requirements listed in Table 1, ASTM D312. Each container or bulk shipping ticket shall indicate the equiviscous temperature, EVT, the finished blowing temperature, FBT, and the flash point FP. Mopping asphalt shall be approved in writing by the roof membrane manufacturer.
    - 1) Siplast PA-100 Asphalt by Siplast; Irving, TX.
  - b. Membrane Cold Adhesive: An asphalt, solvent blend conforming to ASTM D 4479, Type II requirements.
    - 1) Siplast PA-311 M Adhesive by Siplast; Irving, TX
2. Fire Resistant Slipsheet: A coated glass fiber sheet intended for use as a flame barrier over combustible substrates.
  - a. FR10 by Atlas Roofing Corp.: Atlanta, GA
3. Bituminous Cutback Materials
  - a. Primer: An asphalt, solvent blend conforming to ASTM D41 requirements.
    - 1) Siplast PA-1125 Asphalt Primer by Siplast; Irving, TX.
  - b. Mastics: An asphalt cutback mastic, reinforced with non-asbestos fibers, used as a base for setting metal flanges conforming to ASTM D4586 Type II requirements.
    - 1) Siplast PA-1021 Plastic Cement by Siplast, Irving, TX.

4. Sealant: A moisture-curing, non-slump elastomeric sealant designed for roofing application. The sealant shall be approved by the roof membrane Manufacturer for use in conjunction with the roof membrane materials. Acceptable types are as follows:
  - a. Siplast PS-304 Elastomeric Sealant by Siplast, Irving, TX.
5. Ceramic Granules: No. 11 grade specification ceramic granules of color scheme matching the granule surfacing of the finish ply.
6. Metallic Powder: A finely graded metal dust as supplied or approved by the membrane manufacturer, used for covering of bitumen overruns over the foil surfaced membrane.
7. Perlite Cant Strips: A cant strip composed of expanded volcanic minerals combined with waterproofing binders. The top surface shall be pre-treated with an asphalt based coating. The face of the cant shall have a nominal 4" dimension.
8. Fasteners
  - a. Insulation Fasteners and Densdeck Sheathing Panel Fasteners for Wood/Plywood Flashing Surfaces: Insulation fasteners and plates shall be FM Approved, and/or approved by the manufacturer of the primary roofing products. The insulation fasteners shall provide attachment required to meet the specified uplift performance and to restrain the insulation panels against the potential for ridding. The fastening pattern for each insulation panel to be used shall be as recommended by the insulation manufacturer and approved by the manufacturer of the primary roofing products. Acceptable insulation fastener manufacturers for specific deck types are listed below.
    - 1) Metal Decks and Wood/Plywood Flashing Surfaces: Insulation mechanical fasteners for metal decks shall be factory coated for corrosion resistance. The fastener shall conform to meet or exceed Factory Mutual Standard 4470 and when subjected to 30 Kesternich cycles shall show less than 15% red rust. Acceptable insulation fastener types for metal decks are listed below.
      - a) A fluorocarbon coated screw type roofing fastener having a minimum 0.220" thread diameter. Plates used in conjunction with the fastener shall be a metal type having a minimum 3" diameter, as supplied by the fastener manufacturer.
        - Parafast Fastener by Siplast; Irving, TX
        - Roofgrip with Buildex Metal Plates by ITW Buildex; Itasca, IL
        - Dekfast #12 with Dekfast Steel Hexagonal Plates by Construction Fasteners, Inc. Wyomissing, PA.
        - Standard Roofing Fastener by Olympic Manufacturing Group; Agawam, MA.
    - b. Fire Resistant Slipsheet Fasteners: Slipsheet fasteners shall be approved by the manufacturer of the primary roofing products. Acceptable fasteners for specific substrate types are listed below.
      - 1) Wood/Plywood Flashing Substrates
        - a) A 12 gauge, spiral or annular threaded shank, zinc coated steel roofing fastener having a minimum 1" head.
          - Square Cap by W. H. Maze Co.; Peru, IL
          - 12 Gauge Simplex Nail by the Simplex Nail and Manufacturing Co., Americus, GA.
9. Walktread: A prefabricated, puncture resistant polyester core reinforced, polymer modified bitumen sheet material topped with a ceramic-coated granule wearing surface.
  - a. Thickness 0.217" (5.5 mm)
  - b. Weight: 1.8 lb/ft<sup>2</sup> (8.8 kg/m<sup>2</sup>)
  - c. Width: 30" (76.2 cm)
    - 1) Paratread Roof Protection Material by Siplast; Irving, TX

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. Preparation

1. General: Sweep or vacuum all surfaces, removing all loose aggregate and foreign substances prior to commencement of roofing.
2. Preparation of Densdeck Substrates to Receive Flashing Materials: Lay the coated fiberglass slipsheet over the Densdeck surface to receive flashing materials, lapping sides and ends a minimum of 2 inches. Nail the sheets sufficiently to hold in place until the Densdeck sheeting panels can be applied mechanically.

#### B. Substrate Preparation

1. Insulation: Install insulation panels with end joints offset; edges of the panels shall be in moderate contact without forcing applied in strict accordance with the insulation manufacturer's requirements and the following instructions. Stagger joints between layers where insulation is installed in two or more layers. Maintain a maximum panel size of 4' by 4' for insulation applied in hot asphalt.
  - a. Insulation – double layer. Mechanically attach the bottom layer, using the specified fasteners, at a rate of 1 fastener per 2 square feet of panel area (16 per 4' x 8' panel). Increase the fastening frequency at the corners/perimeter in accordance with the recommendations set forth in solid mopping of hot asphalt; laying each panel directly behind the asphalt applicator. Stagger the panel joints between insulation layers.

#### C. Roof Membrane Installation

1. Membrane Application: Apply roofing in accordance with roofing system manufacturer's instructions and the following requirements. Application of roofing membrane components shall immediately follow application of base sheet and/or insulation as a continuous operation.
2. Aesthetic Considerations: An aesthetically pleasing overall appearance of the finished roof application is a standard requirement for this project. Make necessary preparations, utilize recommended application techniques. Apply the specified materials including granules and metallic powder, and exercise care in ensuring that the finished application is acceptable to the Owner.
3. Priming: Prime metal and concrete and masonry surfaces with a uniform coating of the specified asphalt primer.
4. Kettles and Tankers: Kettles and tankers shall be equipped with accurate, fully readable thermometers. DO NOT heat asphalt to or above its flash point. Avoid heating at or above the FBT. Should conditions make this impractical, heating shall be no more than 25 °F below the EVT and no more than 25 °F above EVT.
5. Asphalt Temperatures: If the EVT information is NOT provided, the following asphalt temperature shall be observed. Maximum heating temperature shall be 525 °F (274 °C). Minimum application temperature shall be 400 °F (204 °C).
6. Asphalt Moppings: Ensure that all moppings DO NOT exceed a maximum of 25 lb/sq. Mopping shall be total in coverage, leaving no breaks or voids.
7. Bitumen Consistency: Cutting or alterations of bitumen, primer, and sealants shall NOT be permitted.
8. Roofing Application: Apply all layers of roofing free of wrinkles, creases or fishmouths. Exert sufficient pressure on the roll during application to ensure prevention of air pockets.
  - a. Apply all layers of roofing perpendicular to the slope of the deck.
  - b. Fully bond the base ply to the prepared substrate, utilizing minimum 3" side and end laps. Apply each sheet directly behind the asphalt applicator. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3'.

- c. Fully bond the finish ply to the base ply, utilizing minimum 3" side and end laps. Apply each sheet directly behind the cold adhesive applicator. Stagger end laps of the finish ply a minimum 3'. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply top pressure to top seal T-laps immediately following sheet application. Stagger side laps of the finish ply a minimum 12" from side laps in the underlying base ply. Stagger end laps of the finish ply a minimum 3' from end laps in the underlying base ply.
  - d. Maximum sheet lengths and special fastening of the specified roof membrane system may be required at various slope increments where the roof deck slope exceeds 1/2" per foot. The manufacturer shall provide acceptable sheet lengths and the required fastening schedule for all roofing sheet applications to applicable roof slopes.
9. Granule Embedment: Broadcast mineral granules over all bitumen overruns on the finish ply surface, while the bitumen is still hot or the adhesive is soft, to ensure a monolithic surface color.
  10. Flashing Application – masonry surfaces: Flash masonry parapet wall and curbs using the reinforcing sheet and the metal foil flashing membrane. After the base ply has been applied to the top of the cant, fully adhere the reinforcing sheet, utilizing minimum 3" side laps and extend a minimum of 3" onto the base ply surface and 3" up the parapet wall above the cant. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4" beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9" centers. (See manufacturer's schematic for visual interpretation.)
  11. Flashing Application – surfaces sheathed with gypsum sheathing panels Flash parapet walls and curbs sheathed with the specified gypsum sheathing panel using the reinforcing sheet and the metal foil flashing membrane. After the base ply has been applied to the top of the cant, fully adhere the reinforcing sheet, utilizing minimum 3" side laps and extend a minimum of 3" onto the base ply surface and up the gypsum sheathing panel surface above the cant. After the final roofing ply has been applied to the top of the cant, prepare the surface area that is to receive flashing coverage by torch heating granular surfaces or by application of asphalt primer; allowing primer to dry thoroughly. Torch apply the metal foil-faced flashing into place using three foot widths (cut off the end of roll) always lapping the factory selvage edge. Stagger the laps of the metal foil flashing layer from lap seams in the reinforcing layer. Extend the flashing sheet a minimum of 4" beyond the toe of the cant onto the prepared surface of the finished roof and up the wall to the desired flashing height. Exert pressure on the flashing sheet during application to ensure complete contact with the wall/roof surfaces, preventing air pockets; this can be accomplished by using a damp sponge or shop rag. Check and seal all loose laps and edges. Nail the top edge of the flashing on 9" centers. (See manufacturer's schematic for visual interpretation).
  12. Catalyzed Acrylic Resin Flashing System: Install the liquid-applied primer and flashing system in accordance with the membrane system manufacturer's printed installer's guidelines and other applicable written recommendations as provided by the manufacturer.
  13. Use of Metallic Powder: Broadcast metallic powder over all bitumen overruns on the metal foil membrane surface while the bitumen is still hot to ensure a monolithic surface color.
  14. Water Cut-Off: At end of day's work, or when precipitation is imminent, construct a water cut-off at all the open edges. Cut-offs can be built using asphalt or plastic cement and roofing felts, constructed to withstand protracted periods of service. Cut-offs shall be completely removed prior to the resumption of roofing.

- D. Roof System Interface with Related Components
1. Walktread: Cut the walktread into maximum 5 foot lengths and allow it to relax until flat. Adhere to the sheet using the specified plastic cement. Apply the specified cement in a 3/8" thickness to the back of the product in 4" by 5" spots in accordance with the pattern as supplied by the walktread manufacturer, then walk-in each sheet after application, to ensure proper adhesion. Use a minimum spacing of 2" between sheets to allow for proper drainage.
  2. Sealant: Apply a smooth continuous bead of the specified sealant at the exposed finish ply edge transition to metal flashings incorporated into the roof system.
- E. Care shall be taken so that insulation does NOT get wet or take on moisture during field storage or application. Keep protected at all times. Check moisture content at time of installation and provide reports to the Architect.
- F. Install first layer of roof insulation on metal deck using Grefco Perma-Fasteners at 18" o.c. Joints shall be staggered with joints only occurring on flat hat sections of deck (NOT over flute voids).
- G. Install first layer of roof insulation with joints staggered and mechanically attached to metal deck.
- H. Installation of upper layer of roof insulation shall be coordinated with roofing membrane in order that insulation is protected from elements and remains completely dry.
- I. Any detail shown on drawings which does NOT conform to manufacturer's requirements shall be brought to the attention of the Engineer before bidding.
- J. Field Quality requirements and Inspections
1. Site Condition: Leave all areas around job site free of debris, roofing materials, equipment and related items after completion of job.
  2. Notification of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
  3. Final Inspection
    - a. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by all parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
  4. Issuance of the Guarantee: Complete all post-installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

END OF SECTION

## SECTION 07 54 19 – POLYVINYL-CHLORIDE ROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Mechanically fastened PVC reinforced membrane roofing system.
  - 2. Fiberglass-mat faced gypsum roof boards.
- B. Related Sections:
  - 1. Section 01 40 00 – Quality Requirements.

#### 1.2 REFERENCES

- A. ASTM
  - 1. C472 – Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum concrete.
  - 2. C473 – Standard Test methods for Physical Testing of Gypsum Panel Products.
  - 3. C518 – Standard Test method for Steady-State Thermal Transmission Properties by means of the heat Flow Meter Apparatus.
  - 4. C840 – Standard Specification for application and Finishing of Gypsum Board.
  - 5. C1177 – Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
  - 6. E96 – Standard Test Methods for Water Vapor Transmission of Materials.
  - 7. E661 – Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Energy Performance: Provide roofing system with initial Solar Reflectance Index NOT less than 78 when calculated according to ASTM E1980, based on testing identical products by a qualified testing agency.

#### 1.4 SUBMITTALS

- A. Product Data: Manufacturer's specifications and installation instructions for each product specified.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples for Verification: For the following products:
  - 1. Sheet roofing, of color specified.
- D. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
  - 1. Submit evidence of compliance with performance requirements.
- E. Research/evaluation reports.
- F. Field quality-control reports.
- G. Maintenance data.



## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.
- B. Roof Board Regulatory Requirements: Provide products that comply with the following limits for surface burning characteristics when tested per ASTM E84:
  - 1. Flame spread: 25, maximum.
  - 2. Smoke developed: 450, maximum.
- C. Source Limitations: Obtain components including roof insulation and fasteners for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.
- D. Exterior Fire-Test Exposure: ASTM E108, Class C; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.
- E. Provide fastener pull test to determine number and spacing of plates and fasteners. Use pull tester with memory needle.
  - 1. Pull-out value to be as required by manufacturer.

## 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PVC MEMBRANE ROOFING

- A. PVC Sheet: ASTM D4434, Type III, fabric reinforced.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, the following:
    - a. Carlisle SynTec, Incorporated.
    - b. Duro-Last Roofing, Inc.
    - c. GAF Materials Corporation.
    - d. GenFlex Roofing Systems.
    - e. Johns Manville.
    - f. Sarnafil Inc.
    - g. Stevens Roofing Systems.
    - h. Versico Incorporated.
  - 2. Thickness:.050 inch (1.25mm).
  - 3. Exposed Face Color: White.

### 2.2 ROOF BOARD

- A. Georgia-Pacific Gypsum LLC:
  - 1. Fiberglass-Mat Faced Gypsum Roof Board: DensDeck Prime
- B. Johns Manville
  - 1. Fiberglass-Mat Faced Gypsum Roof Board: JM Fresco.

- C. USG Corporation:
  - 1. Fiberglass-Mat Faced Gypsum Roof Board: Seccurrock fiber-reinforced gypsum roof board.

## 2.3 MATERIALS

- A. Fiberglass-Mat Faced Gypsum Roof Board:
  - 1. Thickness: 1/4 inch.
  - 2. Width: 4 feet.
  - 3. Length: 8 feet.
  - 4. Weight: 1.15 psf.
  - 5. Surfacing: Fiberglass mat with non-asphaltic coating.
  - 6. Flexural Strength, Parallel (ASTM C473): 40 lbf, minimum
  - 7. Flute Span (ASTM E661): 2 – 5/8 inches.
  - 8. Permeance (ASTM E96): NOT more than 50 perms.
  - 9. R-Value (ASTM C518): NOT less than 0.28.
  - 10. Water Absorption (ASTM C1177): Less than 10 percent of weight.

## 2.4 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
  - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
  - 2. Adhesives and sealants that are NOT on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. Plastic Foam Adhesives: 50 g/L.
    - b. Gypsum Board and Panel Adhesives: 50 g/L.
    - c. Multipurpose Construction Adhesives: 70 g/L.
    - d. Fiberglass Adhesives: 80 g/L.
    - e. Contact Adhesive: 80 g/L.
    - f. Other Adhesives: 250 g/L.
    - g. PVC Welding Compounds: 510 g/L.
    - h. Adhesive Primer for Plastic: 650 g/L
    - i. Single-Ply Roof Membrane Sealants: 450 g/L.
    - j. Non-membrane Roof Sealants: 300 g/L.
    - k. Sealant Primers for Nonporous Substrates: 250 g/L.
    - l. Sealant Primers for Porous Substrates: 775 g/L.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.
- C. Prefabricated Parapet Wall Flashing.
  - 1. Equal to Duro-Last Prefabricated Wall Flashing.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.
- F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

- G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.
- H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.
- I. PVC Prefabricated Thru-Wall Scuppers: Prefabricated scupper, reinforced, fabricated from a high tenacity, low shrink, weft inserted 18 x 14, 1000 Denier polyester fabric that has been coated with a proven thermoplastic alloy.
  - 1. Scupper is to be heat (hot air) welded to the roofing membrane.
  - 2. Corners shall be factory welded, NOT field welded.
  - 3. Size of scuppers: Width: 16 inches, height: 6 inches, length: width of wall.

