

VA



U.S. Department
of Veterans Affairs

Specifications

for

VA Project No. 895CM3047

RENOVATE ROSTRUM AND ROAD

Golden Gate National Cemetery

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SECTION 00 01 10

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SECTION 00 01 15

LIST OF DRAWINGS

The drawings listed below accompanying this specification form a part of the Contract.

SHT.#	DWG. NO.	SHEET NAME
1	X-1	COVER SHEET
2	X-2	GENERAL NOTES & ABBREVIATIONS
3	B-1	TOPOGRAPHIC SURVEY
4	B-2	BORING LOGS
5	D-1	EXISTING CONDITIONS & DEMOLITION PLAN
6	L-100	EROSION CONTROL & TEMPORARY MEASURES PLAN
7	L-101	EROSION CONTROL DETAILS
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9	L-201	SITE LAYOUT PLAN & DIMENSION - ROSTRUM ASSEMBLY AREA
10	L-300	GRADING AND DRAINAGE PLAN - OVERALL
11	L-301	GRADING AND DRAINAGE PLAN - ROSTRUM
12	L-302	PLAN & PROFILE – CIRCLE DRIVE, WEST
13	L-303	PLAN & PROFILE – CIRCLE DRIVE, EAST
14	L-400	CONSTRUCTION DETAILS – PAVING DETAILS
15	L-401	CONSTRUCTION DETAILS – WALL & RAIL DETAILS 1
16	L-402	CONSTRUCTION DETAILS – WALL & RAIL DETAILS 2
17	L-403	CONSTRUCTION DETAILS – WALL & RAIL DETAILS 3
18	L-404	CONSTRUCTION DETAILS – WATER FAUCET

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SECTION 01 00 00

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for construction operations, including demolition and removal of existing pavement and rostrum stage, and furnish labor and materials and perform Work for construction of new rostrum stage, fencing guardrails, plaza paving, walks, and pavement replacement as required by Construction Documents (Drawings and Specifications, as well as all other Contract Documents).
- B. Visits to the site by Bidders may be made only by appointment with the Cemetery Director, Ms. Kathleen McCall, 650.589.7737. Golden Gate National Cemetery is located at 1300 Sneath Lane, San Bruno, CA, 94066.
- C. Offices of Jacobs Engineering Group Inc ("Jacobs"), 1050 20th Street, Suite 200 Sacramento, California 95811, Phone 916.929.3323, as Architect-Engineers (A/E), will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer (CO), Contracting Officer's Representative (COR), or his duly authorized representative.
- D. Before placement and installation of Work subject to tests by testing laboratory retained by the Contractor, the Contractor shall notify the COR in sufficient time to enable COR or authorized personnel to be present at the site in time for observation of testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the COR.
- E. All employees of General Contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and be restricted from unauthorized access.
- F. Prior to commencing Work, Contractor shall provide proof that an OSHA certified "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the Work site whenever the general Contractor or subcontractors are present.
- G. Training:
 - 1. All employees of Contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and/or other relevant competency training, as determined by VA.
 - 2. Submit training records of all such employees for approval before the start of Work.

1.2 STATEMENT OF BID ITEMS

- A. ITEM NUMBER 1, GENERAL CONSTRUCTION: Provide all labor, materials, tools, equipment and services to construct a new rostrum, fencing guardrails, plaza paving, walks, and pavement replacement as shown on the Drawings and described in the Specifications including but not limited to: prepare site for construction operations including erosion control, demolition and removal of existing surface and subsurface features; earthwork; excavation, fill and grade; storm drainage structures and appurtenances; paving demolition and reconstruction; walks and other paving; miscellaneous electrical work; minor retaining walls; rostrum stage; and incidental improvements.

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. AFTER AWARD OF CONTRACT, one (1) set of Drawings and Specifications will be furnished.

1.4 CONSTRUCTION SECURITY REQUIREMENTS

- A. Security Plan:
 - 1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
 - 2. The Contractor is responsible for assuring that all subcontractors working on the project and their employees also comply with these regulations.
 - 3. Contractor shall submit the Security Plan to COR for review and approval prior to beginning on-site Work.
- B. Security Procedures:
 - 1. Contractor's employees shall not enter the Project site without an appropriate badge or means of identification. They may also be subject to inspection of their personal effects when entering or leaving the Project site.
 - 2. For working outside the "regular hours" as defined in the Contract, the General Contractor shall request, a minimum of three (3) days in advance of the requested change, in writing, from the COR the change in working hours so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this Section or elsewhere in the Construction Documents.
 - 3. No photography of VA premises is allowed without written permission of the COR, excepting photography as required for daily reporting.
 - 4. VA reserves the right to close down or shut down the Project site and order General Contractor's employees off the premises in the event of a National Emergency. The General Contractor may return to the site only with the written approval of the COR.
- C. Key Control:
 - 1. The General Contractor shall provide duplicate keys and lock combinations to the COR for the purpose of security inspections or emergency access of every area of project.

- D. Document Control:
1. Before starting any Work, the General Contractor/subcontractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
 2. The General Contractor is responsible for safekeeping of all Drawings, Project manual and other Project information. This information shall be shared only with those with a specific need to accomplish the Project.
 3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the Project. Return the information to the COR upon request.
 4. These security documents shall not be removed or transmitted from the Project site without the written approval of COR.
 5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
 6. Notify COR immediately when there is a loss or compromise of "sensitive information".
 7. All electronic information shall be stored in a specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project Construction Documents, both scanned and electronic, shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including Construction Documents and other documents may be attached to e-mail provided all VA evaluation procedures are followed.
- E. Motor Vehicle Restrictions
1. Vehicle authorization request shall be required for any vehicle entering the Site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.

1.5 FIRE SAFETY

- A. Applicable Publications: Publications listed below form part of this Article to the extent referenced. Publications are referenced in text by basic designations only.
1. National Fire Protection Association (NFPA):
 - 10-2010..... Standard for Portable Fire Extinguishers
 - 30-2008..... Flammable and Combustible Liquids Code
 - 51B-2009..... Standard for Fire Prevention During Welding, Cutting and Other Hot Work
 - 70-2008..... National Electrical Code
 - 241-2009..... Standard for Safeguarding Construction, Alteration, and Demolition Operations
 2. Occupational Safety and Health Administration (OSHA):
 - 29 CFR 1926 Safety and Health Regulations for Construction
- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of Work, prepare a plan detailing Project-specific

fire safety measures, including periodic status reports, and submit to COR/Cemetery Director for review for compliance with Contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Prior to any worker for the Contractor or subcontractors beginning Work, they shall undergo a safety briefing provided by the General Contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of NCA equipment, etc. Documentation shall be provided to the COR that individuals have undergone the Contractor's safety briefing.

- C. Site Access: Maintain free and unobstructed access to emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from new construction by distances in accordance with NFPA 241. For small facilities with less than 20 feet exposing overall length, separate by 10 feet.
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block paths from exits to roads. Minimize disruptions and coordinate with COR/Cemetery Director.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COR.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Designate Contractor's responsible Project-site fire prevention program manager to permit hot work.
- K. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COR.
- L. Smoking: Smoking is prohibited in and adjacent to construction areas and on Cemetery grounds.
- M. Dispose of waste and debris in accordance with NFPA 241. Remove from site daily.
- N. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the COR. The Contractor shall hold and save the Government and its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage trailers) and utilities may be erected by the Contractor only with the approval of the COR and shall be built with labor and materials furnished by the Contractor without additional expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the Work.
- C. The Contractor shall, under regulations prescribed by the COR, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the COR. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads. (FAR 52.236-10).
- D. Working space and space available for storing materials shall be as shown on the Construction Documents. Adjustments may be made in the field upon written request and authorization by the COR.
 - 1. Contractor employee parking shall be in areas designated on the Construction Documents or requested in writing and authorized by the COR.
- E. Workmen are subject to rules of the Cemetery applicable to their conduct.
- F. Execute Work so as to interfere as little as possible with normal functioning of Cemetery as a whole, including operations of utility services, fire protection systems and any existing equipment, and with Work being done by others.
 - 1. Do not store materials and equipment in other than assigned areas.
 - 2. Schedule delivery of materials and equipment to immediate construction working areas in quantities sufficient for not more than two work days.
 - 3. Where access by Cemetery is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
 - 4. All such actions shall be coordinated with the Utility Company involved:
 - a. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction Project for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government.
 - b. Whenever it is required that a connection fee be paid to a public utility provider for temporary service to the construction Project, for

such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Contractor.

- G. Phasing: To insure such executions, the Contractor shall furnish the COR with a schedule of approximate dates on which the Contractor intends to accomplish Work in each specific area of Site. In addition, the Contractor shall notify the COR two weeks in advance of the proposed date of starting Work in each specific area of Site. Arrange such dates to insure accomplishment of this Work in successive phases mutually agreeable to the Cemetery Director, COR and Contractor, as follows:
1. The Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Cemetery's operations will not be hindered. The Contractor shall permit access to Department of Veterans Affairs personnel through other construction areas which serve as routes of access to such affected areas and equipment. Coordinate alteration Work in areas occupied by Department of Veterans Affairs so that Cemetery operations will continue during the construction period.
 2. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed.
- H. Construction Fence: Before construction operations begin, the Contractor shall provide a chain link construction fence, seven feet minimum height, around the construction area indicated on the Construction Documents by "LIMIT OF WORK" line. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 15 inches. Bottom of fences shall extend to one inch above grade. Remove the fence when Work is substantially complete and/or as directed by COR.
- I. Utilities Services: Maintain existing utility services for the Cemetery at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.
1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COR and coordination with the Utility owner.
 2. Electrical Work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, Work on any energized circuits or equipment shall not commence without the COR and Cemetery Director's prior knowledge and written approval.
 3. The Contractor shall submit a request to interrupt any such services to COR and Cemetery Director, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.

4. The Contractor will be advised (in writing) of approval of request.
 5. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.
 6. In case of a Contract construction emergency, service will be interrupted on approval of COR. Such approval will be confirmed in writing as soon as practical.
 7. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction Project for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
 8. Whenever it is required that a connection fee be paid to a public utility provider for temporary service to the construction Project for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Contractor.
- J. To minimize interference of construction activities with flow of Cemetery traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times.
 2. Method and scheduling of required cutting, altering and removal of existing improvements must be approved by the COR.
- K. Coordinate the Work for this Contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.
- L. Coordination of Construction with Cemetery Director: The burial activities at a National Cemetery shall take precedence over construction activities. The Contractor must cooperate and coordinate with the Cemetery Director, through the COR, in arranging construction schedule to cause the least possible interference with Cemetery activities in actual burial areas. Construction noise during the interment services shall not disturb the service. Trucks and workmen shall not pass through the service area during this period:
1. The Contractor is required to discontinue his work sufficiently in advance of Easter Sunday, Mother's Day, Father's Day, Memorial Day, Veteran's Day and/or Federal holidays, to permit him to clean up all areas of operation adjacent to existing burial plots before these dates.
 2. Cleaning up shall include the removal of all equipment, tools, materials and debris and leaving the areas in a clean, neat condition to the satisfaction of the COR.