## 2.5 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
  - 1. Total thickness: 4 inches (2 layers of 2 inches); R-25.
- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.
- C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

## 2.6 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- B. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to another insulation layer.

## PART 3 - EXECUTION

### 3.1 ROOF BOARD INSTALLATION

- A. General: In accordance with ASTM C840 and the manufacturer's recommendations.

### 3.2 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components, so insulation is NOT exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Install the two layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

- E. Install insulation in one of the following ways:
  - 1. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
    - a. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
  - 2. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
    - a. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
    - b. Set each subsequent layer of insulation in adhesive, firmly pressing and maintaining insulation in place.

### 3.3 MECHANICALLY FASTENED MEMBRANE ROOFING INSTALLATION

- A. Mechanically fasten membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.
- B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Mechanically fasten or adhere membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- D. Apply membrane roofing with side laps shingled with slope of roof deck where possible.
- E. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
  - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane if required by manufacturer.
  - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
  - 3. Repair tears, voids, and lapped seams in roofing that does NOT comply with requirements.

### 3.4 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. DO NOT apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

### 3.5 PREFABRICATED PARAPET WALL FLASHING INSTALLATION

- A. Wall flashing to overlap base flashing and be welded to base flashing.

- B. Attach to plywood substrate with mastic and mechanically attach top of wall flashing to top of parapet.
- C. Provide horizontal intermediate tabs for support of wall flashing as recommended and required by the manufacturer.
- D. Install in accordance with Drawings and manufacturer's installation instructions.

### 3.6 SCUPPER INSTALLATION

- A. Heat (hot air) weld the scuppers to the roofing membrane.
- B. Install in accordance with Drawings and manufacturer's installation instructions.

### 3.7 FIELD QUALITY REQUIREMENTS

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- B. Repair or remove and replace components of membrane roofing system where inspections indicate that they DO NOT comply with specified requirements.

### 3.8 PROTECTION

- A. Protect gypsum roof board installations from damage and deterioration until the date of Substantial Completion.

END OF SECTION

## SECTION 07 55 20 – SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. SBS-modified bituminous membrane roofing.
  - 2. Roof insulation.
- B. Related Sections include the following:
  - 1. Section 01 40 00 – Quality Requirements.
  - 2. Section 05 31 00 – Steel Deck
  - 3. Section 07 41 13 – Metal Roof and Wall Panels

#### 1.2 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoises for mop-applied roofing asphalt and 75 centipoises for mechanical spreader-applied roofing asphalt, within a range of plus or minus 25 deg F, measured at the mop cart or mechanical spreader immediately before application.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
  - 1. Base flashings, cants, and membrane terminations.
  - 2. Tapered insulation, including slopes.
  - 3. Crickets, saddles, and tapered edge strips, including slopes.
  - 4. Insulation fastening patterns.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- D. Maintenance Data: For roofing system to include in maintenance manuals.
- E. Warranties: Special warranties specified in this Section.
- F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E548.

- C. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.
- D. Pre-installation Conference: Conduct conference at Project site. Notify parties a minimum of 3 days before meeting. Review methods and procedures related to roofing system including, but NOT limited to, the following:
  1. Meet with Owner, Engineer, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
  2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
  3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
  5. Review structural loading limitations of roof deck during and after roofing.
  6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that shall affect roofing system.
  7. Review governing regulations and requirements for insurance and certificates if applicable.
  8. Review temporary protection requirements for roofing system during and after installation.
  9. Review roof observation and repair procedures after roofing installation.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
  1. Discard and legally dispose of liquid material that can NOT be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

#### 1.6 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

#### 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
  1. Special warranty includes roofing membrane, base flashings, roof insulation and other components of roofing system.

2. Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. SBS-Modified Bituminous Membrane Roofing:
    - a. GAF Materials Corporation.
    - b. Johns Manville International, Inc.
    - c. Or approved equal.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are NOT limited to, the products specified.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, the manufacturers specified.

### 2.2 SBS – MODIFIED ASPHALT ROOFING SYSTEMS

- A. Subject to compliance with requirements, provide the modified bituminous membrane roofing system, by one of the following manufacturers or approved equal.
  1. GAF: System No. I-2-1-MGP.
  2. Johns Manville: System No. 3CID.

### 2.3 SBS-MODIFIED ASPHALT-SHEET MATERIALS

- A. Roofing Membrane Cap Sheet: ASTM D6162 or 6164, Type II, Grade G Polyester or fiberglass mat, as specified by trade name below or as part of approved system, saturated in asphalt and coated on both sides with SBS rubber modified asphalt, coated with white roofing granules.
  1. GAF: MOP Granulars Plus
  2. Johns Manville: DynaKap

### 2.4 INTERMEDIATE FELTS

- A. Ply Felt: ASTM D2178, Type VI (as specified by trade name below) asphalt coated fiberglass mat. Two layers.
  1. GAF: FLEXPPLY6
  2. Johns Manville: GlasPly Premier

### 2.5 FLASHING MEMBRANE

- A. Base and Wall Flashings: Polyester mat saturated in asphalt and coated on both sides with SBS rubber modified asphalt, with white ceramic granular finish surface.
  1. GAF: MOP PLUS
  2. Johns Manville: DynaFlex



## 2.6 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. Roofing Asphalt: ASTM D312, III or IV as recommended by roofing system manufacturer for application.
- B. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required by roofing system manufacturer for application.
- C. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.
- D. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07 41 13, METAL ROOF AND WALL PANELS.
- E. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing membrane.
- F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

## 2.7 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, felt or glass-fiber mat facer on both major surfaces.
  - 1. Available Manufacturers:
    - a. GAF Materials Corporation.
    - b. Johns Manville International, Inc.
    - c. Or approved equal.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Minimum slope of 1/2 inch per 12 inches.

## 2.8 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

## 2.9 WALKWAYS

- A. Construct walkways by applying one additional layer of membrane roofing around and between roof top units and to edge of roof as shown on drawings. Minimum width = 2'0".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
  1. Verify that roof openings and penetrations are in place and set and braced.
  2. Verify that cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
  3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05 31 00, STEEL DECK.

### 3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

### 3.3 INSULATION INSTALLATION

- A. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- B. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
  1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- E. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 3 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- F. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
  1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
  2. Fasteners shall protrude no more than 1/4 inch below roof deck.

### 3.4 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality requirements Guidelines for the Application of Polymer Modified Bitumen Roofing."

- B. Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.
- C. Coordinate installing roofing system so insulation and other components of the roofing membrane system NOT permanently exposed are NOT subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
  - 1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
  - 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
  - 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- D. Asphalt Heating: DO NOT raise roofing asphalt temperature above equiviscous temperature range more than one hour before time of application. DO NOT exceed roofing asphalt manufacturer's recommended temperature limits during roofing asphalt heating. DO NOT heat roofing asphalt within 25 deg F of flash point. Discard roofing asphalt maintained at a temperature exceeding finished blowing temperature for more than 4 hours.
- E. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

### 3.5 BASE-PLY SHEET INSTALLATION

- A. Install two glass-fiber base-ply sheets according to roofing system manufacturer's written instructions starting at low point of roofing system. Align glass-fiber base-ply sheets without stretching. Shingle side laps of glass-fiber base-ply sheets uniformly to ensure required number of glass-fiber base-ply sheets covers substrate at any point. Shingle in direction to shed water. Extend glass-fiber base-ply sheets over and terminate beyond cants.
  - 1. Embed each glass-fiber base-ply sheet in a continuous mopping of hot roofing asphalt, to form a uniform membrane without glass-fiber base-ply sheets touching.

### 3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

- A. Install modified bituminous roofing membrane cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
  - 1. Adhere to substrate in a solid mopping of hot roofing asphalt applied at NOT less than 425 deg F.
- B. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
  - 1. Repair tears and voids in laps and lapped seams NOT completely sealed.
  - 2. Apply roofing granules to cover exuded bead at laps while bead is hot.
- C. Install roofing membrane sheets so side and end laps shed water.

### 3.7 FLASHING AND STRIPPING INSTALLATION

- A. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
  - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
  - 2. Backer Sheet Application: Install backer sheet and adhere to substrate in a solid mopping of hot roofing asphalt.

3. Flashing Sheet Application: Adhere flashing sheet to substrate in a solid mopping of hot roofing asphalt applied at NOT less than 425 deg F. Apply hot roofing asphalt to back of flashing sheet if recommended by roofing system manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

D. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

### 3.8 WALKWAY INSTALLATION

A. Walkway Pads: Install walkway pads using units of size indicated or, if NOT indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

B. Walkway Cap Sheet Strips: Install roofing membrane walkway cap sheet strips over roofing membrane in hot roofing asphalt applied at NOT less than 425 deg F.

### 3.9 FIELD QUALITY REQUIREMENTS

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

B. Test Cuts: Test specimens shall be removed to evaluate problems observed during quality assurance inspections of roofing membrane as follows:

1. Approximate quantities of components within roofing membrane shall be determined according to ASTM D3617.

2. Test specimens shall be examined for interply voids according to ASTM D3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality requirements Guidelines for the Application of Polymer Modified Bitumen Roofing."

3. Such specimens and tests shall be provided at Contractor's expense.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Engineer.

1. Notify Engineer or Owner 48 hours in advance of date and time of inspection.

D. Repair or remove and replace components of roofing system where test results or inspections indicate that they DO NOT comply with specified requirements.

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

### 3.10 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction shall NOT affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Engineer and Owner.

B. Correct deficiencies in or remove roofing system that does NOT comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

- C. Clean asphalt spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

## SECTION 07 71 00 – MANUFACTURED ROOF SPECIALTIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Copings.

#### 1.2 PERFORMANCE REQUIREMENTS

- A. Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressures:
  - 1. Design Pressure: 20 lbs./sq. ft.

#### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show layouts of manufactured roof specialties, including plans and elevations. Identify factory- vs. field-assembled work.
- C. Samples: For each type of manufactured roof specialty indicated with factory-applied color finishes.
- D. Product Test Reports: Verifying compliance of copings with performance requirements.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Basis-of-Design Product: The designs for copings are based on the products named. Subject to compliance with requirements, provide either the named products or comparable products by one of the other manufacturers specified.

#### 2.2 EXPOSED METALS

- A. Aluminum Sheet: ASTM B209, alloy and temper recommended by manufacturer for use and finish indicated, finished as follows:
  - 1. Surface: Smooth, flat finish.
  - 2. Mill finish.
  - 3. High-Performance Organic Finish: Three-coat, thermocured system with color coats containing NOT less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2604.

#### 2.3 CONCEALED METALS

- A. Aluminum Sheet: ASTM B209, alloy and temper recommended by manufacturer for use and structural performance indicated, mill finished.
- B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by manufacturer for type of use and structural performance indicated, mill finished.

- C. Stainless-Steel Sheet: ASTM A240, Type 304.
- D. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 (Z275) coating designation; structural quality.

## 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
- C. Elastomeric Sealant: ASTM C920, elastomeric silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- D. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.5 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths NOT exceeding 12 feet, concealed anchorage, concealed splice plates with same finish as coping caps, mitered corner units, and end cap units.
  - 1. Basis-of-Design Product: Southern Aluminum Finishing Company, Inc., Perimeter Systems Division, Profile CP-3, or a comparable product by one of the following:
    - a. Architectural Products Co.
    - b. ATAS International, Inc.
    - c. Castle Metal Products.
    - d. Cheney Flashing Company.
    - e. Hickman, W. P. Company.
    - f. Merchant & Evans, Inc.
    - g. Metal-Era, Inc.
    - h. Metal-Fab Manufacturing LLC.
    - i. MM Systems Corporation.
    - j. Perimeter Systems, a division of Southern Aluminum Finishing Co.
    - k. Petersen Aluminum Corp.
  - 2. Coping Caps: Snap-on, fabricated from the following exposed metal:
    - a. Aluminum: 0.050 inch (1.2 mm) thick.
  - 3. Coping Cap Color: As selected by Architect from manufacturer's full range.
  - 4. Corners: Continuously welded.
  - 5. Splices: Coping sections shall be joined with 6" wide splice plates to provide for thermal movement after installation.
  - 6. Stainless steel spring clips mounted to wood plates at 60" centers.
  - 7. Face Leg Cleats: Concealed, continuous galvanized steel sheet.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install manufactured roof specialties according to manufacturer's written instructions. Anchor manufactured roof specialties securely in place and capable of resisting forces specified in performance requirements. Use fasteners, separators, sealants, and other miscellaneous items as required to complete manufactured roof specialty systems.

1. Install manufactured roof specialties with provisions for thermal and structural movement.
  2. Torch cutting of manufactured roof specialties is NOT permitted.
- B. Metal Protection: Where dissimilar metals shall contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
- C. Install manufactured roof specialties level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.
- D. Install manufactured roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
- E. Expansion Provisions: Provide for thermal expansion of exposed manufactured roof specialties. Space movement joints at a maximum of 12 feet with no unplanned joints within 18 inches of corners or intersections.
- F. Fasteners: Use fasteners of type and size recommended by manufacturer but of sizes that shall penetrate substrate NOT less than 1-1/4 inches for nails and NOT less than 3/4 inch for wood screws.
- G. Seal joints with elastomeric sealant as required by manufacturer of roofing specialties.

### 3.2 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings to resist uplift and outward forces according to performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's recommended spacing.

END OF SECTION



## SECTION 07 72 00 – ROOF ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Roof curbs.
  - 2. Equipment supports.

#### 1.2 SUBMITTALS

- A. Product Data: For each type of roof accessory indicated.
- B. Shop Drawings: For roof accessories.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items.
- E. Operation and maintenance data.
- F. Warranty: Sample of special warranty.

### PART 2 - PRODUCTS

#### 2.1 METAL MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653, G90 (Z275) coating designation.
  - 1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
  - 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
  - 3. Exposed Coil-Coated Finish: Two-coat fluoropolymer finish; AAMA 621; system consisting of primer and fluoropolymer color topcoat containing NOT less than 70 percent PVDF resin by weight.
  - 4. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat.
- B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792, AZ50 (AZM150) coated.
  - 1. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
  - 2. Exposed Coil-Coated Finish: Two-coat fluoropolymer finish; AAMA 621; system consisting of primer and fluoropolymer color topcoat containing NOT less than 70 percent PVDF resin by weight.
  - 3. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat.
- C. Aluminum Sheet: ASTM B209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
  - 1. Mill Finish: As manufactured.

2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
  3. Clear Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.
  4. Color Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.
  5. Exposed Coil-Coated Finish: Two-coat fluoropolymer finish; AAMA 620; system consisting of primer and fluoropolymer color topcoat containing NOT less than 70 percent PVDF resin by weight.
  6. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm).
- D. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.
- E. Stainless-Steel Sheet and Shapes: ASTM A240 or ASTM A666, Type 304.
- F. Steel Shapes: ASTM A36, hot-dip galvanized according to ASTM A123 unless otherwise indicated.

## 2.2 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWWA C2; NOT less than 1-1/2 inches (38 mm) thick.
- C. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide non-removable fastener heads to exterior exposed fasteners.
- D. Sealants: As recommended by roof accessory manufacturer for installation indicated.

## 2.3 ROOF CURBS

- A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, and integrally formed deck-mounting flange at perimeter bottom.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Vent Products Model 8130 roof curb or comparable product by one of the following:
    - a. AES Industries, Inc.
    - b. Curbs Plus, Inc.
    - c. Custom Solution Roof and Metal Products.
    - d. Greenheck Fan Corporation.
    - e. LM Curbs.
    - f. Metallic Products Corp.
    - g. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
    - h. Pate Company (The).
    - i. Roof Products, Inc.
    - j. Safe Air of Illinois.
    - k. Thybar Corporation.
    - l. Vent Products Co., Inc.

- B. Material: Zinc-coated (galvanized) 18-gauge steel sheet.
  - 1. Finish: Mill phosphatized.
  - 2. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
  - 3. Liner: 0.63" aluminum liner.
  - 4. Factory-installed wood nailer at top of curb, continuous around curb perimeter.
  - 5. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated.
  - 6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.
  - 7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.