1.7 ALTERATIONS

- A. Survey: Before any Work is started, the Contractor shall make a thorough survey with the COR of areas in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed, to the Contracting Officer. This report shall list by areas:
 - 1. Existing condition of roadways, curbs, lawns, furnishings, etc not required to be altered during performance and completion of Work (including haul routes).
 - 2. Shall note any discrepancies between Construction Documents and existing conditions at site.
 - 3. Shall designate areas for working space, materials storage and routes of access to areas where alterations occur and which have been agreed upon by Contractor and COR.
 - 4. Pre-construction photographs shall be required to be submitted with the report.
- B. Any items required by Construction Documents to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by the Contractor with new items in accordance with specifications which will be furnished by the Government. Provided the Contract Work is changed by reason of this subparagraph B, the Contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and COR together shall make a thorough re-survey of the areas of construction involved. They shall furnish a report on conditions then existing, of improvements and all surfaces as compared with conditions of same as noted in first condition survey report:
 - 1. Re-survey report shall also list any damage caused by the Contractor to such surfaces, despite protection measures; and, will form the basis for determining extent of repair work required of the Contractor to restore damage caused by the Contractor's workmen in executing Work of this Contract.
- D. Protection: Provide the following protective measures:
 - 1. Temporary protection against damage for portions of existing items and grounds where Work is to be done, materials handled and equipment moved and/or relocated.

1.8 ENVIRONMENTAL CONTROLS

- A. In general, the following preventive measures shall be adopted during construction to keep down dust:
 - 1. Dampen debris to keep down dust.

B. Final Cleanup:

1. Upon completion of the Project, or as Work progresses, remove all construction debris from the site daily.

1.9 DISPOSAL AND RETENTION

A. Materials and equipment accruing from Work and from demolition of site elements, or parts thereof, shall be disposed of as follows:

1. Reserved items which are to remain property of the Government are noted on Drawings or in Specifications as items to be stored or salvaged for reuse. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COR.
2. Items not reserved shall become property of the Contractor and be removed by Contractor from the Cemetery.
3. The Contractor shall be responsible for disposal of materials in accordance with the procedures of the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) as outlined in Code of Federal Regulation (CFR), Titled 40 and 49 respectively. The EPA's Toxic Substance Control Act (TSCA) Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7 also apply. Upon removal of hazardous materials for disposal, the "originator" copy of the Uniform Hazardous Waste Manifest (EPA Form 8700-22), along with the Uniform Hazardous Waste Manifest Continuation Sheet (EPA Form 8700-22A) shall be returned to the COR who will annotate the Contract file and transmit the Manifest to the Cemetery's Director.
 - a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:
 - 40 CFR 261 ... Identification and Listing of Hazardous Waste
 - 40 CFR 262 ... Standards Applicable to Generators of Hazardous Waste
 - 40 CFR 263 ... Standards Applicable to Transporters of Hazardous Waste
 - 40 CFR 761 ... PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions
 - 49 CFR 172 ... Hazardous Material tables and Hazardous Material Communications Regulations
 - 49 CFR 173 ... Shippers - General Requirements for Shipments and Packaging
 - 49 CRR 173... Subpart A General
 - 49 CFR 173 ... Subpart B Preparation of Hazardous Material for Transportation
 - 49 CFR 173 ... Subpart J Other Regulated Material; Definitions and Preparation
 - TSCA..... Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7

1.10 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the Work site which are not to be removed and which do not unreasonably interfere with the Work required under this Contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during Contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the COR.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the Work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this Contract or failure to exercise reasonable care in performing the Work. If the Contractor fails or refuses to repair the damage promptly, the COR may have the necessary Work performed and charge the cost to the Contractor. (FAR 52.236-9)
- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.
- D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) permit is required for this project. The Contractor is considered an "Operator" under the permit and has extensive responsibility for compliance with permit requirements. The Contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements will be satisfied by completing construction as indicated and specified. Some requirements involve the Contractor's method of operations and operations planning and the Contractor is responsible for employing best management practices. The affected activities often include, but are not limited to the following:
 - 1. Designating areas for equipment maintenance and repair;
 - 2. Providing waste receptacles at convenient locations and provide regular collection of wastes;
 - 3. Locating equipment wash down areas on site, and provide appropriate control of wash-waters;
 - 4. Providing protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic materials; and
 - 5. Providing adequately maintained sanitary facilities.
 - 6. Protect the environment from soils migration by air or water.
 - 7. Permits, including all required documentation to obtain the permit and maintain the permit, are the responsibility of the Contractor. The state of

California requires electronic submittal and Annual Reporting; the Contractor shall comply with state permit and reporting requirements.

1.11 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing Work as necessary to install new Work. Except as otherwise shown or specified, do not cut, alter or remove any structural Work, and do not disturb any ducts, plumbing, steam, gas, or electric Work without approval of the COR. Existing Work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring Work shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of Contract, deliver Work complete and undamaged. Existing work (lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new Work shall be patched, repaired, reinstalled, or replaced with new Work, and refinished and left in at least as good condition as existed before commencing Work.
- C. At the Contractor's own expense, the Contractor shall immediately restore to service and repair any damage caused by the Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment, whether shown on the Construction Documents or not.
- D. Expense of repairs to such utilities and systems not shown on Construction Documents and not identified by a Utility Locator Service or locations of which are unknown will be covered by adjustment to Contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.12 PHYSICAL DATA

- A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.
 - 1. The indications of physical conditions on the Drawings and in the specifications are the result of site investigations by limited test borings as indicated on the Drawings.
(FAR 52.236-4)
- B. Subsurface conditions have been developed by core borings. Logs of subsurface exploration are included in the soil report – reference Appendix.
- C. A copy of the soil report titled Geotechnical Investigation, Renovate Rostrum and Road, Golden Gate National Cemetery, San Bruno, California, dated June 25, 2014, by Stevens Ferrone and Bailey Engineering Company, Inc. shall be considered part of the Contract Documents. See Appendix.

- D. The Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine the site of Work and logs of borings and, after investigation, decide for themselves the character of materials and make their bids accordingly. Upon proper application to the Department of Veterans Affairs, bidders will be permitted to make subsurface explorations of their own at Site.

1.13 PROFESSIONAL SURVEYING SERVICES

- A. A registered professional land surveyor or registered civil engineer, licensed in the state in which Work is to be performed, whose services are retained and paid for by the Contractor, shall perform services specified herein and in other Specification Sections. The Contractor shall certify that the land surveyor or civil engineer is not one who is a regular employee of the Contractor, and that the land surveyor or civil engineer has no financial interest in this Contract.

1.14 LAYOUT OF WORK

- A. The Contractor shall lay out the Work from Government-established base lines and bench marks indicated on the Drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at the Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the Work. The Contractor shall be responsible for executing the Work to the lines and grades that may be established or indicated by the COR. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the COR until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the COR may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236 17)

- B. Establish and plainly mark center lines for each roadway, walk, wall, or other structure or site furnishing, existing grades at limit of Work, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for such roads, parking lots, etc, are in accordance with lines and elevations shown on Construction Documents.
- C. Following completion of general demolition and excavations and before any other permanent Work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of Work. The Survey shall include, but not be limited to, location of lines and grades of footings, walls, center lines of roads, major utilities and elevations of slabs:
 - 1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the COR before any Work is placed.

2. If Work involves removal and realignment and replacement of headstones or gravemarkers, Contractor shall provide a pre- and post-construction survey, including photographs of both sides of headstones or gravemarker tied to the physical location of each headstone or gravemarker, before and after Construction. Survey shall be provided in pdf and AutoCAD formats; photographs shall be annotated with Survey point number and gravesite number and shall be provided in both pdf and jpeg formats.
- D. During progress of Work, and particularly as Work progresses from area to area, the Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of Construction Documents. Furnish such certification to the COR before any major items of concrete Work are placed. In addition, the Contractor shall furnish to the COR certificates from a registered land surveyor or registered civil engineer that the following Work is complete in every respect as required by Construction Documents.
1. Elevations of bottoms of footings.
 2. Lines and elevations of storm sewers and distribution systems.
 3. Lines of elevations of all swale areas and gutter flow lines.
 4. Lines and elevations of curbs, roads, streets, parking lots, and assembly areas.
 5. Northing/Easting coordinate locations of all water, sanitary, storm, gas and irrigation structures, directional fittings, control wire and lines.
- E. Upon completion of the Work, the Contractor shall furnish the COR with reproducible drawings, in AutoCAD format, at the scale of the Construction Documents, showing the finished grade on the grid developed for constructing the Work, including fifty foot stationing along new road centerlines and gutter flow lines (or bottom face of curb if curb does not include gutter). These Construction Documents shall bear the seal of the registered land surveyor or registered civil engineer.
1. If Work involves removal and realignment and replacement of headstones or gravemarkers, Contractor shall provide a pre- and post-construction survey, including photographs of both sides of headstones or gravemarker before and after construction. Survey shall be provided in pdf and AutoCAD formats; photographs shall be annotated with Survey point number and shall be provided in both pdf and jpeg formats.
- F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.15 AS-BUILT DRAWINGS

- A. The Contractor shall maintain two (2) full size sets of as-built Drawings which will be kept current during construction of the Project, which will include all Contract changes, modifications and clarifications and all utilities found during construction (type, material, size, depth, and location).

- B. All variations shall be shown in the same general detail as used in the Construction Documents. To insure compliance, as-built Drawings shall be made available for the COR's review, as often as requested.
- C. The Contractor shall deliver two (2) approved completed sets of as-built Drawings to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.16 USE OF ROADWAYS

- A. For hauling, use only established public roads and established roads on Cemetery property and, when authorized by the COR and/or shown on Contract Drawings, such temporary roads which are necessary in the performance of Contract Work. Temporary roads shall be constructed by the Contractor and removed at completion of Construction at the Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this Contract, the Contractor may construct them immediately to facilitate construction operations. These roads may be used by all who have business thereon within zone of construction operations.
 - 1. Roadways are to be kept free and clear of dirt, gravel, and debris for the full curb-to-curb width. Tracking onto roadways by Project vehicles and non-Project vehicles is to be cleaned immediately.
 - 2. Roadways installed as part of the Work shall be protected from damage until construction is complete and the Work is turned over to the VA.
 - 3. Roadways may be used by vehicles which are not loaded and which will not cause damage. Damaged roadways or roadway bases will be reconstructed by the Contractor at Contractor's expense.

1.17 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power, etc will be permitted subject to compliance with the following provisions:
 - 1. Permission to use each unit or system must be given by COR. If the equipment is not installed and maintained in accordance with the following provisions, the COR will withdraw permission for use of the equipment.
 - 2. Electrical installations used by the equipment shall be completed in accordance with the Drawings and Specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.

3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
 4. Any and all fees accrued to use such utilities and equipment shall be paid by the Contractor.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal shall be replaced with identical replacements at no additional cost to the Government.

1.18 TEMPORARY TOILETS

- A. Provide where directed, for use of all Contractor's workmen, ample temporary sanitary toilet accommodations with suitable sewer and water connections, or when approved by COR, provide suitable dry closets where directed. Keep such places clean and free from flies. All connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.

1.19 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing supplies, as specified in the Contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the COR, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity and/or water used for the purpose of determining charges. Before final acceptance of the Work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.
- C. The Contractor shall install meters at the Contractor's expense and furnish the Cemetery a monthly record of the Contractor's usage of electricity and/or water as hereinafter specified.
- D. Electricity (for Construction and Testing): Furnish all temporary electric services.
1. Obtain electricity by connecting to the local electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Where not available the Contractor shall supply power via portable generators at his own expense.
- E. Water (for Construction and Testing): Furnish temporary water service.
1. Obtain water by connecting to the local water distribution system. Provide reduced pressure backflow preventer at each connection. Comply with water purveyor's requirements for connection and use, including obtaining

and paying for permitting, metering, cross-contamination control, etc. and all costs to remove such connections.

- F. Fuel: Natural and LP gas required shall be furnished by the Contractor at Contractor's expense.

1.20 TESTS

- A. Conduct final tests required in various Sections of specifications in presence of an authorized representative of the COR. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- B. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- C. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.21 INSTRUCTIONS

- A. The Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various Sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals (four (4) copies each) for each separate piece of equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.
- C. Instructions: the Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical Sections. Instructions for different items of equipment that are component parts of a complete system shall be given

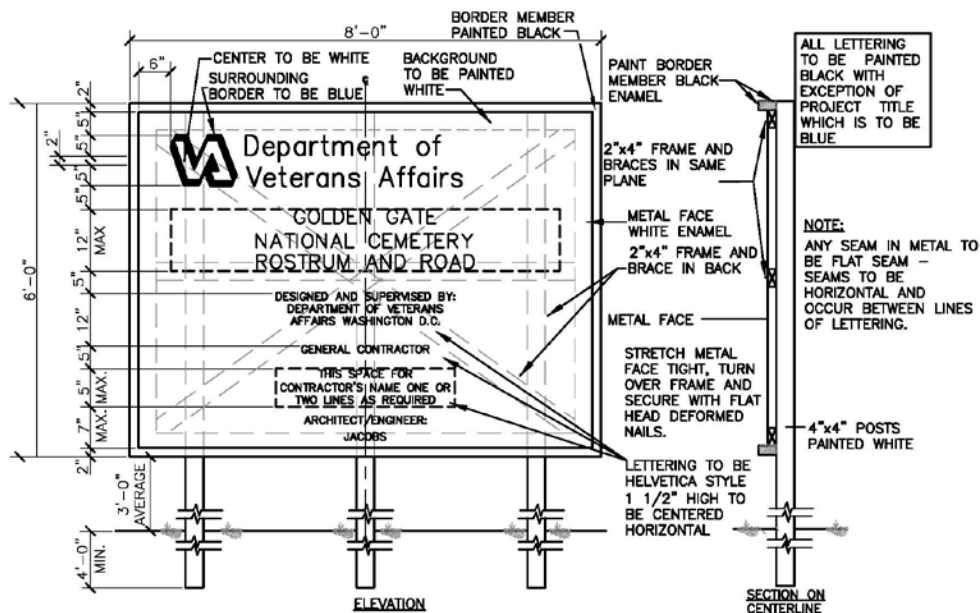
in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.22 RELOCATED ITEMS

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing items indicated by symbol "R" or otherwise shown to be relocated or salvaged and re-installed by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COR.
- C. Suitably cap existing service lines, such as water, drain, gas, air, and/or electrical, whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

1.23 CONSTRUCTION SIGN

- A. Provide a Construction Sign where directed by the COR. All wood members shall be of framing lumber. Cover sign frame with 24 gage galvanized sheet steel nailed securely around edges and on all bearings. Provide three 4 inch by 4 inch posts set four feet into ground. Set bottom of sign level at three feet above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with two by four inch material as directed.
- B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except Project title which shall be blue gloss paint.
- C. Maintain sign and remove it when directed by the COR.
- D. Detail drawing of construction sign showing required legend and other characteristics of sign is shown below:



PROJECT CONSTRUCTION SIGN (To Be Located as Approved by Cemetery Director)

NO SCALE

1.24 SAFETY SIGN

- A. Provide a Safety Sign where directed by COR. Face of sign shall be 3/4 inch thick exterior grade plywood. Provide two four by four inch posts extending full height of sign and three feet into ground. Set bottom of sign level at four feet above ground.
- B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.
- C. Maintain sign and remove it when directed by COR.
- D. Detail drawing of safety sign showing required legend and other characteristics of sign is shown below:



NO SCALE

- ## 1.25 CONSTRUCTION DIGITAL IMAGES

- 01 00 00 - 19
General Requirements

1. The images shall be forwarded electronically to the COR/Project Manager (PM) via email to margaret.jensen@va.gov (or other assigned COR/PM) within 2 days of when the photo was taken. Identify the content of each picture by a caption incorporated in the photo.
2. The digital photo files shall also be submitted on CD-ROM to the COR/Project Manager at the conclusion of the Project. The CD-ROM shall also contain an index of all the images contained therein in either a TXT or Microsoft Word format.

1.26 FINAL PHOTOGRAPHS

- A. Final photographs shall be taken by a commercial/professional photographer. They shall be taken upon completion, including landscaping. They shall be taken on a clear sunny day at as large a scale as possible to obtain sufficient detail to show depth and to provide clear, sharp pictures. All images shall become property of the Government.
- B. Photographs shall be artistically composed showing full front elevations of new rostrum, assembly area, overlook area, site features and surrounding landscapes. A minimum of thirty six (36) images shall be taken as per these specifications.
- C. Minimum digital photo file size for final photos is 20 MB uninterpolated, preferably 52 MB. Submit proofs, via e-mail or web photo gallery, from which the COR/PM will select the final images for printing.
- D. Pictures selected by the COR/PM for printing shall be printed on regular weight paper, matte finish archival grade photographic paper and produced by a RA4 process from the digital image with a minimum 300 PPI. Photographs shall have full picture print with no margin.
- E. Submit two (2) 16 x 20 framed prints and three (3) 8 x 10 prints of the final selected photos. Deliver to the COR/PM in boxes suitable for shipping.
- F. Submit a CD-ROM to the COR/PM containing all (minimum 36) final digital photo files.
 1. Images on CD-ROM shall be recorded in JPEG format with a minimum of 24 bit color and no reduction in actual picture size. Compressed size of the file shall be no less than 80% of the original with no loss of information.
 2. File names shall contain the date the image was taken, the Project number and a unique sequential identifier.
 3. The CD-ROM shall also contain an index of all the images contained therein in either a TXT or Microsoft Word format.
- G. Each of the selected 16 x 20 prints shall be placed in a frame with a minimum 2 inches, maximum 3 inches, of appropriate matting as a border. Submit a selection of 3 different mats and 3 different frames from which the COR will select one mat and one frame style to frame both prints. Preferred frame style is wood molding, matte black finish, box frame, 1-1/8" wide x 7/8-inch deep.

- H. Place a typewritten self-adhesive identity label on the back of each final print without damage to photograph. PHOTO NUMBER shall be included in both the digital file name on the CD and on the photo print label.
- I. The following information shall be on the identity-label for photographs:
 - 1. PHOTO NUMBER;
 - 2. CEMETERY: Golden Gate National Cemetery;
 - 3. LOCATION: San Bruno, CA;
 - 4. PROJECT TITLE: Renovate Rostrum and Roads;
 - 5. PROJECT NUMBER: 895CM3047;
 - 6. DATE TAKEN;
 - 7. CONSTRUCTION COMPANY;
 - 8. CONTRACT NUMBER.

1.27 HISTORIC PRESERVATION

- A. Where the Contractor or any of the Contractor's employees, prior to, or during the construction Work, are advised of or discover any possible archeological, historical and/or cultural resources, the Contractor shall immediately notify the COR verbally, and then with a written follow up.

1.28 PROJECT HEALTH AND SAFETY PLAN

- A. Prior to commencing any construction, the Contractor shall submit a site specific Project Health and Safety Plan (PHSP). At a minimum, the PHSP shall cover the following topics:
 - 1. Organizational structure (including Responsible Persons)
 - 2. Site Characterization and Job Hazard Identification
 - 3. Site Control and Security
 - 4. Training
 - 5. Medical Surveillance
 - 6. PPE
 - 7. Exposure Monitoring
 - 8. Heat Stress
 - 9. Spill Containment
 - 10. Decontamination
 - 11. Emergency Response
 - 12. Confined Spaces
 - 13. Hoisting Operations
 - 14. Trench Safety
 - 15. Lockout/Tagout

1.29 ARCHEOLOGICAL AWARENESS

- A. Purpose
 - 1. There were no findings of significance in the Project area. This does not preclude the existence of items or remains to be encountered during construction. The following information is provided to the Contractor in the event that items are encountered.