## 2.4 EQUIPMENT SUPPORTS

- A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints and integrally formed deck-mounting flange at perimeter bottom.
  - 1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, the following:
    - a. AES Industries, Inc.
    - b. Curbs Plus, Inc.
    - c. Custom Solution Roof and Metal Products.
    - d. Greenheck Fan Corporation.
    - e. LM Curbs.
    - f. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
    - g. Pate Company (The).
    - h. Roof Products, Inc.
    - i. Thybar Corporation.
    - j. Vent Products Co., Inc.
- B. Material: Zinc-coated (galvanized) 18 gauge steel sheet.
  - 1. Finish: Mill phosphatized.
- C. Construction:
  - 1. Fabricate equipment supports to minimum height of 12 inches (300 mm) unless otherwise indicated.
  - 2. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Verify dimensions of roof openings for roof accessories. Install roof accessories according to manufacturer's written instructions.
  - 1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
  - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
  - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
  - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
- C. Roofing Protection:
  - 1. Protect roofing using details approved by the roofing manufacturer.
  - 2. Roofing materials shall be continuous under equipment supports or terminate vertically NOT less than 8 inches above the roof surface.
  - 3. If mechanical units are of a size or weight that they will crush the insulation, then the insulation below the sleeper shall be replaced by wood blocking.
- D. Seal joints with sealant as required by roof accessory manufacturer.

### 3.2 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A780.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 9, FINISHES.
- C. Replace roof accessories that have been damaged or that can NOT be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

## SECTION 07 84 00 – FIRESTOPPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes firestopping and through-penetration protection systems materials and accessories.

#### 1.2 SUBMITTALS

- A. Product Data: Submit data on product characteristics, performance, and limitation criteria.
- B. Design Data: Provide schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

#### 1.3 QUALITY ASSURANCE

- A. Through Penetration Firestopping of Fire Rated Assemblies: ASTM E814 with minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but NOT less than 1-hour.
  - 1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but NOT less than 1-hour.
- B. Fire Resistant Joints in Fire Rated Wall Assemblies: ASTM E1966 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.
- C. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- D. Maintain one copy of each document on site.

#### 1.4 ENVIRONMENTAL REQUIREMENTS

- A. DO NOT apply materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and minimum 3 days after installation of materials.
- C. Provide ventilation in areas to receive solvent cured materials.

### PART 2 - PRODUCTS

#### 2.1 FIRESTOPPING

- A. Manufacturers:
  - 1. Dow Corning Corp.
  - 2. 3M fire Protection Products.
  - 3. United States Gypsum Co.
  - 4. Substitutions: Permitted.

- B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
  - 1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
  - 2. Foam Firestopping Compounds: Single component foam compound.
  - 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
  - 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
  - 5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
  - 6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
  - 7. Firestop Pillows: Formed mineral fiber pillows.
- C. Color: As selected from manufacturer's full range of colors.

## 2.2 ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
- B. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify openings are ready to receive work of this section.

### 3.2 PREPARATION

- A. Clean substrate surfaces of matter effecting bond of firestopping material.
- B. Install backing materials to arrest liquid material leakage.

### 3.3 APPLICATION

- A. Apply primer where recommended by manufacturer for specific material and substrate.
- B. Apply firestopping material in sufficient thickness to achieve required fire rating, to uniform density and texture.
- C. Install material at walls or partition openings containing penetrating sleeves, piping, duct work, conduit and other items, requiring firestopping.
- D. Remove dam material after firestopping material has cured.

### 3.4 SCHEDULES

<b>LOCATION</b>	<b>UL/FM/WH #</b>	<b>FIRE RATING</b>
Main floor fire walls		1 hour
Room to room partitions, metallic pipe and conduit		3/4 hour
Room to room partitions, non-metallic pipe and conduit		3/4 hour

END OF SECTION

## SECTION 07 92 00 – JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Silicone joint sealants.
  - 2. Urethane joint sealants.
  - 3. Preformed joint sealants.
  
- B. Related Sections:
  - 1. Section 01 40 00 – Quality Requirements.
  - 2. Section 04 20 00 – Unit Masonry.

#### 1.2 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that shall contact or affect joint sealants.
  - 1. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Submit NOT fewer than three pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  - 5. Testing shall NOT be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, NOT older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

#### 1.3 SUBMITTALS

- A. Product Data:
  - 1. For each joint-sealant product indicated.
  
- B. Samples for Initial Selection:
  - 1. Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
  
- C. Samples for Verification:
  - 1. For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
  
- D. Joint-Sealant Schedule:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant manufacturer and product name.
  - 3. Joint-sealant formulation.
  - 4. Joint-sealant color.
  
- E. Qualification Data:
  - 1. For qualified Installer and testing agency.



- F. Product Certificates:
  - 1. For each kind of joint sealant and accessory, from manufacturer.
- G. Product Test Reports:
  - 1. Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- H. Preconstruction Compatibility and Adhesion Test Reports:
  - 1. From sealant manufacturer, indicating the following:
    - a. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
    - b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- I. Warranties:
  - 1. Sample of special warranties.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations:
  - 1. Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing:
  - 1. Test joint sealants using a qualified testing agency.
    - a. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.
    - b. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Pre-installation Conference:
  - 1. Conduct conference at Project site.

#### 1.5 PROJECT CONDITIONS

- A. DO NOT proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have NOT yet been removed from joint substrates.

#### 1.6 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that DO NOT comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.

- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that DO NOT comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
  - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. 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 joint-sealant manufacturer, based on testing and field experience.
- B. Liquid-Applied Joint Sealants: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
  - 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that shall be continuously immersed in liquids, provide products that have undergone testing according to ASTM C1247. Liquid used for testing sealants is de-ionized water, unless otherwise indicated.
- C. Colors of Exposed Joint Sealants: As indicated by manufacturer's designations.

### 2.2 SILICONE JOINT SEALANTS

- A. One-Part Silicones: ASTM C920, Type S, Grade NS, Class 25.
  - 1. 795 Silicone Structural Glazing, Glazing, and Weatherproofing Sealant, by Dow Corning. (colors only)
  - 2. Construction 1200 Sealant, General Electric Company.
  - 3. 999-A, Dow Corning.
  - 4. 864 Architectural Silicone, by Pecora Corporation. (colors only)

### 2.3 URETHANE JOINT SEALANTS

- A. Two-Part Urethane: Self-Leveling, ASTM C920, Type M, Grade P, Class 25.
  - 1. Chem-Calk CC-550, by Bostik.
  - 2. Vulkem 245, by Mameco.
  - 3. Vulkem 255, Wide-Joint, by Mameco.
  - 4. NR-200 Urexpan, by Pecora Corporation.
  - 5. Sikaflex-2c NS/SL, by Sika Corporation.
- B. Two-Part Urethane: Non-Sag, ASTM C920, Type M, Grade NS, Class 25.
  - 1. Chem-Calk 500, by Bostik.
  - 2. Vulkem 227, by Mameco.
  - 3. Dynatrol II, by Pecora Corporation.

4. Sikaflex-2c NS/SL, by Sika Corporation.
  5. Sonolastic NP 2, by Sonneborn Building Products, ChemRex Inc.
- C. One-Part Urethane: Self-Leveling, ASTM C920, Type S, Grade P, Class 25.
1. Vulkem 45, by Mameco.
  2. Urexpam NR-201, by Pecora Corporation.
  3. Sonolastic SL1, by Sonneborn Building Products, ChemRex Inc.
  4. Sikaflex 1C-SL by Sika.
- D. One-Part Urethane: Non-Sag, ASTM C920, Type S, Grade NS, Class 25.
1. Chem-Calk 900, by Bostik.
  2. Vulkem 116, by Mameco.
  3. Sonolastic NP I, by Sonneborn Building Products, ChemRex Inc.
  4. Sikaflex 1A by Sika.

## 2.4 PREFORMED JOINT SEALANTS

- A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Dow Corning Corporation; 123 Silicone Seal.
    - b. GE Advanced Materials - Silicones; UltraSpan US1100.
    - c. Pecora Corporation; Sil-Span.

## 2.5 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin) OR Type O (open-cell material), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

## 2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Exterior insulation and finish systems.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that DO NOT stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; DO NOT allow spillage or migration onto adjoining surfaces.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. DO NOT leave gaps between ends of sealant backings.
  - 2. DO NOT stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are NOT used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth,

uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that DO NOT discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C1193.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:

1. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of NOT less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
2. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
3. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

### 3.4 FIELD QUALITY REQUIREMENTS

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
  - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
  - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
  - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
  - a. Whether sealants filled joint cavities and are free of voids.
  - b. Whether sealant dimensions and configurations comply with specified requirements.
  - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants NOT evidencing adhesive failure from testing or noncompliance with other indicated requirements shall be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

### 3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

**DIVISION 9**  
**FINISHES**





## SECTION 09 90 00 – PAINTING AND PROTECTIVE COATINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes: Exposed, buried, and submerged metal, exposed PVC and CPVC, exposed FRP, and aluminum and dissimilar metals, to be protective painted, whether specifically mentioned or not, except as specified otherwise. Prime coat structural steel surfaces. Exterior concrete surfaces shall NOT be protective painted unless specifically indicated. Interior concrete surfaces shall be protective painted as specified herein.
- B. Related Sections:
  - 1. Section 01 40 00 – Quality Requirements.

#### 1.2 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International:
    - a. D16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.
    - b. D4541 – Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.
  - 2. NACE International:
    - a. SP0178 – Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.
    - b. SP0188-06 - Discontinuity (Holiday) Testing of Protective Coatings.
  - 3. NAPF (National Association of Pipe Fabricators):
    - a. 500-03 – Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings.
  - 4. NSF International:
    - a. 61 – Drinking Water System Components - Health Effects.
  - 5. SSPC (Society for Protective Coatings):
    - a. QP1, Standard Procedure for Evaluating Qualifications of Painting Contractors.
    - b. QP2, Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint.
    - c. SP COM - Surface Preparation Commentary for Steel and Concrete Substrates.
    - d. SP-1 – Solvent Cleaning.
    - e. SP-2 – Hand Tool Cleaning.
    - f. SP-3 – Power Tool Cleaning.
    - g. SP-5 – White Metal Blast Cleaning.
    - h. SP-6 – Commercial Blast Cleaning.
    - i. SP-7 – Brush-Off Blast Cleaning.
    - j. SP 8 – Pickling.
    - k. SP-10 – Near-White Blast Cleaning.
    - l. SP 11-T – Power Tool Cleaning to Bare Metal.
    - m. SP 13 – Surface Preparation of Concrete.
    - n. Guide No. 3, PA, Guide to Safety in Painting Applications.
  - 6. U.S. Environment Protection Agency (EPA):
    - a. Method 24 – Surface Coatings.
  - 7. NACE International (NACE):
    - a. SP0178 – Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.
    - b. SP0188-06 – Discontinuity (Holiday) Testing of Protective Coatings.
  - 8. NAPF:

- a. 500-03 – Surface Preparation Standard for Ductile Iron Pipe and Fittings Receiving Special External Coatings and/or Special Internal Linings.
- 9. NSF International (NSF):
  - a. 61 – Drinking Water System Components - Health Effects.
- 10. Society for Protective Coatings (SSPC):
  - a. QP1 – Standard Procedure for Evaluating Qualifications of Painting Contractors.
  - b. QP2 – Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint.
  - c. SP COM – Surface Preparation Commentary for Steel and Concrete Substrates.
  - d. SP-1 – Solvent Cleaning.
  - e. SP-2 – Hand Tool Cleaning.
  - f. SP-3 – Power Tool Cleaning.
  - g. SP-5 – White Metal Blast Cleaning.
  - h. SP-6 – Commercial Blast Cleaning.
  - i. SP-7 – Brush-Off Blast Cleaning.
  - j. SP 8 – Pickling.
  - k. SP-10 – Near-White Blast Cleaning.
  - l. SP 11-T – Power Tool Cleaning to Bare Metal.
  - m. SP 13 – Surface Preparation of Concrete.
  - n. Guide No. 3, PA, Guide to Safety in Painting Applications.
- 11. U.S. EPA:
  - a. Method 24 – Surface Coatings.

### 1.3 DEFINITIONS

#### A. Terms Used:

- 1. Submerged metal: Steel or iron surfaces below tops of channel or structure walls which shall contain water even when above expected water level.
- 2. Submerged concrete and masonry surfaces: Surfaces which are or shall be:
- 3. Underwater.
- 4. In structures which normally contain water.
- 5. Below tops of walls of water containing structures.
- 6. Exposed surface: Any metal or concrete surface, indoors or outdoors that is exposed to view.
- 7. Dry film thickness (DFT): Thickness of fully cured coating, measured in mils.
- 8. Volatile organic compound (VOC): Content of air polluting hydrocarbons in uncured coating product measured in units of grams per liter or pounds per gallon, as determined by EPA Method 24.
- 9. Ferrous: Cast iron, ductile iron, wrought iron, and all steel alloys except stainless steel.
- 10. Where SSPC surface preparation standards are specified or implied for ductile iron pipe or fittings, the equivalent NAPF surface preparation standard shall be substituted for the SSPC standard.
- 11. Coverage: Total minimum DFT in mils, or square feet per gallon.
- 12. FRP: Fiberglass Reinforced Plastic.
- 13. HCl: Hydrochloric Acid.
- 14. MDFT: Minimum DFT.
- 15. MDFTPC: Minimum DFT per Coat.
- 16. Mil: Thousandth of an inch.
- 17. Military Specification-Paint.
- 18. PSDS: Paint System Data Sheet.
- 19. SFPG: Square Feet per Gallon.
- 20. SFPGPC: Square Feet per Gallon per Coat.
- 21. SP: Surface Preparation.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Coating materials shall be especially adapted for use in wastewater treatment applications.
- B. Coating materials used in contact with potable water supply systems shall be certified to NSF 61.

#### 1.5 SUBMITTALS

- A. General: Submit in accordance with Section 01 33 00, SUBMITTAL PROCEDURES.
- B. Shop Drawings:
  - 1. Schedule of proposed coating materials.
  - 2. Schedule of surfaces to be coated with each coating material.
- C. Product Data: Include description of physical properties of coatings including solids content and ingredient analysis, VOC content, temperature resistance, typical exposures and limitations, and manufacturer's standard color chips:
  - 1. Data Sheets:
    - a. For each paint system, furnish a Paint System Data Sheet (PSDS), the Manufacturer's Technical Data Sheets, and paint colors available (where applicable) for each product used in the paint system. The PSDS form is appended to the end of this section.
    - b. Submit required information on a system-by-system basis.
    - c. Furnish copies of paint system submittals to the coating applicator.
    - d. Indiscriminate submittal of Manufacturer's literature only is NOT acceptable.
    - e. Regulatory requirements: Submit data concerning the following:
    - f. VOC limitations.
    - g. Coatings containing lead compounds and PCBs.
    - h. Abrasives and abrasive blast cleaning techniques, and disposal.
    - i. NSF certification of coatings for use in potable water supply systems.
- D. Samples: Include 8-inch square drawdowns or brush-outs of topcoat finish when requested. Identify each sample as to finish, formula, color name and number and sheen name and gloss units.
- E. Certificates: Submit in accordance with requirements for Product Data.
- F. Manufacturer's Instructions:
  - 1. Special requirements for transportation and storage.
  - 2. Mixing instructions.
  - 3. Shelf life.
  - 4. Pot life of material.
  - 5. Precautions for applications free of defects.
  - 6. Surface preparation.
  - 7. Method of application.
  - 8. Recommended number of coats.
  - 9. Recommended dry film thickness (DFT) of each coat.
  - 10. Recommended total dry film thickness (DFT).
  - 11. Drying time of each coat, including prime coat.
  - 12. Required prime coat.
  - 13. Compatible and non-compatible prime coats.
  - 14. Recommended thinners, when recommended.
  - 15. Limits of ambient conditions during and after application.
  - 16. Time allowed between coats (minimum and maximum).
  - 17. Required protection from sun, wind, and other conditions.

18. Touch up requirements and limitations.
19. Minimum adhesion of each system submitted in accordance with ASTM D4541.

G. Manufacturer's Representative's Field Reports.

H. Operations and Maintenance Data: Submit as specified in Section 01 77 00, CLOSEOUT PROCEDURES.

1. Reports on visits to project site to view and approve surface preparation of structures to be coated.
2. Reports on visits to project site to observe and approve coating application procedures.
3. Reports on visits to coating plants to observe and approve surface preparation and coating application on items that are "shop coated."

## 1.6 QUALITY ASSURANCE

A. Quality Assurance Submittals:

1. Quality Assurance plan.
2. Qualifications of coating applicator including List of Similar Projects and List of References substantiating experience.
3. Factory Applied Coatings: Manufacturer's certification stating factory applied coating system meets or exceeds requirements specified.
4. If the Manufacturer of finish coating differs from that of shop primer, provide both Manufacturers' written confirmation that materials are compatible.
5. Manufacturer's written instructions and special details for applying each type of paint.
6. Manufacturers' Certification of Proper Installation.

B. Certifications: All paints and coatings to be used on this project comply with current federal, state, and local VOC regulations

C. Applicator Qualifications:

1. Minimum of 5 years' experience applying specified type or types of coatings under conditions similar to those of the Work:
2. Provide qualifications of applicator and references listing 5 similar projects completed in the past 2 years.
3. Manufacturer approved applicator when manufacturer has approved applicator program.
4. Approved and licensed by polymorphic polyester resin manufacturer to apply polymorphic polyester resin coating system.
5. Approved and licensed by elastomeric polyurethane (100 percent solids) manufacturer to apply 100 percent solids elastomeric polyurethane system.
6. Applicator of off-site application of coal-tar epoxy shall have successfully applied coal-tar epoxy on similar surfaces in material, size, and complexity as on the Project.

D. Regulatory requirements: Comply with governing agencies regulations by using coatings that DO NOT exceed permissible VOC limits and DO NOT contain lead:

1. DO NOT use coal-tar epoxy in contact with drinking water or exposed to ultraviolet radiation.
2. Perform surface preparation and painting in accordance with recommendations of the following:
3. Paint Manufacturer's instructions.
4. SSPC-PA Guide No. 3, Guide to Safety in Paint Applications.
5. Federal, state, and local agencies having jurisdiction.

E. Samples:

1. Reference Panel:
  - a. Prior to start of surface preparation, furnish a 4" by 4" steel panel for each grade of sandblast specified herein, prepared to specified requirements.

- b. Provide panel representative of the steel used; prevent deterioration of surface quality.
  - c. Upon approval of Engineer, panel to be reference source for inspection.
  - d. Unless otherwise specified, before painting work is started, prepare minimum 8" by 10" samples with type of paint and application specified on similar substrate to which paint is to be applied.
  - e. Furnish additional samples as required until colors, finishes, and textures are approved.
  - f. Approved samples to be the quality standard for final finishes.
  - g. Field samples:
  - h. Prepare and coat a minimum 100 square foot area between corners or limits such as control or construction joints of each system.
  - i. Approved field sample may be part of Work.
  - j. Obtain approval before painting other surfaces.
- F. Pre-installation conference: Conduct as specified in Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.
- G. Compatibility of coatings: Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.
- H. Services of coating manufacturer's representative: Arrange for coating manufacturer's representative to attend pre-installation conferences. Make periodic visits to the project site to provide consultation and inspection services during surface preparation and application of coatings, and to make visits to coating plants to observe and approve surface preparation procedures and coating application of items to be "shop primed and coated".
- I. Contract Closeout Submittals:
- 1. Special Guarantee.
- 1.7 PRODUCT DELIVERY, STORAGE AND HANDLING
- A. Deliver, store, and handle products as specified in Section 01 60 00, PRODUCT REQUIREMENTS.
- B. Remove unspecified and unapproved paints from Project site immediately.
- C. Deliver new unopened containers with labels identifying the manufacturer's name, brand name, product type, batch number, date of manufacturer, expiration date or shelf life, color, and mixing and reducing instructions.
- 1. DO NOT deliver materials aged more than 12 months from manufacturing date.
- D. Store coatings in well-ventilated facility that provides protection from the sun, weather, and fire hazards. Maintain ambient storage temperature between 45 and 90-degrees Fahrenheit, unless otherwise recommended by the manufacturer.
- E. Take precautions to prevent fire and spontaneous combustion.
- F. Shipping:
- 1. Where pre-coated items are to be shipped to the site, protect coating from damage. Batten coated items to prevent abrasion.
  - 2. Use nonmetallic or padded slings and straps in handling.

## 1.8 PROJECT CONDITIONS

- A. Surface moisture contents: DO NOT coat surfaces that exceed manufacturer specified moisture contents, or when NOT specified by the manufacturer, the following moisture contents:
  - 1. Plaster and gypsum wallboard: 12 percent.
  - 2. Masonry, concrete, and concrete block: 12 percent.
  - 3. Interior located wood: 15 percent.
  - 4. Concrete floors: 7 percent.
  
- B. DO NOT Apply Coatings:
  - 1. Under dusty conditions or adverse environmental conditions, unless tenting, covers, or other such protection is provided for structures to be coated.
  - 2. When light on surfaces measures less than 15 foot-candles.
  - 3. When ambient or surface temperature is less than 55 degrees Fahrenheit unless manufacturer allows a lower temperature.
  - 4. When relative humidity is higher than 85 percent.
  - 5. When surface temperature is less than 5 degrees Fahrenheit above dew point.
  - 6. When surface temperature exceeds the manufacturer's recommendation.
  - 7. When ambient temperature exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
  - 8. Apply clear finishes at minimum 65 degrees Fahrenheit.
  
- C. Provide fans, heating devices, dehumidifiers, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
  
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain minimum 55 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes.
  
- E. Dehumidification and heating for coating of digester interiors, wet wells, and high humidity enclosed spaces:
  - 1. Provide dehumidification and heating of digester interior spaces in which surface preparation, coating application, or curing is in progress according to the following schedule:
    - a. October 1 to April 30: Provide continuous dehumidification and heating as required to maintain the tanks within environmental ranges as specified in this Section and as recommended by the coating material manufacturer. For the purposes of this Section, "continuous" is defined as 24 hours per day and 7 days per week.
    - b. May 1 to September 30: Provide temporary dehumidification and heating as may be required to maintain the tanks within the specified environmental ranges in the event of adverse weather or other temporary condition. At Contractor's option and at his sole expense, Contractor may suspend work until such time as acceptable environmental conditions are restored, in lieu of temporary dehumidification and heating. Repair or replace any coating or surface preparation damaged by suspension of work, at Contractor's sole expense.
  - 2. Equipment requirements:
    - a. Capacity: Provide dehumidification, heating, and air circulation equipment with minimum capacity to perform the following:
      - 1) Maintain the dew point of the air in the tanks at a temperature at least 5 degrees Fahrenheit less than the temperature of the coldest part of the structure where work is underway.
      - 2) Reduce dew point temperature of the air in the tanks by at least 10 degrees Fahrenheit in 20 minutes.
      - 3) Maintain air temperature in the tanks at 60 degrees minimum.
    - b. Systems:

- 1) Internal combustion engine generators: May be used; Contractor shall obtain all required permits and provide air pollution and noise control devices on equipment as required by permitting agencies.
  - 2) Dehumidification: Provide desiccant or refrigeration drying. Desiccant types shall have a rotary desiccant wheel capable of continuous operation. No Liquid, granular, or loose lithium chloride drying systems shall be allowed.
  - 3) Heating: Electric, indirect combustion, or steam coil methods may be used. Direct fired combustion heaters shall NOT be allowed during abrasive blasting, coating application, or coating cure time.
3. Design and submittals:
- a. Contractor shall prepare dehumidification and heating plan for this project, including all equipment and operating procedures.
  - b. Suppliers of services and equipment shall have NOT less than 3 years' experience in similar applications.
  - c. Supplier: The following or equal:
    - 1) Cargocaire Corporation (Munters) or equal.
  - d. Submit dehumidification and heating plan for Engineer's review.
4. Monitoring and performance:
- a. Measure and record relative humidity and temperature of air, and structure temperature twice daily (beginning and end of work shifts) to verify that proper humidity and temperature levels are achieved inside the work area after the dehumidification equipment is installed and operational. Test results shall be made available to the Engineer upon request.
  - b. Interior space of the working area and tank(s) shall be sealed and a slight positive pressure maintained as recommended by the supplier of the dehumidification equipment.
  - c. The filtration system used to remove dust from the air shall be designed so that it does NOT interfere with the dehumidification equipment's ability to control the dew point and relative humidity inside the reservoir.
    - 1) The air from the tank, working area, or dust filtration equipment shall NOT be recirculated through the dehumidifier during coating application or when solvent vapors are present.

## 1.9 SEQUENCING AND SCHEDULING

- A. Sequence and Schedule: As specified in Section 01 14 00, WORK RESTRICTIONS.

## 1.10 SPECIAL GUARANTEE

- A. Furnish Manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the Owner, removal and replacement of work specified in this section found defective during a period of 1 year after the date of Substantial Completion.
- B. Contractor and paint Manufacturer shall jointly and severally furnish guarantee.

## 1.11 MAINTENANCE

- A. Extra materials: Deliver as specified in Section 01 77 00, CLOSEOUT PROCEDURES. Include minimum 1 gallon of each type and color of coating applied:
1. When manufacturer packages material in gallon cans, deliver unopened labeled cans as comes from factory.
  2. When manufacturer does NOT package material in gallon cans, deliver material in new gallon containers, properly sealed, and identified with typed labels indicating brand, type, and color.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Special coatings:
1. Carboline: Carboline, St. Louis, MO.
  2. Ceilcote: International Protective Coatings, Berea, OH.
  3. Dampney: The Dampney Company, Everett, MA.
  4. Devoe: International Protective Coatings, Louisville, KY.
  5. Dudick: Dudick, Inc., Streetsboro, OH.
  6. GET: Global Eco Technologies, Pittsburg, CA.
  7. Henkel: Henkel North America, Madison Heights MI.
  8. IET: Integrated Environmental Technologies, Santa Barbara, CA.
  9. Induron Protective Coatings, Birmingham, AL.
  10. PPG Amercoat: PPG Protective & Marine Coatings, Brea, CA.
  11. Raven Lining Systems, Broken Arrow, OK.
  12. Rustoluem : Rustoleum Corp., Sommerset, NJ.
  13. Sanchem: Sanchem, Chicago, IL.
  14. Superior: Superior Environmental Products, Inc., Addison, TX.
  15. S-W: Sherwin-Williams Co., Cleveland, OH.
  16. Tnemec: Tnemec Co., Kansas City, MO.
  17. Wasser: Wasser High Tech Coatings, Kent, WA.
  18. ZRC: ZRC Worldwide Innovative Zinc Technologies, Marshfield, MA.

### 2.2 PREPARATION AND PRETREATMENT MATERIALS

- A. Metal pretreatment: As manufactured by one of the following or equal:
1. Henkel: Galvaprep 5.
  2. International: AWLGrip Alumiprep 33.
- B. Surface cleaner and degreaser: As manufactured by one of the following or equal:
1. Carboline Surface Cleaner No.3.
  2. Devoe: Devprep 88.
  3. S-W: Clean and Etch.

### 2.3 COATING MATERIALS

- A. Alkali resistant bitumastic: As manufactured by one of the following or equal:
1. Carboline: Bitumastic No. 50.
  2. S-W: Targuard.
  3. Wasser: MC-Tar.
- B. Wax coating: As manufactured by the following or equal:
1. Sanchem: No-Ox-Id A special.
- C. High solids epoxy (self-priming) NOT less than 72 percent solids by volume: As manufactured by one of the following or equal:
1. Carboline: Carboguard 891.
  2. Devoe: Bar Rust 233H.
  3. Induron: PE-70
  4. PPG Amercoat: Amerlock 2.
  5. S-W: Macropoxy 646.
  6. Tnemec: HS Epoxy Series 104.
- D. Aliphatic or aliphatic-acrylic polyurethane: As manufactured by one of the following or equal:



1. Carboline: Carbothane 134 VOC.
  2. Devoe: Devthane 379.
  3. PPG Amercoat: Amershield VOC.
  4. S-W: High Solids Polyurethane [CA].
  5. Tnemec: Endura-Shield II Series 1075 (U).
- E. Epoxy Novolac: Multi-component aggregate-filled epoxy system specifically designed for exposure to municipal wastewater. As manufactured by one of the following or equal:
1. Sauereisen: Sewergard No. 210, 210S, or 210GL
  2. Carboline: Plasite 4550 S
  3. Devoe: Devmat 100
  4. Raven 410
- F. High temperature coating 150 to 350 degrees Fahrenheit: As manufactured by one of the following or equal:
1. Carboline: Thermaline 4900.
  2. Dampney: Thermalox 245 Silicone - Zinc Dust.
  3. PPG Amercoat: Amerlock 2/400 GFK.
- G. High temperature coating 400 to 1,000 degrees Fahrenheit (dry): As manufactured by one of the following or equal:
1. Carboline: Thermaline 4700.
  2. Dampney: Thermolox 230C Series Silicone.
  3. Devoe: HT-12, High Heat Silicone.
- H. High temperature coating up to 1,400 degrees Fahrenheit: As manufactured by the following or equal:
1. Dampney: Thermalox 240 Silicone Ceramix.
- I. Asphalt Varnish:
1. AWWA C 500.
- J. Protective Coal-Tar:
1. Carboline: Bitumastic No. 50.
  2. PPG Amercoat: 78HB
- K. Coal-Tar Epoxy:
1. Carboline: 300-M, Bitumastic.
  2. PPG Amercoat: 78HB.
  3. S-W: Tar Guard 100.
  4. Tnemec: Series 46H-413.
- L. Coal-tar:
1. Where coal-tar, coal-tar epoxy, or coal-tar mastic are specified or indicated on the Drawings, use coal-tar epoxy substitute in their place. Coal-tar shall NOT be allowed.
- M. Coal-tar epoxy substitute:
1. Devoe: Devtar 5A HS.
  2. S-W: Macropoxy 646 Black.
- N. Vinyl ester: Glass mat reinforced, total system 125 mils DFT. As manufactured by one of the following or equal:
1. Carboline: Semstone 870.
  2. Ceilcote: 6640 Ceilcrete.
  3. Dudick: Protecto-Flex 800.

- 4. Tnemec: Chembloc Series 239SC.
- O. Elastomeric polyurethane, 100 percent solids, ASTM D16, Type V, (Urethane P): As manufactured by the following or equal:
  - 1. GET: Endura-Flex EF-1988.
- P. Concrete floor coatings: As manufactured by one of the following or equal:
  - 1. Carboline: Semstone 140SL.
  - 2. Devoe: Devran 124.
  - 3. Dudick: Polymer Alloy 1000.
  - 4. Tnemec: Tneme-Glaze Series 282.
- Q. Waterborne acrylic emulsion: As manufactured by one of the following or equal:
  - 1. S-W: DTM Acrylic B66W1.
  - 2. Tnemec: Tneme-Cryl Series 6.
- R. Galvanizing Zinc Compound: As manufactured by one of the following or equal:
  - 1. ZRC: Cold Galvanizing Compound.

#### 2.4 MIXES

- A. Mix in accordance with manufacturer's instructions.

### PART 3 - EXECUTION

#### 3.1 GENERAL PROTECTION

- A. Protect adjacent surfaces from coatings and damage. Repair damage resulting from inadequate or unsuitable protection:
- B. Protect adjacent surfaces NOT to be coated from spatter and droppings with drop cloths and other coverings:
  - 1. Mask off surfaces of items NOT to be coated or remove items from area.
- C. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces NOT being coated; in particular, surfaces within storage and preparation area.
- D. Place cotton waste, cloths, and material which may constitute fire hazard in closed metal containers and remove daily from site.
- E. Remove electrical plates, surface hardware, fittings, and fastenings, prior to application of coating operations. Carefully store, clean, and replace on completion of coating in each area. DO NOT use solvent or degreasers to clean hardware that may remove permanent lacquer finish.

#### 3.2 GENERAL PREPARATION

- A. Prepare surfaces in accordance with coating manufacturer's instructions unless more stringent requirements are specified in this Section.
- B. Protect following surfaces from abrasive blasting by masking, or other means:
  - 1. Threaded portions of valve and gate stems, grease fittings, and identification plates.
  - 2. Machined surfaces for sliding contact.
  - 3. Surfaces to be assembled against gaskets.
  - 4. Surfaces of shafting on which sprockets are to fit.