- B. Legal Responsibility
 - 1. Federal entities have a responsibility to protect specific Native American and public interests in historical and archaeological remains under laws and regulations such as the National Environmental Policy Act (NEPA) and Section 106 and Section 110 of the National Historic Preservation Act (NHPA) (16 USC 470), the Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001), and the Archaeological Resources Protection Act (ARPA) (16 USC 470aa-11). Theft or deliberate destruction of archaeological remains may be prosecuted as a felony under ARPA.
- C. Archaeological Remains
 - 1. Generally archaeological remains are understood to be the traces of the lives of prehistoric and historical people. In North America this includes both Native American and historical remains. Remains may include structural remains, debris, and the remains of the people themselves, discovered in marked or unmarked burials.
- D. Archaeological Phenomena
 - 1. Phenomena of interest to archaeology are generally found buried in the soil, though the presence of archaeological remains may sometimes be signaled by surface evidence. They include a broad range of objects and conditions including:
 - a. Midden accumulations – Soils for Earthwork types caused by human occupations. Midden is generally an accumulation of the waste and discarded materials from daily lives, including ash and charcoal from cooking fires, food remains such as bone, shell, and burned seeds, and discarded tools,
 - b. Features – fixed objects, hearths, structures, cairns, foundations, pipelines, and similar items,
 - c. Interments, both human and animal,
 - d. Artifacts – arrowheads, spear heads, shell beads and ornaments, historic table-wares, bottles, metal objects, ceramic, glass, and similar materials.
- E. Prehistoric Materials
 - 1. Prehistoric materials that are commonly recognized include chipped stone tools and weapon tips, milling tools such as mortars, pestles, hand stones and grinding slabs, and debris such as the flakes and pieces from stone working. Burials and other kinds of remains including hearths may also be found. Typical materials may include stone such as obsidian and flint or chert, shell, and bone.
- F. Historic Materials
 - 1. Historic materials to be aware of include ceramics, glass, metal, brick, cut stone, and wood, as well as food remains that include both animal bone and shell. Foundations and both abandoned and unmapped utilities in use may be encountered. Hollow features, such as wells or privies, often are filled with household debris upon abandonment and may be legally significant.

G. Resource Treatment – General Rule

1. Generally, when potentially important objects are discovered they need to be evaluated as quickly as possible. Halt Work in the location. Leave the discovery in place (if it is still in place) in the soil and establish an exclusion area around the find to buffer it from construction. If an object is found in spoils from trenching or grading, set it aside where it cannot be lost and notify the archaeological monitor immediately. If possible, halt excavation and construction Work where the spoils came from. Prehistoric or historic features such as burials, trash pits, foundations and similar finds made in place must be protected from further disturbance until the find can be evaluated. The Contractor shall halt construction within a five-meter radius of the outer edge of the find location. The exclusion area should be flagged to alert equipment operators. Discoveries such as interments should be covered with a tarp or loose soil to protect them from the elements and the curious.

H. Native American Issues

1. Native Americans have specific concerns regarding prehistoric sites, especially human burials. These remains are the direct evidence of their own ancestral past and the significance is direct and personal, not scientific interest or simple curiosity. They appreciate respectful treatment of such remains. This respectful treatment is mandated by Federal law and the right to define what respectful treatment consists of in general belongs to the most likely descendants. If, as part of the Native American handling of ancestral remains, ritual is conducted on site, maintain quiet and at a distance unless invited to observe or participate, in which case the officiating person will usually explain the rules for observers.
2. Note that the unauthorized removal of prehistoric or historic archaeological objects or the deliberate damage of archaeological sites on federal land may be a violation of Federal or State law.

I. Contacts

1. In all cases, the COR must be contacted prior to the notification of any other entity.
2. In case of exposed human remains (even one bone), immediately cease Work and call the COR and the Cemetery Director.
3. If other archaeological remains (prehistoric or historic) are uncovered during construction, the contractor shall stop Work and call the COR.

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SECTION 01 32 17

NETWORK ANALYSIS SCHEDULES (MICROSOFT PROJECT GANTT CHART)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Contractor shall develop a Microsoft Project 2003 (or later, if compatible with the VA's current software) Gantt Chart (bar chart) schedule demonstrating fulfillment of the Contract requirements. The Contractor shall keep the schedule up-to-date in accordance with the requirements of this Section. The Contractor shall utilize the plan for scheduling, coordinating, and monitoring Work under this Contract (including all activities of subcontractors, equipment vendors and suppliers). The Gantt Chart will be utilized to satisfy time and payment applications.

1.2 CONTRACTOR'S REPRESENTATIVE

- A. The Contractor shall designate an in-house representative who will be responsible to prepare the schedule, review the schedule and report progress of the Project to the COR.
- B. The Contractor's in-house representative shall be given authority to act on behalf of the Contractor in fulfilling the requirements of this specification Section. Such authority shall not be interrupted throughout the duration of the Project.

1.3 COMPUTER PRODUCED SCHEDULES

- A. The Contractor shall provide to CO/COR monthly computer processing of all computer produced schedules generated from monthly Project updates. The Contractor shall provide to CO/COR two (2) copies of the updated Microsoft Project Gantt Chart and an electronic copy of this data. This must be submitted with and substantively support the Contractor's monthly payment request.
- B. The Contractor is responsible for the correctness and timeliness of the computer-produced reports. The Contractor is also responsible for the accurate and timely submittal of the updated Project schedule.
- C. CO/COR shall report errors in computer-produced reports to the Contractor's representative within ten (10) calendar days from receipt of reports. The Contractor shall reprocess the Gantt Chart and associated CDs, when requested by the COR, to correct errors that affect the schedule for the Project.

1.4 THE COMPLETE PROJECT GANTT CHART SUBMITTAL

- A. The Complete Project Microsoft Project Gantt Chart will contain sufficient Work activities/events as necessary to fully detail the Project schedule.

- B. Within ten (10) calendar days after receipt of the Notice to Proceed, the Contractor shall submit for the COR's review, a Microsoft Project Gantt Chart and a CD. Each activity/event on the Gantt Chart schedule shall contain as a minimum, but not limited to, activity/event description, duration, start dates and finish dates. Activity constraints not required by the Contract will not be accepted. Logic events (non-Work) will be permitted where necessary to reflect proper sequence among Work events, but must have zero duration.
- C. The complete working Gantt Chart shall reflect the Contractor's approach to scheduling the complete Project. The final Gantt Chart in its original form shall contain no Contract changes or delays that may have been incurred during the final Gantt Chart development period. It shall reflect the Contractor's "AS BID" or "DAY 1" schedule. Changes and/or delays shall be entered at the first monthly update after the final Gantt Chart has been approved. The Contractor shall provide their requests for time and supporting time extension analysis for Contract time as a result of Contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.
- D. Within ten (10) calendar days after receipt of the complete project Gantt Chart, the Contracting Officer (CO) or his representative, will do one or both of the following:
 - 1. Notify the Contractor concerning his actions, opinions, and objections.
 - 2. Schedule a meeting with the Contractor at or near the job site, or via conference call, for joint review, correction or adjustment of the proposed plan. Within ten (10) calendar days after the joint review, the Contractor shall revise and shall submit two (2) copies of the revised Gantt Chart and a revised CD as specified to the CO/COR. The revised submission will be reviewed by the CO and, if found to be as previously agreed upon, will be approved.

1.5 WORK ACTIVITY/EVENT AND COST DATA INFORMATION

- A. The Contractor shall not be required to "cost load" the computerized Microsoft Project Gantt Chart. As part of this submission, the Contractor shall provide a separate Schedule of Costs on AIA document G703. This Schedule of Costs shall reflect and contain all the same activities/events identified on the Gantt Chart.
- B. The Contractor and the CO shall use this Schedule of Costs for monthly payment purposes as referenced in the General Conditions of this agreement.
- C. The Contractor and CO shall agree on percentages for monthly Work accomplished. The cumulative total amount of all cost loaded activities/events (including alternates) shall equal the total Contract price.
- D. Prorate overhead, profit and general conditions on all Work activities/events for the entire Project. Negative Work activity/event cost data will not be acceptable, except on VA issued Contract changes.

1.6 GANTT CHART REQUIREMENTS

- A. Show on the Gantt Chart the sequence and interdependence of Work activities/events required for complete performance of all items of Work. In preparing the Gantt Chart, the Contractor shall:
1. Show the following on each Work activity/event:
 - a. Concise description of the Work represented by the activity/event.
 - b. Duration (in work days).
 2. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction Work.
 - b. COR's and A/E's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
 - c. Interruption of VA Cemetery utilities, delivery of Government-furnished equipment, Project phasing and any other specification requirements.
 - d. Test, balance, and adjust various systems and pieces of equipment.
 - e. VA inspection and acceptance activity/event with a minimum duration of five (5) work days at the end of each phase and immediately preceding any VA move activity/event required by the Contract phasing for that phase.
 3. Break up the Work into activities/events of durations no longer than thirty (30) work days each, except as to non-construction activities/events (i.e. procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the CO may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals shall not be less than ten (10) workdays. The construction time as determined by the Gantt Chart schedule from start to finish for any sub-phase, phase or the entire project shall not exceed the total Contract duration. Describe Work activities/events clearly, so the Work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
 4. Exterior Label Information: Provide the following information on an external label attached to each diskette(s):
 - a. VA Project Number and Project location.
 - b. Name and telephone number of a point of contact, preferably the person who created the schedule.
 - c. The CD number and total number of CDs in the set.
 - d. The Project data status date.

1.7 PAYMENT TO THE CONTRACTOR

- A. Monthly, the Contractor shall submit the Gantt Chart updated for remaining activity durations and a Schedule of Costs updated for costs. AIA application and certification for payment documents G702 and G703 will be used. The payment request should reflect and be in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, PAYMENT UNDER

FIXED-PRICE CONSTRUCTION CONTRACTS of Section GENERAL CONDITIONS. The Contractor is entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated Schedule of Costs unless, in special situations, the Contracting Officer permits an exception to this requirement. Monthly payment requests shall include: two (2) copies of the updated Microsoft Project Gantt Chart, a listing of all project schedule changes, and associated data, made at the update. These must be submitted with and substantively support the Contractor's monthly application and certificate for payment request documents.

1. Monthly updates to the Gantt Chart shall include a summary of changes in the form of baseline duration/start/end dates and current month's variance from baseline duration/start/end dates.
- B. When the Contractor fails or refuses to furnish to the CO the information and the associated updated Gantt Chart data, which, in the sole judgment of the CO, are necessary for validating the monthly progress payment, the Contractor shall not be deemed to have provided supporting schedule data upon which progress payment may be reasonably determined.