5. Surfaces of shafting on which bearings are to fit.
  6. Machined surfaces of bronze trim, including those slide gates.
  7. Cadmium-plated items, except cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment requiring abrasive blasting.
  8. Galvanized items, unless scheduled to be coated.
- C. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by entering sand or dust.
- D. Concrete:
1. Allow new concrete to cure for minimum of 28 days before coating.
  2. Clean concrete surfaces of dust, mortar, fins, loose concrete particles, form release materials, oil, and grease. Fill voids so that surface is smooth. Etch or brush-off blast clean in accordance with SSPC SP-7 to provide surface profile equal to 40 to 60-grit sandpaper, or as recommended by coating manufacturer. All concrete surfaces shall be vacuumed clean prior to coating application.
- E. Ferrous metal surfaces:
1. Remove grease and oil in accordance with SSPC SP-1.
  2. Remove rust, scale, and welding slag and spatter, and prepare surfaces in accordance with appropriate SSPC standard as specified.
  3. Abrasive blast surfaces prior to coating.
    - a. When abrasive blasted surfaces rust or discolor before coating, abrasive blast surfaces again to remove rust and discoloration.
    - b. When metal surfaces are exposed because of coating damage, abrasive blast surfaces and feather into a smooth transition before touching up.
    - c. Ferrous metal surfaces NOT to be submerged: Abrasive blast in accordance with SSPC SP-10, unless blasting may damage adjacent surfaces, prohibited, or specified otherwise. Where NOT possible to abrasive blast, power tool clean surfaces in accordance with SSPC SP-3.
    - d. Ferrous metal surfaces to be submerged: Unless specified otherwise, abrasive blast in accordance with SSPC SP-5 to clean and provide roughened surface profile of NOT less than 2 mils and NOT more than 4 mils in depth when measured with Elcometer 123, or as recommended by the coating manufacturer.
  4. All abrasive blast cleaned surfaces shall be blown down with clean dry air and or vacuumed.
- F. Ductile iron pipe and fittings to be lined or coated: Abrasive blast clean in accordance with NAPF 500-03.
- G. Sherardized, aluminum, copper, and bronze surfaces: Prepare in accordance with coating manufacturer's instructions.
- H. Galvanized surface:
1. Degrease or solvent clean (SSPC SP-1) to remove oily residue.
  2. Power tool or hand tool clean or whip abrasive blast.
  3. Test surface for contaminants using copper sulfate solution.
  4. Apply metal pretreatment within 24 hours before coating galvanized surfaces that canNOT be thoroughly abraded physically, such as bolts, nuts, or preformed channels.
- I. Shop primed metal:
1. Certify that primers applied to metal surfaces in the shop are compatible with coatings to be applied over such primers in the field.
  2. Remove shop primer from metal to be submerged by abrasive blasting in accordance with SSPC SP-10, unless greater degree of surface preparation is required by coating manufacturer's representative.

3. Correct abraded, scratched, or otherwise damaged areas of prime coat by sanding or abrasive blasting to bare metal in accordance with SSPC SP-2, SP 3, or SP-6, as directed by the Engineer.
  4. When entire shop priming fails or has weathered excessively (more than 25 percent of the item), or when recommended by coating manufacturer's representative, abrasive blast shop prime coat to remove entire coat and prepare surface in accordance with SSPC SP-10.
  5. When incorrect prime coat is applied, remove incorrect prime coat by abrasive blasting in accordance with SSPC SP-10.
  6. When prime coat NOT authorized by Engineer is applied, remove unauthorized prime coat by abrasive blasting in accordance with SSPC SP-10.
  7. Shop applied bituminous paint or asphalt varnish: Abrasive blast clean shop applied bituminous paint or asphalt varnish from surfaces scheduled to receive non-bituminous coatings.
- J. Cadmium-plated, zinc-plated, or sherardized fasteners:
1. Abrasive blast in same manner as unprotected metal when used in assembly of equipment designated for abrasive blasting.
- K. Abrasive blast components to be attached to surfaces which can NOT be abrasive blasted before components are attached.
- L. Grind sharp edges to approximately 1/16-inch radius before abrasive blast cleaning.
- M. Remove and grind smooth all excessive weld material and weld spatter before blast cleaning in accordance with NACE SP0178.
- N. PVC and FRP Surfaces:
1. Prepare surfaces to be coated by light sanding (de-gloss) and wipe-down with clean cloths, or by solvent cleaning in strict accordance with coating manufacturer's instructions.
- O. Cleaning of previously coated surfaces:
1. Utilize cleaning agent to remove soluble salts such as chlorides and sulfates from concrete and metal surfaces:
    - a. Cleaning agent: Biodegradable non-flammable and containing no volatile organic compounds.
    - b. Manufacturer: The following or equal:
      - 1) Chlor-Rid International, Inc.
  2. Steam clean and degrease surfaces to be coated to remove oils and grease.
  3. Cleaning of surfaces utilizing the decontamination cleaning agent may be accomplished in conjunction with abrasive blast cleaning, steam cleaning, high-pressure washing, or hand washing as approved by the coating manufacturer's representative and the Engineer.
  4. Test cleaned surfaces in accordance with the cleaning agent manufacturer's instructions to ensure all soluble salts have been removed. Additional cleaning shall be carried out as necessary.
  5. Final surface preparation prior to application of new coating system shall be made in strict accordance with coating manufacturer's printed instructions.

### 3.3 MECHANICAL AND ELECTRICAL EQUIPMENT PREPARATION

- A. Identify equipment, ducting, piping, and conduit as specified in Division 40 and Section 26 05 53, IDENTIFICATION FOR ELECTRICAL SYSTEMS.
- B. Remove grilles, covers, and access panels for mechanical and electrical system from location and coat separately.

- C. Prepare and finish coat-primed equipment with color selected by the Engineer.
- D. Prepare and prime and coat insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are covered with prefinished coating.
- E. Replace identification markings on mechanical or electrical equipment when coated over or spattered.
- F. Prepare and coat interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line.
- G. Prepare and coat dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels.
- H. Prepare and coat exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
- I. Prepare and coat both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- J. Color code equipment, piping, conduit, and exposed ductwork and apply color banding and identification, such as flow arrows, naming and numbering, in accordance with Contract Documents.

#### 3.4 GENERAL APPLICATION REQUIREMENTS

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Coat metal unless specified otherwise:
  1. Aboveground piping to be coated shall be empty of contents during application of coatings.
- C. Verify metal surface preparation immediately before applying coating in accordance with SSPC SP COM.
- D. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.
- E. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.
- F. Prime shop primed metal surfaces. Spot prime exposed metal of shop primed surfaces before applying primer over entire surface.
- G. Multiple coats:
  1. Apply minimum number of specified coats.
  2. Apply additional coats when necessary to achieve specified thicknesses.
  3. Apply coats to thicknesses specified, especially at edges and corners.
  4. When multiple coats of same material are specified, tint prime coat and intermediate coats with suitable pigment to distinguish each coat.
  5. Lightly sand and dust surfaces to receive high gloss finishes, unless instructed otherwise by coating manufacturer.
  6. Dust coatings between coats.
- H. Coat surfaces without drops, overspray, dry spray, runs, ridges, waves, holidays, laps, or brush marks.

- I. Remove spatter and droppings after completion of coating.
- J. Apply coating by brush, roller, trowel, or spray, unless a particular method of application is required by coating manufacturer's instructions or these Specifications.
- K. Plural component application: Drums shall be premixed each day. All gauges shall be working order prior to the start of application. Ratio checks shall be completed prior to each application. A spray sample shall be sprayed on plastic sheeting to ensure set time is complete prior to each application. Hardness testing shall be performed after each application.
- L. Spray application:
  - 1. Stripe coat edges, welds, nuts, bolts, difficult to reach areas by brush before beginning spray application, as necessary, to ensure specified coating thickness along edges.
  - 2. When using spray application, apply coating to thickness NOT greater than that recommended in coating manufacturer's instructions for spray application.
  - 3. Use airless spray method, unless air spray method is required by coating manufacturer's instruction or these specifications.
  - 4. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist, fumes, or overspray.
- M. Drying and recoating:
  - 1. Provide fans, heating devices, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
  - 2. For submerged service the Contractor shall provide a letter to the Engineer that the lining system is fully cured and ready to be placed into service.
  - 3. Limit drying time to that required by these Specifications or coating manufacturer's instructions.
  - 4. DO NOT allow excessive drying time or exposure which may impair bond between coats.
  - 5. Recoat epoxies within time limits recommended by coating manufacturer.
  - 6. When time limits are exceeded, abrasive blast clean and de-gloss clean prior to applying another coat.
  - 7. When limitation on time between abrasive blasting and coating can NOT be met before attachment of components to surfaces which can NOT be abrasive blasted, coat components before attachment.
  - 8. Ensure primer and intermediate coats of coating are unscarred and completely integral at time of application of each succeeding coat.
  - 9. Touch up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.
  - 10. Leave no holidays.
  - 11. Sand and feather into a smooth transition and recoat and recoat scratched, contaminated, or otherwise damaged coating surfaces so damages are invisible to naked eye.
- N. Concrete:
  - 1. Apply first coat (primer) only when surface temperature of concrete is decreasing in order to eliminate effects of off-gassing on coating.

### 3.5 ALKALI RESISTANT BITUMASTIC

- A. Preparation:
  - 1. Prepare surfaces in accordance with general preparation requirements.
- B. Application:
  - 1. Apply in accordance with general application requirements and as follows:
    - a. Apply at least 2 coats, 8 to 14 mils DFT each.

### 3.6 WAX COATING

#### A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements.

#### B. Application:

1. Apply in accordance with general application requirements and as follows:
  - a. Apply at least 1/32-inch-thick coat with 2-inch or shorter bristle brush.
  - b. Thoroughly rub coating into metal surface with canvas covered wood block or canvas glove.

### 3.7 HIGH SOLIDS EPOXY SYSTEM

#### A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements and as follows:
  - a. Abrasive blast ferrous metal surfaces to be submerged at jobsite in accordance with SSPC SP-5 prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP-10.
  - b. Abrasive blast non-submerged ferrous metal surfaces at jobsite in accordance with SSPC SP-10, prior to coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP 6.
  - c. Abrasive blast clean ductile iron surfaces at jobsite in accordance with SSPC SP-7.

#### B. Application:

1. Apply coatings in accordance with general application requirements and as follows:
  - a. Apply minimum 2-coat system with minimum total DFT of 12 mils.
  - b. Recoat or apply succeeding epoxy coats within time limits recommended by manufacturer. Prepare surfaces for recoating in accordance with manufacturer's instructions.
  - c. Coat metal to be submerged before installation, when necessary, to obtain acceptable finish, and to prevent damage to other surfaces.
  - d. Coat entire surface of support brackets, stem guides, pipe clips, fasteners, and other metal devices bolted to concrete.
  - e. Coat surface of items to be exposed and adjacent 1 inch to be concealed when embedded in concrete or masonry.

### 3.8 HIGH SOLIDS EPOXY AND POLYURETHANE COATING SYSTEM

#### A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements and as follows:
  - a. Prepare concrete surfaces in accordance with general preparation requirements.
  - b. Touch up shop primed steel and miscellaneous iron.
  - c. Abrasive blast ferrous metal surfaces at jobsite prior to coating. Abrasive blast clean rust and discoloration from surfaces.
  - d. Degrease or solvent clean, whip abrasive blast, power tool, or hand tool clean galvanized metal surfaces.
  - e. Lightly sand (de-gloss) fiberglass and poly vinyl chloride (PVC) pipe to be coated and wipe clean with dry cloths, or solvent clean in accordance with coating manufacturer's instructions.
  - f. Abrasive blast clean ductile iron surfaces.

#### B. Application:

1. Apply coatings in accordance with general application requirements and as follows:
  - a. Apply 3 coat system consisting of:
    - 1) Primer: 4 to 5 mils DFT high solids epoxy.
    - 2) Intermediate coat: 4 to 5 mils DFT high solids epoxy.

- 3) Topcoat: 2.5 to 3.5 mils DFT aliphatic or aliphatic-acrylic polyurethane topcoat.
2. Recoat or apply succeeding epoxy coats within 30 days or within time limits recommended by manufacturer, whichever is shorter. Prepare surfaces for recoating in accordance with manufacturer's instructions.

### 3.9 EPOXY NOVOLAC SYSTEM

#### A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements and as follows:
2. Prepare concrete to obtain clean, open pore with exposed aggregate in accordance with manufacturer's instructions.
3. Prepare ferrous metal surfaces in accordance with SSPC SP-5, with coating manufacturer's recommended anchor pattern.
4. Complete application of prime coat within 6 hours of abrasive blast cleaning. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP-5.
5. When handling steel, wear gloves to prevent hand printing.
6. Adjust pH of concrete to within 7 to 11 before applying prime coat.

#### B. Application:

1. Apply coatings in accordance with general application requirements and in accordance with manufacturer's instructions.
2. Continue to monitor dew point. Dew point shall remain 5 degrees above ambient temperature for a minimum of 8 hours after application of coating.

### 3.10 HIGH TEMPERATURE COATING

#### A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements and as follows:
  - a. Abrasive blast surface in accordance with SSPC SP-10.

#### B. Application:

1. Apply coatings in accordance with general application requirements and as follows:
  - a. Apply number of coats in accordance with manufacturer's instructions.

### 3.11 ASPHALT VARNISH

#### A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements.

#### B. Application:

1. Apply coatings in accordance with general application requirements and as follows:
  - a. Apply minimum 2 coats.

### 3.12 COAL-TAR EPOXY SUBSTITUTE

#### A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements and in accordance with the coating manufacturer's printed instructions.

#### B. Application:

1. Apply 2 coats at 6 mils to 8 mils each, for a minimum total DFT of 12 mils.



### 3.13 VINYL ESTER

- A. Preparation:
  - 1. Prepare surfaces in accordance with coating manufacturer's recommendations and as directed and approved by coating manufacturer's representative.
- B. Application:
  - 1. Apply prime coat, as required by coating manufacturer, base coat, glass mat, and topcoat to total DFT of 125 mils minimum:
    - a. Final topcoat on floors shall include non-skid surface, applied in accordance with manufacturer's instructions.
  - 2. Perform high voltage holiday detection test in accordance with SP0188-06, over 100 percent of coated surface areas to ensure pinhole free finished coating system.
  - 3. All work shall be accomplished in strict accordance with coating manufacturer's instructions and under direction of coating manufacturer's representative.

### 3.14 ELASTOMERIC POLYURETHANE (100 PERCENT SOLIDS)

- A. Preparation:
  - 1. Prepare surfaces in strict accordance with coating manufacturer's instructions and as directed and approved by coating manufacturer's representative.
- B. Application:
  - 1. Apply epoxy primer at DFT of 1 to 2 mils, in strict accordance with manufacturer's instructions.
  - 2. Apply polyurethane coating at minimum total DFT as follows:
    - a. Steel: 60 mils DFT.
    - b. Ductile iron and ductile iron pipe coating and lining: 30 mils DFT.
    - c. Concrete: 120 mils DFT.
    - d. Or as recommended by the coating manufacturer and accepted by the Engineer.
- C. For concrete application, provide saw cutting for coating terminations in strict accordance with manufacturer's instructions:
- D. For application to damaged concrete, refer to Section 03 01 00, MAINTENANCE OF CONCRETE.
- E. Perform high voltage holiday detection test in accordance with SP0188-06, over 100 percent of coated surface areas to ensure pinhole free finished coating system.

### 3.15 CONCRETE FLOOR COATINGS

- A. Preparation:
  - 1. Prepare surfaces in accordance with general application requirements and in strict accordance with coating manufacturer's instructions.
- B. Application:
  - 1. Apply primer if required by coating manufacturer.
  - 2. Apply 1 or more coats as recommended by coating manufacturer to receive a minimum total DFT of 25 mils, color as selected by Owner.
- C. Final topcoat shall include non-skid surface, applied in strict accordance with coating manufacturer's instructions.

3.16 WATERBORNE ACRYLIC EMULSION

- A. Preparation:
  - 1. Remove all oil, grease, dirt, and other foreign material by Solvent Cleaning in accordance with SSPC SP-1.
  - 2. Lightly sand all surfaces and wipe thoroughly with clean cotton cloths before applying coating.
- B. Application:
  - 1. Apply 2 or more coats to obtain a minimum DFT of 5.0 mils.

3.17 FIELD QUALITY REQUIREMENTS

- A. Each coat shall be inspected. Strip and remove defective coats, prepare surfaces and recoat. When approved, apply next coat.
- B. Control and check DFT and integrity of coatings.
- C. Measure dry film thickness with calibrated thickness gauge.
- D. Dry film thicknesses on ferrous-based substrates may be checked with Elcometer Type 1 Magnetic Pull-Off Gage or Positector 6000.
- E. Verify coat integrity with low-voltage sponge or high-voltage spark holiday detector, in accordance with SP0188 06. Allow Engineer to use detector for additional checking.
- F. Check wet film thickness before coal-tar epoxy coating cures on concrete or non-ferrous metal substrates.
- G. Arrange for services of coating manufacturer's field representative to provide periodic field consultation and inspection services to ensure proper surface preparation of facilities and items to be coated, and to ensure proper application and curing:
  - 1. Notify Engineer 24 hours in advance of each visit by coating manufacturer's representative.
  - 2. Provide Engineer with a written report by coating manufacturer's representative within 48 hours following each visit.

3.18 PROTECTIVE COATINGS SYSTEMS

- A. System No. 1: Submerged Metal – General

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast or Centrifugal Wheel Blast (SP 5)	Primer: High Solids Epoxy (Self-Priming)	1 coat, 6 MDFT
	Top-Coat: High Solids Epoxy	1 coat, 6 MDFT

- B. System No. 2: Submerged Metal - Domestic Sewage

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast (SP 10)	Primer: Per Manufacturer's Recommendations	1 coat, 5 MDFT
	Top-Coat: Coal-Tar Epoxy or Coal-Tar Epoxy Substitute	2 coats, 20 MDFTPC

C. System No. 3: Exposed Metal - Highly Corrosive:

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast (SP 10)	Primer: Per Manufacturer's Recommendations	1 coat, 2.5 MDFT
	Intermediate Coat: High Solids Epoxy	1 coat, 4 MDFT
	Top-Coat: Aliphatic Polyurethane	1 coat, 3 MDFT

D. System No. 4: Exposed Metal – Mildly Corrosive:

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast (SP 10)	Primer: Per Manufacturer's Recommendations	1 coat, 2.5 MDFT
	Top-Coat: Aliphatic Polyurethane	1 coat, 3 MDFT

E. System No. 5: Buried Metal - General:

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast or Centrifugal Wheel Blast (SP 10)	Standard Hot Coal-Tar Enamel, Coal-Tar Epoxy, or Tape Coat System	AWWA C203, AWWA C210, or AWWA C214
	For Acidic Soil, Brackish Water High Bacteria: Hot Coal-Tar, Double Felt	AWWA C203, App. A, Sec. AI.5
	For Abrasive Soil, Brackish Water: Hot Coal-Tar, Fibrous Glass, or Tape Coat System	AWWA C203, App. A, Sec. AI.5, or AWWA C214 with Double Outer Wrap

F. System No. 6 High Temperature (150° - 350°):

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast (SP 10)	Primer: Per Manufacturer's Recommendations	1 coat, 2 MDFT
	Top-Coat: High Temperature Coating 150° - 350°	1 coat, 2 MDFT

G. System No. 7 High Temperature (400° - 1000°):

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast (SP 10)	Primer: Per Manufacturer's Recommendations	1 coat, 2 MDFT
	Top-Coat: High Temperature Coating 400° - 1000°	1 coat, 2 MDFT 1 coat, 2 MDFT

H. System No. 8 High Temperature (1000° - 1400°):

Surface Prep.	Paint Material	Min. Coats, Cover
Abrasive Blast (SP 10)	Primer: Per Manufacturer's Recommendations	1 coat, 2 MDFT
	Top-Coat: High Temperature Coating up to 1400°	1 coat, 2 MDFT

I. System No. 10 Galvanized Metal Conditioning:

Surface Prep.	Paint Material	Min. Coats, Cover
Solvent Clean (SP 1), followed by Hand Tool (SP 2), or Power Tool (SP 3)	Wash Primer or Coating Manufacturer's Recommendation.	1 coat, 0.4 MDFT Remaining coats as required by exposure.

J. System No. 11 Galvanized Metal Conditioning:

Surface Prep.	Paint Material	Min. Coats, Cover
Solvent Clean (SP 1), followed by Hand Tool (SP 2), Power Tool (SP 3), or Brush-off Blast (SP 7)	Primer: Organic Zinc Rich	1 coat, 3 MDFT Remaining coats as required by exposure.

K. System No. 12 Skid-Resistant Aluminum and FRP:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Brush-off Blast (SP 7) or Plastic Surface Preparation	High Solids Epoxy (aggregated)	1 coat, 16 MDFT

L. System No. 13 Sliding Metal:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Solvent Clean (SP 1), followed by Hand Tool (SP 2), Power Tool (SP 3), or Brush-off Blast (SP 7)	Wax Coating	1 coat, 31 MDFT

M. System No. 14 Exposed PVC:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
Plastic Surface Preparation	Primer: Per Manufacturer's Recommendations	1 coat, 2 MDFT

N. System No. 15 Aluminum and Dissimilar Metal Insulation:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
SP 1	Alkali Resistant Bitumastic or Coal-Tar Epoxy Substitute	1 coat, 18 MDFT

O. System No. 16 Existing Concrete/CMU Repair:

<b>Surface Prep.</b>	<b>Paint Material</b>	<b>Min. Coats, Cover</b>
SP 13	Filler: Per Manufacturer's Recommendations	1 coat, 10 MDFT
	Primer: Per Manufacturer's Recommendations	1 coat, 5 MDFT
	Top-Coat: High Solids Epoxy	1 coat, 4 MDFT

P. System No. 17 New Concrete/CMU Exterior (as required by application schedule):

Surface Prep.	Paint Material	Min. Coats, Cover
SP 13	Filler: Per Manufacturer's Recommendations	1 coat, 10 MDFT
	Intermediate Coat: High Solids Epoxy	1 coat, 5 MDFT
	Top-Coat: Aliphatic Polyurethane	1 coat, 4 MDFT

Q. System No. 18 Concrete/CMU – Interior or Immersion Mildly Corrosive:

Surface Prep.	Paint Material	Min. Coats, Cover
SP 13	Filler: Per Manufacturer's Recommendations	1 coat, 10 MDFT
	Intermediate Coat: High Solids Epoxy	1 coat, 6 MDFT
	Top-Coat: Aliphatic Polyurethane	1 coat, 6 MDFT

R. System No. 19 Concrete/CMU – Immersion Highly Corrosive:

Surface Prep.	Paint Material	Min. Coats, Cover
SP 13	Per Manufacturer's Recommendations	1 coat, 10 MDFT
	Epoxy Novolac	2 coat, 40 MDFT Minimum or as called for on the Project Drawings.

### 3.19 SCHEDULE OF ITEMS NOT REQUIRING COATING

- A. General: Unless specified otherwise, the following items DO NOT require coating:
1. Items that have received final coat at factory and NOT listed to receive coating in field.
  2. Aluminum, brass, bronze, copper, plastic (except PVC pipe), rubber, stainless steel, chrome, Everdur, or lead.
  3. Buried or encased piping or conduit.
  4. Exterior concrete.
  5. Galvanized steel wall framing, galvanized roof decking, galvanized electrical conduits, galvanized pipe trays, galvanized cable trays, and other galvanized items:
    - a. Areas on galvanized items or parts where galvanizing has been damaged during handling or construction shall be repaired as follows:
      - 1) Clean damaged areas by SSPC SP-1, SP-2, SP-3, or SP-7 as required.
      - 2) Apply 2 coats of a Galvanizing Zinc Compound in strict accordance with manufacturer's instructions.
  6. Grease fittings.
  7. Fiberglass ducting or tanks in concealed locations.
  8. Steel to be encased in concrete or masonry.

### 3.20 SCHEDULE OF SURFACES TO BE COATED IN THE FIELD

- A. In general, apply coatings to steel, iron, galvanized surfaces, and wood surfaces unless specified or otherwise indicated on the Drawings. Coat concrete surfaces and anodized aluminum only when specified or indicated on the Drawings. Color coat all piping as specified in Section 40 23 39, PROCESS PIPING, GENERAL.
- B. Following schedule is incomplete. Coat unlisted surfaces with same coating system as similar listed surfaces. Verify questionable surfaces.
- C. Metal:
1. System 1 – Submerged Metal – General
    - a. As required for:
      - 1) Above grade piping, wall pipes, and pipe sleeves.
      - 2) Structural Steel.
      - 3) Non-stainless-steel pipe support components.
  2. System 2 – Submerged Metal – Domestic Sewage
    - a. Submerged piping in digesters including non-stainless-steel pipe support components.
  3. System 3 – Exposed Metal – Highly Corrosive
    - a. Piping within digester control building.
    - b. Piping at digester mixing pumps.
    - c. Pipe supports at mixing pumps.
    - d. Digester covers.
      - 1) Contractor shall coordinate with cover manufacturer to confirm final protective coating system requirements to verify application requirements do not exceed cover design. Adjust requirements of this specification for this application location as necessary. Submit documentation to Engineer from cover manufacturer indicating the protective coating system is acceptable.
  4. System 4 – Exposed Metal – Mildly Corrosive
    - a. Pumps, motors, equipment items, and accessories identified in the technical specifications.
    - b. Pipe, valves, pipe hangers, supports and saddles, conduit, cable tray hangers and supports.
    - c. Valve and gate operator and stands.
    - d. Mechanical equipment supports, drive units, and accessories.
  5. System 5 – Buried Metal – General
    - a. As required for buried, below-grade portions of steel items, except buried stainless steel or ductile iron.
  6. System 6 – High Temperature (150° - 350°)
    - a. Not used.
  7. System 7 – High Temperature (400° - 1000°)
    - a. Not used.
  8. System 8 – High Temperature (1000° - 1400°)
    - a. Not used.
  9. System 10 – Galvanized Metal Conditioning
    - a. As required.
  10. System 11 – Galvanized Metal Conditioning
    - a. As required.
  11. System 12 – Skid-Resistant Aluminum and FRP
    - a. As required for aluminum checker plate in all exterior locations, and in wet interior locations.
  12. System 13 - Sliding Metal
    - a. As required for sliding contact surfaces of slide gates and sluice gates.
  13. System 15 - Aluminum and Dissimilar Metal Insulation
    - a. As required for:

- 1) Aluminum surfaces embedded or in contact with concrete, masonry, and other metals.
- 2) Stainless steel embedded in concrete.
- 3) Dissimilar metals for electrical insulation.

D. Other Materials

1. System 14 - Exposed PVC
  - a. All exterior exposed-to-view PVC and CPVC surfaces, and FRP surfaces without integral UV resistant gel coat.

E. Concrete:

1. System 17 – New Concrete/CMU Exterior
  - a. Safety markings
2. System 18 – Concrete/CMU Interior or Immersion Mildly Corrosive
  - a. As required.
3. System 19 – Concrete/CMU Immersion Highly Corrosive
  - a. As required.

END OF SECTION



## SECTION 09 97 23 – CONCRETE OR MASONRY COATINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Interior coating systems for miscellaneous concrete structures.
- B. Related sections:
  - 1. Section 01 40 00 – Quality Requirements.

#### 1.2 REFERENCES

- A. ASTM International:
  - 1. D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
  - 2. D4414 – Standard Practice for Measurement of Wet Film Thickness of Organic Coating by Notched Gages
  - 3. D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
  - 4. D4787 – Standard Practice for Continuity Verification of Liquid or Sheet Lining Applied to Concrete Substrates
- B. Other Standards:
  - 1. ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays
  - 2. NACE No. 6 / SSPC SP-13 – Surface Preparation of Concrete

#### 1.3 SUBMITTALS

- A. General: Administrative, shop drawings, samples, quality requirements, and contract closeout submittals shall conform to the requirements of Section 01 33 00, SUBMITTAL PROCEDURES.
- B. Product Data: Submit manufacturer's product data for each coating, including generic description, complete technical data, surface preparation requirements, and application instructions.
- C. Color Samples: Submit manufacturer's color samples showing full range of standard colors.
- D. Manufacturer's Quality Assurance:
  - 1. Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.
  - 2. Submit a list of at least five completed projects of similar size and similar waste stream where coating has been applied. Include for each project:
    - a. Project name and location.
    - b. Name, address, and phone number of Owner.
    - c. Name of applicator.
    - d. Name of Engineer.
    - e. Approximate area of coatings applied.
    - f. Date of completion.
- E. Applicator's Quality Assurance:
  - 1. The applicator shall be trained and certified/approved by the coating system manufacturer.
  - 2. Submit a list of at least five completed projects of size and complexity similar to this work where applicator has spray applied 100% solids epoxies. Include for each project:

- a. Project name and location.
  - b. Name, address, and phone number of Owner.
  - c. Name of Contractor.
  - d. Name of Engineer.
  - e. Name of coating manufacturer and product applied.
  - f. Approximate area of coatings applied.
  - g. Date of completion.
3. Submit certification that each foreman to be utilized on this project has overseen the application of 50,000 square feet of 100% solids epoxy coatings in the last three years. Certification for each foreman shall include the following information for each applicator company for which each foreman worked:
    - a. Employees' name;
    - b. Project names and descriptions;
    - c. Name, address, and telephone of contact person for each applicator company worked for;
    - d. Name, address, phone number of contact person for each project Owner;
    - e. Years' experience and amount of coating applied.
  4. Submit certification that the "nozzle men" to be utilized on this project each have a minimum of two years' experience and have spray applied a minimum of 30,000 square feet of 100% solids epoxy coatings in the last two years. Certification for each "spray man" to be utilized shall include the following information for each applicator company for which each "spray man" worked:
    - a. Employees' name;
    - b. Project names and descriptions;
    - c. Name, address, and telephone of contact person for each applicator company worked for;
    - d. Name, address, phone number of contact person for each project Owner;
    - e. Years' experience and amount of coating applied.
  5. Submit certification that at least two-thirds of the crew to be utilized on this project has a minimum of two years experience applying 100% solids epoxy coatings. Certification for each crew member to be utilized shall include the following information for each applicator company for which each employee worked:
    - a. Employees' name;
    - b. Project names and descriptions;
    - c. Name, address, and telephone of contact person for each applicator company worked for;
    - d. Name, address, phone number of contact person for each project Owner;
    - e. Primary role(s) and years' experience in each role applying 100% solids epoxies.
  6. Other, equivalent documentation shall be considered for approval at Engineer's discretion.
- F. Manufacturer's Field Report: Provide copy of report from manufacturer's representative confirming that the surfaces to which coating is to be applied are in a condition suitable to receive same.
- G. Warranty:
1. Material Warranty:
    - a. A written guarantee of five years submitted to the City for the specified project shall be provided by the Manufacturers of the Coatings and Repair Products if different manufacturers.
  2. Workmanship Warranty:
    - a. A written guarantee of at least two years shall be provided by the Applicator against any shortcoming in Workmanship.

## 1.4 QUALITY ASSURANCE

- A. Mock-Ups: Prepare a separate 10-foot x 10-foot flat concrete panel for use as a mock-up for each "spray man" using materials, tools, equipment, and procedures intended for actual surface preparation and application. Panel shall be placed to present a vertical surface during application of coating. Obtain Engineer's concurrence of acceptability of each mock-up. The mock-ups are to establish minimum standards by which the coating and its application shall be judged and therefore shall be retained and stored by Contractor until the project is completed.
1. Pre-Installation Conference: Prior to beginning coating operations, a meeting shall be held with Contractor, coating Subcontractor, Engineer, Owner's representative, and coating manufacturer's representative to verify and review the following:
    - a. Project requirements for coating as set out in Contract Documents.
    - b. Manufacturer's product data including application instructions.
    - c. Substrate conditions and procedures for substrate preparation and coating installation. Applicator shall be familiar with the overall condition of structures to be coated prior to the conference.
  2. Technical Consultation: The coating manufacturer's representative shall provide technical consultation on coating application.

## 1.5 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:
1. Coating or material name.
  2. Manufacturer.
  3. Color name and number.
  4. Batch or lot number.
  5. Date of manufacture.
  6. Mixing instructions.
- B. Storage:
1. Store materials in a clean dry area away from open flame, heat, and strong oxidants. Store materials within temperature range as recommended by manufacturer.
  2. Keep containers sealed until ready for use.
  3. DO NOT use materials beyond manufacturer's shelf-life limits.
- C. Handling: Protect materials during handling and application to prevent damage or contamination. Handle materials according to their material safety data sheets.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Coating System:
1. The coating system shall be a spray applied 100% solids epoxy coating which forms a monolithic coating covering all interior surfaces of the structures specified to be coated.
  2. The bonding strength of the finished coating shall exceed the point of concrete failure according to ASTM D4541.
  3. Acceptable coating manufacturers shall be:
    - a. Raven
    - b. Sauereisen
    - c. Tnemec
    - d. Warren
    - e. Approved Equal

- B. Repair Materials and Primers:
  - 1. Acceptable patching, filling, repairing, and priming systems shall be as recommended by the coating manufacturer and shall be certified to be compatible with and provide adequate bonding to both the substrate and coating system.
- C. Conductive Underlayment:
  - 1. Acceptable conductive underlayments, as necessary to facilitate high-voltage holiday testing, shall be as recommended by the coating manufacturer and shall be certified by the coating manufacturer to be compatible with and provide adequate bonding to the substrate, any repair or primer materials, and coating system.
- D. Equipment:
  - 1. All equipment for surface cleaning, surface preparation, and coating application shall be approved for use by the coating manufacturer.
  - 2. Spray equipment for application of the coating system shall be airless.
- E. Non-skid Materials:
  - 1. Non-skid material shall be "8-12" dry sand as manufactured by APAC or approved equal.

### PART 3 - EXECUTION

#### 3.1 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

- A. Protect surrounding areas and surfaces NOT scheduled to be coated from damage during surface preparation and application of coatings.
- B. Immediately remove coatings that fall on surrounding areas and surfaces NOT scheduled to be coated.