1.8 PAYMENT AND PROGRESS REPORTING

- A. Monthly job site progress meetings shall be held on dates mutually agreed to by the CO/COR and the Contractor. Presence of subcontractors during the progress meeting is optional unless required by the CO/COR. Job progress will be reviewed to verify:
1. Actual start and/or finish dates for updated/completed activities/events.
 2. Remaining duration, required to complete each activity/event started, or scheduled to start, but not completed.
 3. Time and cost data for change orders, and supplemental agreements that are to be incorporated into the Gantt Chart.
 4. Percentage for completed and partially completed activities/events.
 5. Logic and duration revisions required by this Section of the specifications.
 6. Activity/event duration and percent complete shall be updated independently.
- B. The Contractor shall submit a narrative report as a part of his monthly review and update, in a form agreed upon by the CO. The narrative report shall include a description of problem areas; current and anticipated delaying factors and their estimated impact on performance of other activities/events and completion dates; and an explanation of corrective action taken or proposed. This report is in addition to the daily reports pursuant to the provisions of Article, DAILY REPORT OF WORKERS AND MATERIALS in the GENERAL CONDITIONS.
- C. As part of the monthly jobsite progress meeting, the General Contractor, specifically requested subcontractors, and the CO/COR shall meet to discuss the monthly updated schedule. The main emphasis shall be to address Work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period.

1.9 RESPONSIBILITY FOR COMPLETION

- A. Whenever it becomes apparent from the monthly progress review meeting or the monthly computer-produced Gantt Chart schedule that phasing or Contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
 - 1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of Work.
 - 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of Work.
 - 3. Reschedule the Work in conformance with the specification requirements.
 - 4. Remedial actions shall be at no additional cost to the Government.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the CO for the proposed schedule changes. If such actions are approved, the revisions shall be incorporated by the Contractor into the Gantt Chart before the next update, at no additional cost to the Government.

1.10 CHANGES TO GANTT CHART SCHEDULE

- A. Within ten (10) calendar days after VA acceptance and approval of any updated computer-produced schedule, the Contractor shall submit a revised Gantt Chart, the associated CDs, and a list of any activity/event changes including predecessors and successors for any of the following reasons:
 - 1. Delay in completion of any activity/event or group of activities/events, which indicate an extension of the project completion by twenty (20) working days or 10 percent of the remaining project duration, whichever is less. Such delays which may be involved with Contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the Gantt Chart as the direct cause for delaying the project beyond the acceptable limits.
 - 2. Delays in submittals, or deliveries, or Work stoppage are encountered which make rescheduling of the Work necessary.
 - 3. The schedule does not represent the actual prosecution and progress of the Project.
 - 4. When there is, or has been, a substantial revision to the activity/event costs of the network diagram regardless of the cause for these revisions.
- B. Revisions made under this paragraph, which affect the previously-approved computer-produced schedules for Government-furnished equipment, Contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, must be furnished in writing to the CO for approval.
- C. CO's approval for the revised Gantt Chart and all relevant data is contingent upon compliance with all other paragraphs of this Section and any other previous agreements by the CO/COR.

- D. The cost of revisions to the Gantt Chart resulting from Contract changes will be included in the cost of the change.
- E. The cost of revisions to the Gantt Chart not resulting from Contract changes is the responsibility of the Contractor.

1.11 ADJUSTMENT OF CONTRACT COMPLETION

- A. The Contract completion time will be adjusted only for causes specified in this Contract. Request for an extension of the Contract completion date by the Contractor shall be supported with a justification, Gantt Chart data and supporting evidence as the CO may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals.
- B. The CO's determination as to the total number of days of Contract extension will be based upon the current computer-produced Gantt Chart schedule for the time period when the change took place and all other relevant information. The CO will, within thirty (30) calendar days after receipt of such justification and supporting evidence, advise the Contractor in writing of his decision on the matter.
- C. The Contractor shall submit each request for a change in the Contract completion date to the CO in accordance with the provisions specified under Article CHANGES in the Section GENERAL CONDITIONS. The Contractor shall include, as a part of each change order proposal, a sketch showing all revisions, duration (in work days) changes, and cost changes, for Work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-Work activities/events such as RFI's, WEATHER, STRIKES, and similar non-Work activities/events shall be analyzed on a month by month basis.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

- 1.1 Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1.2 For the purposes of this Contract, samples, including laboratory samples to be tested, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1.3 Submit for approval all of the items specifically mentioned under the separate Sections of the specification, with information sufficient to evidence full compliance with Contract requirements. Materials, fabricated articles and the like to be installed in permanent Work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to and approved by CO that manufacturer cannot make scheduled delivery of approved item; or,
 - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity; or,
 - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1.4 Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of Contract-required items. Delays attributable to untimely and rejected submittals (including any laboratory samples or testing) will not serve as a basis for extending Contract time for completion.
 - A. The VA review period for submittals shall be 10 workdays.
- 1.5 Submittals will be reviewed for compliance with Contract requirements by A/E, and action thereon will be taken by COR on behalf of the CO.
 - A. Substitutions: Requests for substitution shall be submitted in writing, with full material information and product literature, justification for seeking substitution, and demonstration by the Contractor that the substitution requested meets or exceeds quality and/or performance of the specified Item. Contractor shall provide all required calculations. COR concurrence is required prior to providing submittal for substituted item.

- 1.6 Upon receipt of submittals, COR will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1.7 The Government reserves the right to require additional submittals, whether or not particularly mentioned in this Contract. If additional submittals beyond those required by the Contract are furnished pursuant to request therefore by CO, adjustment in Contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.
- 1.8 Schedules called for in Specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and A/E. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The CO and A/E assume no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1.9 Submittals must be submitted by Contractor only and shipped prepaid. CO assumes no responsibility for checking quantities or exact numbers included in such submittals.
 - A. Submit samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
 - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Cemetery, name of Contractor, Contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
 1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
 2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Cemetery, name of Contractor, manufacturer, brand, Contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
 4. Submit full sections. Partial section submittals shall not be acceptable.
 - C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests shall be tested, at the expense of Contractor, in a commercial laboratory approved by CO.
 1. Laboratory shall furnish CO with a certificate stating that it is fully equipped and qualified to perform intended Work, is fully acquainted with specification requirements and intended use of materials, and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.

2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
 3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
 4. Contractor shall send a copy of transmittal letter to both COR and to A/E simultaneously with submission of material to a commercial testing laboratory.
 5. Laboratory test reports shall be sent directly to COR for appropriate action.
 6. Laboratory reports shall list Contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
 7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.
- D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
- E. Approved samples will be kept on file by the COR at the site until completion of Contract, at which time such samples will be destroyed. On-site samples will be delivered to Contractor as Contractor's property. Where noted in technical Sections of Specifications, approved samples in good condition may be used in their proper locations in Contract Work upon written approval from the CO. At completion of Contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the Contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of Contract.
- F. Submittal drawings (shop, erection or setting drawings) and schedules, required for Work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with Contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
1. For each drawing required, submit one legible photographic paper or vellum reproducible.
 2. Reproducible shall be full size.
 3. Each drawing shall have marked thereon proper descriptive title, including Cemetery location, project number, manufacturer's number, reference to Contract drawing number, detail Section Number, and Specification Section Number.
 4. A space 4-3/4 by 5 inches shall be reserved on each drawing to accommodate approval or disapproval stamp.
 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
 7. When Work is directly related and involves more than one trade, shop drawings shall be submitted to A/E under one cover.

- 1.10 Samples, shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

A/E: _____

Address : _____

ATTN: Golden Gate National Cemetery Project Manager

Phone: _____

- A. Digital Submittals: Digital submittals will be permitted only after the Contractor has demonstrated that the process can be accommodated within the limits of the VA and A/E network limitations.
- 1.11 At the time of transmittal to the A/E, the Contractor shall also send a copy of the complete submittal directly to the COR.

Department of Veterans Affairs
National Cemetery Administration (41F1)
425 I Street, NW, 5E425H
Washington, DC 20001
ATTN: Ms. Peggy Jensen
Phone: 202.632.5895

END OF SECTION

SECTION 01 45 29

TESTING LABORATORY SERVICES – RETAINED BY CONTRACTOR

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained and paid for by Contractor.

1.2 RELATED DOCUMENTS

- A. Section 01 00 00, GENERAL REQUIREMENTS.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this Specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified. Use the latest edition of the referenced publication.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - T27 Sieve Analysis of Fine and Coarse Aggregates
 - T96 Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - T99 The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
 - T104 Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
 - T180 Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
 - T191 Density of Soil In-Place by the Sand-Cone Method
- C. American Society for Testing and Materials (ASTM):
 - A325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - A370 Definitions for Mechanical Testing of Steel Products
 - A490 Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
 - C31 Making and Curing Concrete Test Specimens in the Field
 - C33 Concrete Aggregates
 - C39 Compressive Strength of Cylindrical Concrete Specimens
 - C109 Compressive Strength of Hydraulic Cement Mortars
 - C138 Unit Weight, Yield, and Air Content (Gravimetric) of Concrete

C140.....	Sampling and Testing Concrete Masonry Units and Related Units
C143.....	Slump of Hydraulic Cement Concrete
C172.....	Sampling Freshly Mixed Concrete
C173.....	Air Content of freshly Mixed Concrete by the Volumetric Method
C330.....	Lightweight Aggregates for Structural Concrete
C567.....	Density Structural Lightweight Concrete
C780.....	Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019.....	Sampling and Testing Grout
C1064.....	Freshly Mixed Portland Cement Concrete
C1077.....	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
C1314.....	Compressive Strength of Masonry Prisms
C1364.....	Architectural Cast Stone
D698.....	Laboratory Compaction Characteristics of Soil Using Standard Effort
D1143.....	Piles Under Static Axial Compressive Load
D1188.....	Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556.....	Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557.....	Laboratory Compaction Characteristics of Soil Using Modified Effort
D2166.....	Unconfined Compressive Strength of Cohesive Soil
D2167.....	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216.....	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2974.....	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666.....	Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740.....	Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
D6938.....	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
E94.....	Radiographic Testing
E164.....	Ultrasonic Contact Examination of Weldments
E329.....	Agencies Engaged in Construction Inspection and/or Testing
E543.....	Agencies Performing Non-Destructive Testing
E709.....	Guide for Magnetic Particle Examination
E1155.....	Determining FF Floor Flatness and FL Floor Levelness Numbers