#### 3.2 AREA PREPARATION

- A. All structures to be coated shall be readily accessible to applicator.
- B. Appropriate actions shall be taken to comply with local, state, and federal regulatory and other applicable agencies with regard to environment, health, and safety.
- C. Surface cleaning, surface preparation, and coating application shall NOT commence until the concrete substrate has properly cured for a minimum of 28 days.
- D. The temperature of the surface to be coated shall be maintained within the range recommended by the manufacturer. Prior to and during application, care should be taken to avoid exposure of structure to be coated to direct sunlight or other intense heat sources. Application of preparation or coating materials shall NOT be performed when the concrete surface temperature is rising or in direct sunlight to avoid blistering due to thermal expansion of trapped air or moisture in the substrate.
- E. Applicator shall inspect all surfaces specified to receive a coating prior to surface cleaning and preparation. Applicator shall notify Engineer of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair or coating materials.

#### 3.3 SURFACE PREPARATION

- A. All contaminants including oil, grease, waxes, form release, curing compounds, efflorescence, sealers, salts, incompatible existing coatings, and other contaminants shall be removed.

- B. A water drop test shall be utilized to test the concrete surface for the presence of hydrophobic contaminants. A droplet of water is placed on the concrete surface and its wetting behavior is observed. If the water droplet flattens and “wets out” the concrete surface, it is likely that the concrete is NOT contaminated. If the water droplet beads up on the surface like rain on a freshly waxed car, it is likely that the concrete is contaminated.
- C. Suitable surface cleaning methods for removing oils, grease, and other chemicals from the substrate are low pressure detergent/degreaser water cleaning and low-pressure hot water cleaning.
- D. Surface preparation shall achieve surfaces that are sound, clean, smooth, even, and free of laitance, fins, protrusions, chemical contaminants, dust, and standing water. Surface preparation shall also result in a concrete surface profile (CSP) as recommended by the coating manufacturer.
- E. Suitable surface preparation methods are abrasive blasting and water jetting. Surface preparation procedures shall be in accordance with ICRI Guideline No. 03732 and NACE No. 6 / SSPC SP-13.
- F. All surfaces shall be inspected during and after surface preparation and prior to application of the coating system. Any evidence of remaining contamination or laitance shall be removed by additional cleaning or surface preparation before proceeding with the application of the coating.
- G. Application of Repair Materials:
  1. Areas where structural steel has been exposed or removed shall be repaired as acceptable to the Engineer and surface shall be built out to full-thickness to match adjacent surfaces.
  2. All areas where the existing surface is more than ½ inch less than the thickness of the original surface shall be built out to full-thickness to match adjacent surfaces.
  3. All structural cracks, voids, bugholes, and honeycombs shall be filled and floated with an approved repair material.
  4. All bituminous or elastomeric joint sealants or gaskets shall be coated with an approved material.
  5. Approved repair materials shall be trowel or spray applied using proper equipment to specified surfaces. Repair materials shall be applied and prepared to provide a surface with a profile equivalent to the ICRI CSP recommended by the coating manufacturer.
  6. Repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds may NOT be used unless approved by the coating manufacturer for compatibility with the specified system.
  7. Application of the repair materials, if NOT performed by the coating applicator, shall be observed by the applicator’s representative to ensure proper finishing for suitability to receive the coating system.

### 3.4 APPLICATION OF COATING SYSTEM

- A. Prior to application of any coating, the conductivity of the concrete shall be tested for each structure to be coated. The test shall be performed in accordance with ASTM D4787. If the test indicates the concrete provides an insufficient ground, a conductive underlayment shall be applied prior to any coating.
- B. Prior to application of any coating, a moisture test shall be performed on the walls and repaired areas as recommended by the manufacturer.
- C. Application procedures shall conform to the recommendations of the coating manufacturer, including material handling, mixing, environmental controls during application, safety, equipment, pressure settings, and application techniques.

- D. For concrete surfaces that DO NOT require rehabilitation, the coating shall be applied to average and minimum uniform dry film thicknesses as follows or as approved by Engineer:

<b>Product</b>	<b>Average Thickness (mils)</b>	<b>Minimum Thickness (mils)</b>
Raven - 405	100	80
Tnemec - Perma-Glaze No. 435	100	80

- E. For concrete surfaces that require rehabilitation, the coating shall be applied to average and minimum uniform dry film thicknesses as follows or as approved by Engineer:

<b>Product</b>	<b>Average Thickness (mils)</b>	<b>Minimum Thickness (mils)</b>
Raven - 405	125	100
Tnemec - Perma-Glaze No. 435	125	100

- F. DO NOT use mixed coatings exceeding manufacturer's recommended pot life.
- G. The spray applied coating, including any recommended basecoat or primer, shall be applied according to the manufacturer's recommended number of coat applications.
- H. The benches shall be coated to the same average and minimum thicknesses as required for the walls except the benches shall have non-skid materials included in the coating system. The benches shall be made non-skid in accordance with manufacturer recommended procedures and shall have a final texture similar to ten grit sandpaper.
- I. The elapsed time between succeeding coats shall be as specified by manufacturer.
- J. Any solvents left in the equipment shall be completely removed before applying coating to the designated surfaces.
- K. No application shall be made to frozen surfaces or if freezing is expected to occur inside the structure within a time period detrimental to the uncured coating.
- L. Applied coatings shall be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.

### 3.5 FIELD QUALITY REQUIREMENTS

- A. Contractor's Services:
1. Verify coatings and other materials are as specified.
  2. Verify surface preparation and application are as specified.
  3. Verify wet film thickness of each coat using wet film gages and total dry film thickness of the coating system by dry film testing as described below.
  4. Coating Defects:
    - a. Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
    - b. Check for holidays on interior surfaces using holiday detector as described in Paragraph 3.6.
  5. Report:
    - a. Submit written reports describing inspections made and actions taken to correct nonconforming work.

- b. Report nonconforming work NOT corrected.
  - c. Submit copies of report to Engineer and Contractor.
- B. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

### 3.6 TESTING AND INSPECTION

- A. A wet film thickness gage, conforming to ASTM D4414, shall be used during coating application to ensure a uniform thickness during application.
- B. After the coating system has set hard to the touch it shall be inspected by the Engineer, verifying the following:
  - 1. The coating system's cured thickness. Measurement shall be obtained from a specimen retrieved by the applicator by physically cutting through the coating (by drilling or coring).
  - 2. No groundwater infiltration.
  - 3. All pipe connections are open and clear.
  - 4. No evident cracks, voids, pinholes, uncured spots, lifts, delamination, blisters, or other type of defects.
  - 5. No "runs" or "sags" NOT in conformance with the standard set by the mock-ups or that affect the performance of the coating system.
- C. Holiday Testing:
  - 1. Holiday testing shall be performed according to ASTM D4787 and these specifications. After the elapsed time recommended by the coating manufacturer, the coating shall be inspected with high-voltage holiday detection equipment. An induced holiday shall be made onto the coated concrete surface and serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of minimum specified (NOT average) film thickness applied but shall be increased if it is insufficient to detect the induced holiday. All detected holidays shall be marked. Holidays shall be repaired by abrading the coating system surface with grit paper or other hand tooling method, completely opening the holiday. After abrading and cleaning, additional coating material shall be hand applied to the repair area. All touch-up/repair procedures shall follow the recommendations of the coating system manufacturer. Repaired areas shall be allowed to cure, as recommended by the manufacturer, before being retested.
- D. Pull-off Testing:
  - 1. Measurement of bond strength of the coating system to the substrate shall be made at a minimum of three locations on each coated structure and along different sections of the structure (i.e. corbel, wall, bench). Bond strength shall be measured in accordance with ASTM D4541, Method E and these specifications. A minimum of three 20mm dollies shall be fixed to the coated surface at locations selected by the Engineer. Test failures shall be documented as failure within the concrete, failure within the coating, or failure at the coating/concrete interface. The following criteria shall be used to evaluate the test results:
    - a. Failure of the dolly adhesive shall require retesting.
    - b. Failure at the coating/concrete interface with less than 20% of substrate adhered to the coating and less than 200 psi pull-off strength shall be deemed coating adhesion failure and the Contractor shall remove all coating NOT meeting minimum requirements, re-perform surface preparation procedures, and recoat the failed surfaces, at no additional cost to the Owner.
  - 2. Low pull-off strength values (less than 250 psi) may require additional testing/evaluation to determine potential adhesion defects at the sole discretion of the Owner.
  - 3. The Owner shall further evaluate any areas detected to have inadequate adhesion. Further adhesion testing may be performed to determine the extent of potentially deficient bonded areas and repairs shall be made in accordance with the manufacturer's recommendations.

- E. A final visual inspection shall be made by the Engineer and applicator. Any deficiencies in the finished system shall be marked and repaired by the coating applicator according to the manufacturer's recommendations.

### 3.7 WARRANTY INSPECTIONS

- A. Inspection of the coated structures shall be performed after the first year of service. Owner shall set date for inspections.
- B. Inspection shall be attended by Owner, Contractor, Engineer, and manufacturer's representative.
- C. Coating defects found shall be evaluated by a qualified inspector and the coating manufacturer to determine the cause of the failure and propose repair procedures. Contractor shall coordinate repair of deficiencies in coating systems in accordance with recommended repair procedures, at no additional cost to the Owner.

END OF SECTION



DIVISION 23

HVAC



## SECTION 23 05 02 – BASIC MECHANICAL MATERIALS AND METHODS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings
  - 3. Dielectric fittings
  - 4. Mechanical sleeve seals
  - 5. Sleeves
  - 6. Escutcheons
  - 7. Grout
  - 8. Mechanical Demolition.
  - 9. Equipment installation requirements common to equipment sections
  - 10. Painting and Finishing
  - 11. Concrete Bases
  - 12. Supports and Anchorages
  - 13. Access Panels
  - 14. Piping Seals

#### 1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
  - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
  - 2. CPVC: Chlorinated polyvinyl chloride plastic.
  - 3. PE: Polyethylene plastic.
  - 4. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### 1.3 CODES AND STANDARDS

- A. Clean Air Act 1990

- B. Refrigeration Service Engineers Society

#### 1.4 SUBMITTALS

- A. Product Data:
  - 1. Transition Fittings
  - 2. Dielectric Fittings
  - 3. Mechanical Sleeve Seals
  - 4. Escutcheons
  - 5. Access Panels
- B. Welding certificates.

#### 1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

#### 1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are NOT limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 40 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

## 2.3 JOINING MATERIALS

- A. Refer to individual Division 40 piping Sections for special joining materials NOT listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
  2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- E. Solder Filler Metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:
  1. ABS Piping: ASTM D2235.
  2. CPVC Piping: ASTM F493.
  3. PVC Piping: ASTM D2564. Include primer according to ASTM F656.
  4. PVC to ABS Piping Transition: ASTM D3138.
- I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

## 2.4 TRANSITION FITTINGS

- A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
  1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.

- b. Dresser Industries, Inc.; DMD Div.
    - c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
    - d. JCM Industries.
    - e. Smith-Blair, Inc.
    - f. Viking Johnson.
  - 2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
  - 3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
  - 4. Aboveground Pressure Piping: Pipe fitting.
- B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
- 1. Manufacturers:
    - a. Elson Thermoplastics.
- C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.
- 1. Manufacturers:
    - a. Thompson Plastics, Inc.
- D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.
- 1. Manufacturers:
    - a. NIBCO INC.
    - b. NIBCO, Inc.; Chemtrol Div.
- E. Flexible Transition Couplings for Underground Non-pressure Drainage Piping: ASTM C1173 with elastomeric sleeve ends same size as piping to be joined, and corrosion-resistant metal band on each end.
- 1. Manufacturers:
    - a. Cascade Waterworks Mfg. Co.
    - b. Fernco, Inc.
    - c. Mission Rubber Company.
    - d. Plastic Oddities, Inc.

## 2.5 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
  - 1. Manufacturers:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. Eclipse, Inc.
    - d. Epco Sales, Inc.
    - e. Hart Industries, International, Inc.
    - f. Watts Industries, Inc.; Water Products Div.
    - g. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- minimum working pressure as required to suit system pressures.

1. Manufacturers:
  - a. Capitol Manufacturing Co.
  - b. Central Plastics Company.
  - c. Epco Sales, Inc.
  - d. Watts Industries, Inc.; Water Products Div.
  
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Central Plastics Company.
    - d. Pipeline Seal and Insulator, Inc.
  2. Separate companion flanges and steel bolts and nuts shall have 150- minimum working pressure where required to suit system pressures.
  
- F. Dielectric Couplings: Galvanized-steel coupling with inert and non-corrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
  1. Manufacturers:
    - a. Calpico, Inc.
    - b. Lochinvar Corp.
  
- G. Dielectric Nipples: Electroplated steel nipple with inert and non-corrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
  1. Manufacturers:
    - a. Perfection Corp.
    - b. Precision Plumbing Products, Inc.
    - c. Sioux Chief Manufacturing Co., Inc.
    - d. Victaulic Co. of America.

## 2.6 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  1. Manufacturers:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  3. Pressure Plates: Stainless steel. Include two for each sealing element.
  4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

## 2.7 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Under deck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped and smooth-outer surface with nailing flange for attaching to wooden forms.

## 2.8 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  - 1. Finish: Polished chrome-plated.
- E. One-Piece, Floor-Plate Type: Cast-iron floor plate.
- F. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

## 2.9 GROUT

- A. Description: ASTM C1107, Grade B, non-shrink, and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, non-staining, non-corrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

## 2.10 ACCESS PANELS

- A. Access panels shall have welded steel frame, one-piece doors, and self-latching door locks.
- B. Panels shall be Milcor, Cesco, Karp or prior approved equal. Milcor model numbers are cited as examples.

<u>Construction or Material Surface</u>	<u>Model No.</u>
Fire rated walls or ceiling 1-1/2 Hr, B-Label 16 ga frame, 20 ga door	Fire Rated-Primer Finish
Drywall walls and ceilings 16 ga frame, 14 ga door panel	DW primer finish
Plaster walls and ceilings 16 ga frame, 14 ga door	K - primer finish



Masonry and Tile

M - primer finish  
MS - stainless steel

- C. Locks: Standard locks shall be screw driver operated with case hardened steel cam. Cylinder lock shall be furnished in psychiatric areas, secure areas or other sensitive area. Provide two keys per panel.

## 2.11 MISCELLANEOUS STEEL

- A. ASTM A36 Structural Steel

## 2.12 VALVE TAG AND CHART

- A. Valve tags shall be Seton 250-BL with heavy brass chain. One valve number shall be stamped on each tag. Identify each valve tag for the utility it serves, such as "CW" for cold water, HW for hot water, etc. Valve charts shall be Seton A-11P.

## PART 3 - EXECUTION

### 3.1 MECHANICAL DEMOLITION

- A. Refer to Section 01 70 00, EXECUTION REQUIREMENTS, and Section 02 41 00, DEMOLITION, for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  - 3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
  - 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  - 5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  - 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 40 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    - f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
    - g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with rough-brass finish.
    - h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
  - 2. Existing Piping: Use the following:
    - a. Chrome-Plated Piping: Split-casting, cast-brass type with chrome-plated finish.
    - b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge and spring clips.
    - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
    - d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
    - e. Bare Piping in Unfinished Service Spaces: Split-casting, cast-brass type with rough-brass finish.
    - f. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge and set screw or spring clips.
    - g. Bare Piping in Equipment Rooms: Split-casting, cast-brass type.
    - h. Bare Piping at Floor Penetrations in Equipment Rooms: Split-casting, floor-plate type.

- M. Sleeves are NOT required for core-drilled holes.
- N. Permanent sleeves are NOT required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a. Pipe Sleeves: For pipes smaller than NPS 6.
    - b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    - c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      - 1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Section 07 92 00, JOINT SEALANTS for materials and installation.
- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
  - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire stop materials. Refer to Division 7 Section "Through-Penetration Fire stop Systems" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 40 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: DO NOT use pipe or pipe fittings with threads that are corroded or damaged. DO NOT use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D2235 and ASTM D2661 Appendixes.
  - 3. CPVC Piping: Join according to ASTM D2846 Appendix.
  - 4. PVC Pressure Piping: Join schedule number ASTM D1785, PVC pipe and PVC socket fittings according to ASTM D2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D2855.
  - 5. PVC Non-pressure Piping: Join according to ASTM D2855.
  - 6. PVC to ABS Non-pressure Transition Fittings: Join according to ASTM D3138 Appendix.
- J. Plastic Pressure Piping Gasket Joints: Join according to ASTM D3139.
- K. Plastic Non-pressure Piping Gasket Joints: Join according to ASTM D3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

### 3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are NOT indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 3.6 PAINTING

- A. Painting of mechanical systems, equipment, and components is specified in Division 9, FINISHES.
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.7 CONCRETE BASES

- A. Concrete Housekeeping Pads:
  1. Provide concrete housekeeping pads under all floor mounted equipment, pipe support and duct supports and where indicated.
  2. Housekeeping pads shall be NOT less than 6" thick, sized at least 8 in. larger than the equipment.
  3. Pads shall be doweled to floor with NOT less than 4 No. 4 bars grouted in place.
  4. Pads shall have chamfered edges.
  5. Pads shall receive a broom finish.
  6. NOTE: Anchor bolts for equipment shall be poured integral with the pad.
  7. Pads shall be reinforced with at least one No. 4 bar (stirrups).