- D. American Welding Society (AWS):
D1.1-07..... Structural Welding Code-Steel

1.4 REQUIREMENTS

- A. Accreditation Requirements: Testing Laboratory retained and paid for by Contractor must be accredited by one or more of the National Voluntary Laboratory Accreditation Program (NVLAP) programs acceptable in the geographic region for the project. Furnish to the COR a copy of the Certificate of Accreditation and Scope of Accreditation. For testing laboratories that have not yet obtained accreditation by a NVLAP program, submit an acknowledgement letter from one of the laboratory accreditation authorities indicating that the application for accreditation has been received and the accreditation process has started, and submit to the COR for approval, certified statements, signed by an official of the testing laboratory attesting that the proposed laboratory, meets or conforms to the ASTM standards listed below as appropriate to the testing field.
1. Laboratories engaged in testing of construction materials shall meet the requirements of ASTM E329.
 2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C1077.
 3. Laboratories engaged in testing of bituminous paving materials must meet the requirements of ASTM D3666.
 4. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D3740.
 5. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to ASTM A880.
 6. Laboratories engaged in non-destructive testing (NDT) shall meet the requirements of ASTM E543.
 7. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA.
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by COR. When it appears materials furnished or Work performed by Contractor fail to meet construction Contract requirements, Testing Laboratory shall direct attention of COR to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to COR, A/E, and Contractor within 24 hours after each test is completed unless other arrangements are agreed to in writing by the COR. Submit reports of tests that fail to meet construction Contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to COR immediately of any irregularity.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EARTHWORK

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services

identified/required herein, within the agreed to schedule and/or time frame. The Work to be performed shall be as identified herein and shall include but not be limited to the following:

1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the COR regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to COR extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
2. Provide full time observation of fill placement and compaction and field density testing in retaining wall and rostrum areas and pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural (engineered) fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill, aggregate base, and subgrade material used, in compliance with ASTM D698, and in no case fewer than three (3) tests for each type.
2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556 or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the COR before the tests are conducted.
 - a. Rostrum and Assembly Area Subgrade: At least one test of subgrade for every 2,000 square feet of slab, but in no case fewer than three (3) tests. In each compacted fill layer, perform one test for every 2,000 square feet of overlaying slab, but in no case fewer than three (3) tests.
 - b. Wall Backfill: One test per 100 feet of each layer of compacted fill but in no case fewer than two (2) tests.
 - c. Pavement Subgrade: One test for each 400 square yards, but in no case fewer than four (4) tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 300 feet, but in no case fewer than four (4) tests.
 - e. Trenches: One test at maximum 100 foot intervals per 4 foot of vertical lift and at changes in required density, but in no case fewer than four (4) tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to COR. In each compacted fill layer below wall footings, perform one field density test for every 100 feet of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and

correlate actual soil conditions observed with those indicated by test borings.

- C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- D. Testing Materials: Test suitability of on-site and off-site borrow as directed by COR.

3.2 ASPHALT CONCRETE PAVING

- A. Aggregate Base Course:
 - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with ASTM D1557, Method D.
 - 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with ASTM D1556.
 - 3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.
- B. Asphalt Concrete:
 - 1. Aggregate: Sample and test aggregates in stock pile and hot bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).
 - 2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
 - 3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.3 SITE WORK CONCRETE

- A. Test site work concrete including materials for concrete as required in Article CONCRETE of this section.

3.4 CONCRETE

- A. Batch Plant Inspection and Materials Testing:
 - 1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of COR with concurrence of CO and perform periodic inspections thereafter as determined by COR.
 - 2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to COR.
 - 3. Sample and test mix ingredients as necessary to insure compliance with specifications.
 - 4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.

5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate Project site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.
- B. Field Inspection and Materials Testing:
1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
 2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
 3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 50 cubic yards or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. After good concrete quality control has been established and maintained as determined by COR make three cylinders for each 100 cubic yards or less of each concrete type, and at least three cylinders from any one day's pour for each concrete type. Label each cylinder with an identification number. COR may require additional cylinders to be molded and cured under job conditions.
 4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
 5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 25 cubic yards thereafter each day. For concrete not required to be air-entrained, test every 100 cubic yards at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
 6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
 7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete. Test the first truck and each time cylinders are made.
 8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
 9. Verify that specified mixing has been accomplished.
 10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 40 degrees F, record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.

- b. When ambient air temperature rises above 85 degrees F, record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
 - 11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
 - 12. Observe conveying, placement, and consolidation of concrete for conformance to Specifications.
 - 13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
 - 14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
 - 15. Observe preparations for placement of concrete:
 - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - b. Inspect preparation of construction, expansion, and isolation joints.
 - 16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
 - 17. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.
 - 18. Measure concrete flatwork for levelness and flatness as follows:
 - a. Perform Floor Tolerance Measurements FF and FL in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
 - b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
 - c. Provide the Contractor and the COR with the results of all profile tests, including a running tabulation of the overall FF and FL values for all slabs installed to date, within 72 hours after each slab installation.
 - 19. Other inspections:
 - a. Grouting anchor bolts and reinforcing steel in hardened concrete.
- C. Laboratory Tests of Field Samples:
- 1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by COR. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
 - 2. Furnish certified compression test reports (duplicate) to COR. In test report, indicate the following information:
 - a. Cylinder identification number and date cast.
 - b. Specific location at which test samples were taken.
 - c. Type of concrete, slump, and percent air.
 - d. Compressive strength of concrete in psi.

- e. Weather conditions during placing.
- f. Temperature of concrete in each test cylinder when test cylinder was molded.
- g. Maximum and minimum ambient temperature during placing.
- h. Ambient temperature when concrete sample in test cylinder was taken.
- i. Date delivered to laboratory and date tested.

3.5 REINFORCEMENT

- A. Review mill test reports furnished by Contractor.
- B. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.
- C. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.
- D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

3.6 ARCHITECTURAL CAST STONE

- A. Perform testing according to ASTM C1364 or verify compliance by reviewing previous test results of same product.
- B. Inspect the plant to verify that specification requirements for curing and finishes have been met.

3.7 MASONRY

- A. Mortar Tests:
 - 1. Laboratory compressive strength test:
 - a. Comply with ASTM C780.
 - b. Obtain samples during or immediately after discharge from batch mixer.
 - c. Furnish molds with 2 inch, 3 compartment gang cube.
 - d. Test one (1) sample at 7 days and two (2) samples at 28 days.
 - 2. Two tests during first week of operation; one test per week after initial test until masonry completion.
- B. Grout Tests:
 - 1. Laboratory compressive strength test:
 - a. Comply with ASTM C1019.
 - b. Test one (1) sample at 7 days and two (2) samples at 28 days.
 - c. Perform test for each 2,500 square feet of masonry.
- C. Masonry Unit Tests:
 - 1. Laboratory compressive strength test:
 - a. Comply with ASTM C140.
 - b. Test three (3) samples for each 5,000 square feet of wall area.

- D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 5,000 square feet of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.
- E. Field Inspection and Materials Testing:
 - 1. Verify the following prior to grouting:
 - a. Grout space is clean.
 - b. Type, spacing, and placement of reinforcement, connectors, and anchors comply with the Contract requirements.

3.8 STRUCTURAL STEEL

- A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with Contract Documents. Welding shall conform to AWS D1.1 Structural Welding Code.
- B. Prefabrication Inspection:
 - 1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
 - 2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
 - 3. Approve welder qualifications by certification or retesting.
 - 4. Approve procedure for control of distortion and shrinkage stresses.
 - 5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.
- C. Fabrication and Erection:
 - 1. Weld Inspection:
 - a. Inspect welding equipment for capacity, maintenance and working condition.
 - b. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
 - c. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
 - d. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
 - e. Measure 25 percent of fillet welds.
 - f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
 - 1) 20 percent of all shear plate fillet welds at random, final pass only.
 - 2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
 - 3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
 - 4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
 - 5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.

- g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
 - h. Welding Radiographic Testing: Test in accordance with ASTM E94, and AWS D1.1 for 5 percent of all full penetration welds at random.
 - i. Verify that correction of rejected welds are made in accordance with AWS D1.1.
 - j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
2. Bolt Inspection:
- a. Inspect high strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts.
 - b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
 - c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. Inspect all bolts in connection when one or more are rejected.
 - d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.
 - e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.
 - f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to COR.

3.9 TYPE OF TEST

		Approximate Number of Tests Required
A.	Earthwork:	
	Laboratory Compaction Test, Soils (ASTM D698)	9
	Field Density, Soils (ASTM D6938)	30
	Penetration Test, Soils	3
B.	Aggregate Base:	
	Laboratory Compaction (ASTM D1557)	3
	Field Density (ASTM D1556)	9

	Aggregate, Base Course	
	Gradation (AASHTO T27)	1
	Wear (AASHTO T96)	1
	Soundness (AASHTO T104)	1
C.	Asphalt Concrete:	
	Field Density (ASTM D1188)	3
	Aggregate, Asphalt Concrete	
	Gradation (AASHTO T27)	1
	Wear (AASHTO T96)	1
	Soundness (AASHTO T104)	1
D.	Concrete:	
	Making and Curing Concrete Test Cylinders (ASTM C31)	15
	Compressive Strength, Test Cylinders (ASTM C39)	5
	Concrete Slump Test (ASTM C143)	5
	Concrete Air Content Test (ASTM C173)	30
	Aggregate, Normal Weight:	
	Gradation (ASTM C33)	1
	Deleterious Substances (ASTM C33)	1
	Soundness (ASTM C33)	1
	Abrasion (ASTM C33)	1
E.	Reinforcing Steel:	
	Tensile Test (ASTM A370)	2
	Bend Test (ASTM A370)	2
	Mechanical Splice (ASTM A370)	1
	Welded Splice Test (ASTM A370)	1
F.	Masonry:	
	Making and Curing Test Cubes (ASTM C109)	12
	Compressive Strength, Test Cubes (ASTM C109)	6
	Sampling and Testing Mortar, Comp. Strength (ASTM C780)	3
	Sampling and Testing Grout, Comp. Strength (ASTM C1019)	3
	Masonry Unit, Compressive Strength (ASTM C140)	3
	Prism Tests (ASTM C1314)	1
G.	Structural Steel:	
	Ultrasonic Testing of Welds (ASTM E164)	1
	Magnetic Particle Testing of Welds (ASTM E709)	1
	Radiographic Testing of Welds (ASTM E94)	1

END OF SECTION

SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this Section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, and solid waste, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various Contract items of Work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely affect human health or welfare.
 - 2. Unfavorably alter ecological balances of importance to human life.
 - 3. Affect other species of importance to humankind.
 - 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.

1.2 DEFINITIONS OF POLLUTANTS

- A. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
- B. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
- C. Sediment: Soil and other debris that has been eroded and transported by runoff water.
- D. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from project construction activities.
- E. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "waters of the United States" and require a permit to discharge water from the Governing Agency.
- F. Rubbish: Combustible and noncombustible wastes such as, but not limited to, paper, plastic, metal and plastic containers and cans, boxes, metal and lumber scrap.
- G. Sanitary Wastes: Domestic sanitary sewage.

1.3 QUALITY CONTROL

- A. Contractor shall establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Contractor shall record on daily reports any problems in complying with laws, regulations, and ordinances and note any corrective action taken.

1.4 REFERENCES

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Federal Environmental Regulatory Requirements: Comply with applicable regulations. The following is for Contractor's information only:
 - 1. Storm water permits; refer to The Office of Wastewater Management, NPDES Storm Water Program: <http://www.epa.gov/npdes/stormwater>
 - 2. RCRA hazardous and non-hazardous solid waste requirements; refer to EPA's Office of Solid Waste and Emergency Response: <http://www.epa.gov/epaoswer/osw/laws-reg.htm>
 - 3. Oil spill requirements for construction activities; refer to EPA Oil Program web site: <http://www.epa.gov/oilspill/>
 - 4. Hazardous substances (Superfund Liability) requirements for construction activities; refer to EPA's Superfund website: <http://www.epa.gov/superfund/index.htm>
 - 5. Air quality requirements for construction activities; refer to EPA'S Air Program Mobile Sources Page: <http://www.epa.gov/ebtpages/airmobilesources.html>
 - 6. Asbestos requirements for construction activities; refer to EPA's Asbestos Management and Regulatory Requirements Website: <http://www.epa.gov/fedsite/cd/asbestos.html>
 - 7. National Environmental Policy Act (NEPA) requirements for construction activities
 - 8. National Historic Preservation Act
- C. State and Local Environmental Regulatory Requirements: Comply with applicable regulations. The following is for Contractor's information only:
 - 1. State Office/Department of Environmental Quality – California Environmental Protection Agency (Cal/EPA).
 - 2. Local Office/Department of Environmental Quality – San Bruno / San Mateo County.
 - 3. The Construction Industry Compliance Assistance Center: <http://www.cicacenter.org/index.cfm>
 - 4. The National Environmental Compliance Assistance Clearinghouse: <http://cfpub.epa.gov/clearinghouse/>

1.5 SUSTAINABILITY REQUIREMENTS

- A. Materials in this section may contribute towards contract compliance with sustainability requirements.
- B. Biobased Material: For products designated by the USDA's BioPreferred® program, provide products that meet or exceed USDA recommendations for biobased content, subject to the products compliance with performance requirements in this Section. For more information regarding the product categories covered by the BioPreferred® program, visit <http://www.biopreferred.gov>.

1.6 SUBMITTALS

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the Contractor shall furnish the following:
 - 1. Environmental Protection Plan: After the Contract is awarded and prior to the commencement of the Work, the Contractor shall meet with the COR to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the COR for approval a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - a. Name(s) and qualifications of person(s) within the Contractor's organization who is (are) responsible for:
 - 1) Ensuring adherence to the Environmental Protection Plan.
 - 2) Manifesting hazardous waste to be removed from the site.
 - 3) Training the Contractor's environmental protection personnel.
 - b. Description of the Contractor's environmental protection personnel training program.
 - c. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
 - d. Methods for protection of features to be preserved within authorized Work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - e. Procedures to provide environmental protection that complies with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - f. Permits, licenses, and the location of the solid waste disposal area.
 - g. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan

approved by the State Water Resources Control Board / Regional Water Quality Control Board and the Department of Veterans Affairs.

- h. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - i. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of construction limits or protected areas. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- B. Within 20 days after the date of its submittal, the COR shall approve the Contractor's Comprehensive Environmental Protection Plan, or respond with an explanation for its rejection and required resubmittal.
- C. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.7 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the Project boundaries and those affected outside the limits of permanent Work during the entire duration of this Contract and after the Project is complete. Confine construction activities to areas defined by construction limits in the Specifications and Drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the Work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, land forms, wetlands or wetland buffers without prior approval from the COR. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or dictated by special emergency use.
 - 1. Work Area Limits: Prior to any construction, mark/fence/protect the areas that require Work to be performed under this Contract. Mark/fence/protect monuments, works of art, and markers prior to construction. Convey to all personnel the purpose of marking and protecting all marked and protected objects.
 - 2. Protection of Specific Regulated Elements: Wetlands and wetland buffers and other landscape features shown on the Construction Documents to be preserved by marking, fencing, or using any other approved protective techniques.
 - a. Protect trees and shrubs to remain on site to protect from damage per Contract details.
 - b. All damage to existing trees and shrubs shall be immediately repaired by trimming, cleaning, and painting with antiseptic tree paint.
 - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
 - 3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear

- areas only as needed to use to work the area to be developed. Form earthwork to final grade as shown as quickly as possible to minimize potential erosion damage. Immediately protect side slopes and back slopes upon completion of rough grading or clearing with appropriate material as defined in the Erosion and Sediment Control Plan.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, check dams and berms to retard and divert run-on and runoff from the construction site to protected drainage areas as intended under paragraph 208 of the Clean Water Act.
 - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 2 year storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
 - b. Reuse or conserve the collected topsoil sediment as directed by the COR. Topsoil use and requirements are specified in Section 31 20 00, EARTH MOVING.
 - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
 5. Erosion and Sedimentation Control Devices: Construct or install temporary and permanent erosion and sedimentation control features to avoid violating water quality in accordance with Federal and State regulations. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
 6. Manage and control spoil areas on Government property to minimize erosion and to prevent soil and/or sediment from entering nearby water courses.
 7. Protect adjacent areas from despoilment by temporary excavations and embankments.
 8. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
 9. Store chemical waste away from the Work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 10. Handle discarded materials other than those included in the solid waste category as directed by the COR.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in sediment basins prior to entering retention/detention ponds, allowing

- the suspended material to settle, the pollutants to separate, or the water to evaporate.
2. Monitor water areas, wetlands and wetland buffers affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list protected species that require specific attention along with measures for their protection.
- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of California Air Resources Board and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials at all times, including weekends, holidays, and hours when Work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, spoil areas, borrow areas, and all other Work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, or other methods are permitted to control particulates in the Work area as approved in the Environmental Protection Plan.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Noise Control: Minimize noise using every action possible. Perform noise-producing Work in less sensitive hours of the day or week as directed by the COR. Maintain noise-produced Work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m. unless otherwise permitted by local ordinance or the COR. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

- a. Maintain maximum permissible construction equipment noise levels at 50 feet (dBA):

EARTHMOVING		MATERIALS HANDLING	
Front Loaders	75	Concrete Mixers	75
Backhoes	75	Concrete Pumps	75
Dozers	75	Cranes	75
Tractors	75	Derricks Impact	75
Scrapers	80	Pile Drivers	95
Graders	75	Jack Hammers	75
Trucks	75	Rock Drills	80
Pavers, Stationary	80	Pneumatic Tools	80
Pumps	75		
Generators	75	Saws	75
Compressors	75	Vibrators	75

- b. Provide soundproof housings or enclosures for noise-producing machinery.
 - c. Use efficient silencers on equipment air intakes.
 - d. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
 - e. Line hoppers and storage bins with sound deadening material.
 - f. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while Work is being performed above 75 dBA noise level. Measure noise exposure at the property line or 50 feet from the noise source, whichever is greater. Measure the sound levels on the A weighted sound level of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at three to six feet in front of any building face. Submit the recorded information to the COR noting any problems and the alternatives for mitigating actions.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition as approved by the COR. The site shall be left meeting the requirements of the local and state environmental requirements associated with the Storm Water Pollution Protection Plan (SWPPP) as submitted. Cleaning shall include off-Cemetery disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new Work operations, clearing, logging and general construction in accordance with State and local regulations and the Contract.
 - 1. Contractor shall provide all documentation required to allow for terminating coverage under the Construction General Permit via SMARTS.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this Section specifies the requirements for the management of non-hazardous demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled, or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle, not limited to the following:
 - 1. Waste Management Plan development and implementation.
 - 2. Techniques to minimize waste generation.
 - 3. Sorting and separating of waste materials.
 - 4. Salvage of existing materials and items for reuse or resale.
 - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (e.g., concrete, masonry and asphalt).
 - 3. Clean dimensional wood and palette wood.
 - 4. Green waste (biodegradable landscaping materials).
 - 5. Metal products (e.g., steel, wire, beverage containers, etc).
 - 6. Cardboard, paper and packaging.
 - 7. Plastics (e.g., ABS, PVC).
 - 8. Paint.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 02 41 10, DEMOLITION.

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing construction products. Processes shall be employed to ensure the generation of as little waste as possible. Construction/Demolition waste includes products of the following:
 - 1. Excess or unusable construction materials.
 - 2. Packaging used for construction products.
 - 3. Poor planning and/or layout.
 - 4. Construction error.

5. Over ordering.
 6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to reuse and recycle new materials to maximum extent practical.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the Contractor.
- E. Contractor shall provide all demolition, removal, and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, State, and/or Federal regulations. The Whole Building Design Guide website (<http://www.wbdg.org>) provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.
- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse, and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

- E. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- F. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- G. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- H. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- I. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- J. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- K. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling – Materials that are sorted and processed on site for use in an altered state in the Work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling – Materials hauled to a location and used in an altered form in the manufacture of new products.
- L. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- M. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- N. Return: To give back reusable items or unused products to vendors for credit.
- O. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- P. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.

- Q. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- R. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:
- B. Prepare and submit to the COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
 - 1. Procedures to be used for debris management.
 - 2. Techniques to be used to minimize waste generation.
 - 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, and/or recycled.
 - b. List of each material and quantity proposed to be taken to a landfill.
 - 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - c. The names and locations of mixed debris reuse and recycling facilities or sites.
 - d. The names and locations of trash disposal landfill facilities or sites.
 - e. Documentation that the facilities or sites are approved to receive the materials.
 - 5. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- C. Prepare and submit monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the Work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.

U.S. Green Building Council (USGBC):
LEED Green Building Rating System for New Construction

1.1 RECORDS

- A. Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.
 - 1. The Project is not seeking LEED Certification. Records are to be provided for Government's use.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, and/or reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

- A. Provide all necessary containers, bins, and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins, and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, State, and/or Federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with State and Federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.
- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, and invoices. Include the net total costs for each disposal.