### 3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Section 05 50 00, METAL FABRICATIONS, for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### 3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.
- B. Select fastener sizes that shall NOT penetrate members if opposite side shall be exposed to view or shall receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

### 3.10 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

### 3.11 ACCESS PANELS

- A. Provide access panels in walls and ceilings as needed to allow access to valves, equipment, shock absorbers, trap primers, etc. and where noted.
- B. Access doors shall be selected for the type of wall or ceiling where needed. All locking access panels shall be keyed alike.

### 3.12 FIRE STOPPING AND SOUND STOPPING

- A. Provide penetrations for piping through floors and walls for work under this contract.
- B. Penetrations through floors and fire resistant walls shall be sealed to the rated fire resistance equal to the wall. Installation shall be done by a qualified installer, approved by the manufacturer.
- C. Provide sound proofing through non-rated walls.
- D. In an existing building all penetrations through floors and fire resistant walls shall be sealed at the end of each working day. These closures shall have an equal fire resistance rating to the floor or wall.

### 3.13 EXCAVATION, SHORING AND BACKFILL

- A. Provide any excavation required for work in this Division. Refer to soil borings for type of sub-grade materials.
- B. Provide separate trench for each utility.
- C. Provide bracing, shoring, sheet piling to protect sides of excavation, workers and adjacent structures. Provide site de-watering systems where water level is above bottom of trench.
- D. Provide barricades and lights to protect open excavations. Provide pedestrian bridges for foot traffic across excavation.
- E. Provide steel plates over excavations for automobile and truck traffic across excavations.
- F. Remove all timber and foreign material from excavation before backfilling. Backfill simultaneously on both sides of tanks, piping, etc. Backfill materials shall be approved clay or chert, free of debris, rock larger than 1-1/2 inch or other harmful material.
- G. Backfilling shall be done in 12 in. lifts or layers. All backfilling shall be compacted to the Modified Proctor Density (ASTM D1557) listed below:
  - 1. 90 Percent:
    - a. Under Sidewalks
    - b. Grassed Areas
  - 2. 95 Percent:
    - a. Paved Areas
    - b. Under Structures
    - c. Building Slabs
- H. Restore existing pavement, curbs, sidewalks, sodding, etc. removed or damaged by work in this Division.

### 3.14 ANCHORS

- A. Mount all equipment, brackets, hangers, anchors, etc. to safely resist the vibration or thrust forces and support the unit's weight.
- B. Floor mounted rotating or vibrating equipment shall be anchored to the floor using grouted-in-place or cast-in-place anchor bolts with three inch hook and sleeve. Anchor bolts shall be of the size recommended by the manufacturer.
- C. Floor mounted static items, wall and ceiling mounted equipment bracket and hangers shall be installed using drilled anchors. Anchors shall be Phillips Drill Company "Red Head" or Multi-Set II. Size anchors for four times the applied load. Bolts used outdoors or in a wet environment shall be hot dip galvanized.

### 3.15 SOUND LEVELS

- A. Select diffusers, grilles, terminal boxes, and equipment so as NOT to exceed the NC curve rating for the various areas. Equipment and materials furnished shall be rated in accordance with the sound power tests measured in accordance with ASHRAE Standard 36B-63. Room attenuation and ceiling transmission loss shall depend on the spaces and architectural finishes.
- B. Attenuation allowances shall be as follows unless scheduled otherwise:
  - 1. Acoustical tile: -4dB

2. Plaster ceiling: -1dB
3. 5/8 in. gypsum ceiling: -1dB
4. Room attenuation effect: -8dB

C. Air performance tests shall be conducted in accordance with Air Diffusion Council (ADC) Equipment Test Code 1062 RI and ratings approved by the ADC.

D. Maximum sound pressure levels for installed material and equipment shall be as follows:  
1. All Areas: NC Curve Range 30-35

### 3.16 FLASHING

A. Provide flashing at piping and duct penetrations through roof and roof mounted structures furnished under this Division. Flash in accordance with Roofing manufacturer's details.

B. Flashing materials shall be in accordance with the roofing manufacturers system.

C. Provide flashing at pipes passing through floors with waterproof membrane. Flashing shall be in accordance with waterproofing manufacturer's details.

### 3.17 ROOF TOP WORK

A. Protect roof surface by using plywood walkouts, work platforms, and cribbing during construction.

B. Provide counter flashing unless specifically included in the work of another Division. Counter flashing shall be in accordance with roof manufacturer's instructions such that roof warranty is maintained.

C. Provide a certificate of inspection from the roof manufacturer stating that the roof has been repaired in accordance with their specifications and that the warranty remains in effect.

### 3.18 PIPE IDENTIFICATION

A. Provide pipe markers and directional arrows on pipes at both sides of partitions and floors slabs, at branch line take-offs, at valves, at intermediate intervals NOT in excess of 20 ft. and at connections to equipment.

B. Tape color band identifying markers and arrows on each pipe, both insulated and bare pipes. Pipe markers and arrows shall be located where readily visible and on lower quadrants of overhead pipes.

C. Submit schedule of pipe markers, with legend and background colors for approval by the Architect.

### 3.19 REFRIGERANT RECOVERY

A. All work on refrigerant systems shall employ service techniques that prevent release of refrigerants to the atmosphere.

B. Remove all refrigerant. Place refrigerant in DOT approved containers for recycling/re-use.

### 3.20 WORKMANSHIP

A. Pipe size changes shall be made at reducing fittings. Bushings shall NOT be used.



- B. Provide drain valves at points where water is trapped in piping.
- C. Install pipe to prevent noise or water hammer.
- D. Blowout or flush out all lines prior to final connection or start-up, to remove foreign matter.
- E. Make allowance in piping for expansion and contraction, for installation of insulation and to avoid air pockets.
- F. DO NOT tap small pipes into larger pipes. Provide fittings or reinforced branch connections.
- G. Cut pipes ends square, ream and de-burr. Cut threads clean and sharp. Pipe threads shall conform to ANSI B 2.1.
- H. Pull up threaded fittings to a tight fit with an approved good quality pipe joint compound applied to male threads.
- I. Inspect screwed joints for leakage and remake each joint that appears to be faulty. DO NOT wait for rust to form. Clean threads on both parts apply compound and remake joints.
- J. Clean piping strainers after start-up by removing strainer screen and wire brushing.
- K. Conceal pipes in pipe shafts, partitions and furred spaces except where otherwise distinctly indicated on the drawings. Each riser shall be separately valved.
- L. Every branch pipe shall be controlled by a valve where it connects to the supply main or riser.
- M. Valves shall be easily accessible, with proper clearance for maintenance. Valves inside furred spaces, behind access doors shall be grouped to keep the number of access doors and their sizes to a minimum.
- N. Provide drain valves at the base of each riser.
- O. Provide drain valves and drain lines from pumps, heaters, water cooled equipment, relief valves, etc., and pipe to floor drains.
- P. Tighten flanges and packing glands after the system has been placed in operation. Replace gaskets in flanges that show any signs of leakage after tightening.
- Q. Install NO piping in electrical switchgear room, transformer vaults, telephone rooms or electrical closets. Provide drip pans under drain piping above electrical switchgear in mechanical rooms.
- R. Install piping in alignment with and parallel to the walls of the building. All risers shall be plumb.
- S. No cross connections shall be installed between potable water systems and polluted supply or waste systems.
- T. Provide valves and unions or flanges at equipment such as pumps, coils, tanks, automatic valves, heat exchangers, etc. Provide valves on capped branches for extension by other Contractors.
- U. Support piping at the proper intervals. Adjust pipe hangers and supports for correct pitch and alignment. Brace piping systems which sway.

- V. Remove rust, scale, and foreign materials from equipment and renew any defaced surfaces. If equipment is marred, provide new materials.
- W. Protect insulation. Repair insulation that is damaged. Keep it dry and free of tears. Allow no punctures in vapor barrier. Insure good tape adhesion. Provide smooth surfaces in finished areas.
- X. Pitch sanitary and storm lines: pipes 3 in. and larger NOT less than 1/8 inch per foot, pipes 2 inch and smaller NOT less than 1/4 inch per foot. Make changes in grade or direction by "Y" branches.
- Y. Pitch vent piping to free themselves of water and condensation. Install vent branches NOT less than 42 inches above floor. Clean fixtures of labels and stains with whiting and alcohol. Clean copper tubing and fittings with steel wool to remove traces of oxidation.
- Z. Install ductwork to allow adequate clearance for maintenance. Locate fire dampers and access doors to allow replacement of fusible links. All dampers shall be accessible.
- AA. All copper tubing shall be hard drawn unless noted otherwise. Annealed tubing where used shall be stretched, and installed with tool formed bends.

END OF SECTION

## SECTION 23 05 17 – SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
- B. Related sections:
  - 1. Section 07 92 00 - Joint Sealants.

#### 1.2 SUBMITTALS

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

### PART 2 - PRODUCTS

#### 2.1 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A53, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- B. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.

### PART 3 - EXECUTION

#### 3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Permanent sleeves are NOT required for holes in slabs formed by molded-PE or -PP sleeves.
  - 2. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
- C. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00, JOINT SEALANTS.
- D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07 84 00, FIRESTOPPING.

#### 3.2 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Exterior Walls above Grade:

- a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
2. Interior Partitions:
  - a. Piping Smaller Than NPS 6 (DN 150): PVC-pipe sleeves.

END OF SECTION

## SECTION 23 05 29 – HANGERS AND SUPPORTS FOR MECHANICAL PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes the following hangers and supports for Mechanical system piping and equipment:
  - 1. Steel pipe hangers and supports.
  - 2. Trapeze pipe hangers.

#### 1.2 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

#### 1.3 SUBMITTALS

- A. Product Data:
  - 1. Steel pipe hangers and supports.

#### 1.4 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."

### PART 2 - PRODUCTS

#### 2.1 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

#### 2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

#### 2.3 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A36, steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C1107, factory-mixed and packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
  - 1. Properties: Non-staining, noncorrosive, and nongaseous.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are NOT specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that shall NOT have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30.
  - 2. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Carbon or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
  - 2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  - 3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  - 4. C-Clamps (MSS Type 23): For structural shapes.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
- K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are NOT specified in piping system Sections.
- L. Comply with MFMA-102 for metal framing system selections and applications that are NOT specified in piping system Sections.

- M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

### 3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal-piping and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  - 2. Field fabricate from ASTM A36, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- D. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. DO NOT penetrate roof membrane.
- E. Fabricate from welded-structural steel shapes.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement shall NOT be transmitted to connected equipment.
- I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are NOT exceeded.
- J. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. DO NOT exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - 4. Shield Dimensions for Pipe: NOT less than the following:
    - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    - b. NPS 4: 12 inches long and 0.06 inch thick.

5. Insert Material: Minimum length same as protective shield.

### 3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

### 3.4 PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09, FINISHES.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION



## SECTION 23 05 53 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Warning tags.

#### 1.2 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing ceilings or other concealment.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
  - 1. Material and Thickness: Brass, 0.032-inch, Stainless steel, 0.025-inch, Aluminum, 0.032-inch, or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Minimum Label Size: Length and width vary for required label content, but NOT less than 2-1/2 by 3/4 inch.
  - 3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  - 4. Fasteners: Stainless-steel rivets or self-tapping screws.
  - 5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
  - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
  - 2. Letter Color: White.
  - 3. Background Color:
    - a. Black.
  - 4. Maximum Temperature:
    - a. Able to withstand temperatures up to 160 deg F.
  - 5. Minimum Label Size:
    - a. Length and width vary for required label content, but NOT less than 2-1/2 by 3/4 inch.
  - 6. Minimum Letter Size:
    - a. 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  - 7. Fasteners:

- a. Stainless-steel rivets or self-tapping screws.
- 8. Adhesive:
  - a. Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules).

## 2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but NOT less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners:
  - 1. Stainless-steel rivets or self-tapping screws.
- H. Adhesive:
  - 1. Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content:
  - 1. Include caution and warning information, plus emergency notification instructions.

## 2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels:
  - 1. Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pre-tensioned Pipe Labels:
  - 1. Pre-coiled, semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels:
  - 1. Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents:
  - 1. Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 2. Flow-Direction Arrows:
    - a. Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 3. Lettering Size:
    - a. At least 1-1/2 inches high.

## 2.4 WARNING TAGS

- A. Warning Tags:
  - 1. Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
  - 2. Size:
    - a. 3 by 5-1/4 inches minimum.
  - 3. Fasteners:
    - a. Brass grommet and wire.
  - 4. Nomenclature:
    - a. Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  - 5. Color:
    - a. Yellow background with black lettering.

## PART 3 - EXECUTION

### 3.1 PREPARATION

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

### 3.2 EQUIPMENT LABEL INSTALLATION

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

### 3.3 PIPE LABEL INSTALLATION

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

### 3.4 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

## SECTION 23 81 27 – MINI-SPLIT-SYSTEM AIR-CONDITIONING UNITS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes ductless mini-split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting and may be connected to ducts.
- B. Related Sections:
  - 1. Section 01 40 00 – Quality Requirements.

#### 1.2 SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
- D. Warranty: Special warranty specified in this Section.

#### 1.3 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 – "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 – "Heating, Ventilating, and Air-Conditioning."

#### 1.4 COORDINATION

- A. Coordinate size and location of concrete bases for outside units. Cast anchor-bolt inserts into bases.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of ductless mini-split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: one year from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Carrier
  - 2. Daikin
  - 3. Fujitsu
  - 4. Mitsubishi

### 2.2 EVAPORATOR-FAN COMPONENTS

- A. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
  - 1. Insulation: Faced, glass-fiber duct liner.
  - 2. Drain Pans: Galvanized steel, with connection for drain; insulated.
  - 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.
- C. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements with refractory ceramic support bushings; automatic-reset thermal cutout; built-in magnetic contactors; manual-reset thermal cutout; airflow proving device; and one-time fuses in terminal box for overcurrent protection.
- D. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
- E. Fan Motors: Comply with requirements in Division 26.
  - 1. Special Motor Features: Multi-tapped, multispeed with internal thermal protection and permanent lubrication.
- F. Disposable Filters: 1 inch thick, in fiberboard frames.
- G. Wiring Terminations: Connect motor to chassis wiring with plug connection.
- H. Condensate Pump: furnish condensate pump.

### 2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

- A. Casing: Steel, finished with baked enamel with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
- B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
  - 1. Compressor Type: Reciprocating or Scroll.
  - 2. Manual-reset high-pressure switch and automatic-reset low-pressure switch.
  - 3. Refrigerant: R-410A.
- C. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with liquid subcooler.

- D. Provide corrosion resistant coatings on coils.
- E. Heat Pump Components: Reversing valve and low-temperature air cut-off thermostat for heat pump units.
- F. Fan: Aluminum-propeller type, directly connected to motor.
- G. Motor: Permanently lubricated, with integral thermal-overload protection.
- H. Low Ambient Kit: Permits operation down to 0 deg F.
- I. Mounting Base: Polyethylene.
- J. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1, "Energy Standard for Buildings except Low-Rise Residential Buildings."

#### 2.4 ACCESSORIES

- A. Thermostat: Wired, low voltage with subbase to control compressor and evaporator fan.
- B. Automatic-reset timer to prevent rapid cycling of compressor.
- C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
  1. Minimum Suction Line Insulation Thickness: 1/2-inch-thick closed cell unicellular or preformed fiberglass.
- D. Include any additional accessories indicated in the Drawings

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install ground-mounting, compressor-condenser components on 8-inch-thick, reinforced concrete base; 4 inches larger on each side than unit, 4-inches above finished grade.
- D. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit. Adhere to manufacturers' installation instructions for line sizes and maximum lengths; DO NOT install units or piping if adverse conditions exist.
- E. Insulate refrigerant suction lines and condensate drain lines.

#### 3.2 CONNECTIONS

- A. Install piping adjacent to unit to allow service and maintenance.
- B. Electrical Connections: Comply with requirements in Division 26 for power wiring, switches, and motor controls. Ground equipment according to Section 26 05 26, GROUNDING AND BONDING SYSTEM.

### 3.3 FIELD QUALITY REQUIREMENTS

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace malfunctioning units and retest as specified above.

### 3.4 DEMONSTRATION

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

END OF SECTION