END OF SECTION

SECTION 01 81 11

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section describes general requirements and procedures to comply with various federal mandates for sustainable design, including the Guiding Principles for Leadership in High Performance and Sustainable Buildings Memorandum of Understanding incorporated in the Executive Orders 13423 and 13514; Energy Policy Act of 2005 (EPA 2005) and the Energy Independence and Security Act of 2007 (EISA 2007).

1.2 OBJECTIVES

- A. General:
1. Maximize resource efficiency and reduce the environmental impacts of construction and operation.
 2. Include environmental considerations as part of the normal purchasing process.
 3. Emphasize pollution prevention early in the purchasing process.
 4. Examine multiple environmental attributes throughout a product's or service's life cycle.
 5. Compare relevant environmental impacts when selecting products and services.
 6. Collect and base purchasing decisions on accurate and meaningful information about environmental performance.
 7. Preserve and restore the site ecosystem and biodiversity; avoid site degradation and erosion. Minimize offsite environmental impact.
 8. Reduce construction waste through reuse, recycling, and supplier take-back.
 9. Consider the durability, maintainability, and flexibility of site systems.
- B. Conform to the EPA's Five Guiding Principles for Federal Leadership in High Performance and Sustainable Building as per the Memorandum of Understanding, as follows:
1. Employing integrated design: As specified and as follows:
 - a. ASTM E2348, Standard Guide for Framework for a Consensus-based Environmental Decision making Process.
 - b. ASTM E2432 Standard Guide for General Principles of Sustainability Relative to Buildings.
 2. Protecting and conserving water: As specified and as follows:
 - a. Water stewardship: EPA WaterSense, and FEMP Best Management Practices for Water Conservation.
 3. Reducing the environmental impact of materials: As specified and as follows:
 - a. Recycled Content Products: EPA Comprehensive Procurement guidelines.

b. Biobased Content Products: USDA Biopreferred.

- C. The A/E has selected materials and utilized design processes that achieve the above objectives to the extent currently possible and practical. The Contractor is responsible to maintain and support these objectives in developing means and methods for performing the work and in proposing product substitutions and/or changes to specified processes. By submitting a change or substitution of materials or processes, the Contractor must demonstrate its diligence in performing the level of investigation and comparison encouraged under the EPA's Five Guiding Principles.

1.3 RELATED DOCUMENTS

- A. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

1.4 DEFINITIONS

- A. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19.
- B. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock.
- C. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use.
- D. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 "Guidelines for the Use of Environmental Marketing Claims":
www.ftc.gov/bcp/grnrule/guides980427.
- E. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured.
- F. Sealant: Any material that fills and seals gaps between other materials.
- G. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.
- H. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical

reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

1.5 SUBMITTALS

- A. Sustainability Action Plan:
 - 1. Within 30 days of after Preconstruction Meeting, the General Contractor must provide a narrative plan for complying with the objectives, product requirements and construction operations' environmental controls stipulated within this section.
 - 2. The plan must make reference to the following sustainable design submittals defined by this section an either attached to report or provided within time periods allowed:
 - a. Project Materials Cost Data spreadsheet.
 - b. Construction Waste Management Plan.
- B. Sustainable Design Submittals:
 - 1. Heat Island Effect:
 - a. Site Paving: Provide manufacturer's cut sheets for all impervious paving materials, highlighting the Solar Reflectance Index (SRI) of the material.
 - 2. Salvaged or Reused Materials: Provide documentation that lists each salvaged or reused material, the source or vendor of the material, the purchase price, and the replacement cost if greater than the purchase price.
 - 3. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation: Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product.
 - a. An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.
 - 4. Exterior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on ambient air quality, must include manufacturer's MSDSs or other manufacturer's Product Data highlighting VOC content.
 - 5. Refer to technical specifications for additional submittal requirements related to sustainability goals.
- C. Project Materials Cost Data: Provide a spreadsheet in an electronic file indicating the total cost for the Project and the total cost of building materials used for the Project, as follows:

1. Not more than 30 days after the Preconstruction Meeting, the General Contractor shall provide to the COR and A/E a preliminary schedule of materials costs for all materials used for the Project organized by specification section. Exclude labor costs. Include the following:
 - a. Identify each reused or salvaged material, its cost, and its replacement value.
 - b. Identify each recycled-content material, its post-consumer and pre-consumer recycled content as a percentage the product's weight, its cost, its combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value), and the total combined recycled content value for all materials as a percentage of total materials costs.
 2. Provide final versions of the above spreadsheets to the COR and A/E not more than 14 days after Substantial Completion.
- D. Construction Waste Management: See Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT for submittal requirements.
- E. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:
1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

1.6 QUALITY ASSURANCE

- A. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with COR, A/E, and all Subcontractors to discuss the Sustainability Action Plan content as it applies to Construction Waste Management Plan and all other Sustainable Design Requirements. The purpose of this meeting is to develop a mutual understanding of the Project's Sustainable Design Requirements and coordination of the Contractor's management of these requirements with the COR.
- B. Construction Job Conferences: The status of compliance with the Sustainable Design Requirements of these specifications will be an agenda item at all regular job meetings conducted during the course of work at the site.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Society for Testing and Materials (ASTM):
E2348-06(2010)..... Framework for a Consensus-based Environmental
Decision-making Process

- C. Shop Drawings:
 - 1. Submit Steel Reinforcement Shop Drawings and Product Data to include all information necessary for fabrication and placement of reinforcement.
 - 2. Indicate grades of reinforcing steel.
 - 3. Clearly indicate the splice length for every size and type of bar used.
 - 4. Indicate the type, size and location of all accessories required for the proper assembly, placement and support of the reinforcement.
 - 5. Provide layout drawings of all floor slabs and formed concrete indicating control and expansion joints.

PART 2 - PRODUCTS

2.1 PRODUCT ENVIRONMENTAL REQUIREMENTS

- A. Site Clearing: Topsoil to be provided by the Contractor from on-site material which has been stockpiled for reuse. Off-site borrow should only be used when on-site sources are exhausted. Chip and/or compost on site all vegetated material identified for removal.
- B. Do not burn rubbish, organic matter, etc. or any material on the site; dispose of such material legally in accordance with Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- C. Exterior Lighting Fixtures:
 - 1. No lighting of building facades or landscape features is permitted.
- D. Herbicides and Pest Control: Herbicides shall not be permitted, and pest control measures shall utilize EPA-registered biopesticides only.
- E. Salvaged or Reused Materials: There shall be no substitutions for specified salvaged and reused materials and products.
- F. Recycled Content of Materials:
 - 1. Provide construction materials with recycled content such that post-consumer recycled content value plus half the pre-consumer recycled content value constitutes a minimum of 30% of the cost of materials used for the Project. The Contractor shall make all attempts to maximize the procurement of materials with recycled content.
 - a. The post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content by the total weight of the material and multiplying by the cost of the material.
 - b. Do not include labor and delivery costs in the calculations.
 - c. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).
 - d. Utilize all on-site existing paving materials that are scheduled for demolition as granulated fill, provided that Contractor can show that it meets requirements of the specification, and include the

cost of this material had it been purchased in the calculations for recycled content value.

2. Contractor is obligated by contract to satisfy Federal mandates for procurement of products and materials meeting recommendations for post-consumer content and recovered materials content; the list of designated product categories with recommendations has been compiled by the EPA - refer to <http://www.epa.gov/wastes/conservation/tools/cpg/products/>.
 - a. Complying with the mandate requirements may exceed the minimum limits set by this section; otherwise, additional product and material selections with recycled content must be provided, as determined by Contractor's Sustainability Action Plan.
 - b. The EPA website includes lists prepared for the Federal Comprehensive Procurement Guidelines; the website also provides tools such as a Product Supplier Directory search engine and product resource guides.
 - c. EPA Categories include, but not limited to:
 - 1) Cement and concrete.
 - 2) Flowable fill.
 - 3) Nonpressure pipe.
 - 4) Compost and fertilizer made from recovered organic materials.
 - 5) Lawn and garden edging.

G. Biobased Content:

1. Subject to conformance with drawings and specifications, provide products designated by the USDA's BioPreferred program; provide other products and material made from biobased materials to the maximum extent possible without jeopardizing the intended end use or detracting from the overall quality delivered to the National Cemetery Administration. All supplies and materials shall be of a type and quality that conform to applicable specifications and standards.
2. Biobased products that are designated for preferred procurement under USDA's BioPreferred program must meet the required minimum biobased content. Refer to [Http://www.biopreferred.gov/ProductCategories.aspx](http://www.biopreferred.gov/ProductCategories.aspx) for the product categories and <http://www.biopreferred.gov/bioPreferredCatalog/faces/jsp/catalogLanding.jsp> for the BioPreferred Catalog. Submit data for the biobased products to include biobased content and source of biobased material; indicating the name of the manufacturer, cost of each material, and the intended use of each of the materials that are to be used in carrying out the requirements of the contract.
3. Provide biobased products to the greatest extent possible.

H. Construction Operations' Environmental Aspects, Impacts and Controls: Monitor environmental aspects and impacts of Contractor's operations (including identification and pursuit of controls on and mitigation of adverse impacts) and as follows:

1. Climate Change and Air Pollution Control: Environmental aspects of and controls on Contractor operations related to climate change include Greenhouse Gas (GHG) emissions associated with construction

equipment. Environmental aspects of and controls on Contractor operations related to criteria air pollutants include particulate matter (PM) and nitrogen oxides (NOx) emissions associated with construction equipment.

a. Documentation: Maintain the following records for review on request basis.

- 1) For diesel powered equipment, indicate number and type of construction equipment that utilizes emission control technologies complying with 2008 pollution requirements for new diesel engines.
- 2) GHG emissions: Document estimated GHG emissions of equipment used on the project. Calculate GHG emissions from mobile combustion in accordance with the EPA Climate Leaders protocols <http://www.epa.gov/climateleaders/resources/> Indicate quantity of fuel by type used and provide estimate for comparison to industry standard.
- 3) Air Pollution Control: Document the current emissions of the equipment. Calculate the emissions reduced with the selected option applied to the equipment in accordance with the Diesel Emissions Quantifier (www.epa.gov/cleandiesel) protocols. Indicate the change in emissions.

2. Water Stewardship: Environmental aspects of and controls on Contractor operations related to water stewardship include quantity and quality of discharges to surface water and ground water. Refer to soil and erosion control requirements within the drawings and specifications.

3. Noise Control: Perform operations to minimize noise; perform noise-producing work with heavy equipment during less sensitive hours of the day or week.

- a. The noise source cannot exceed 60 dBA from 7:00 a.m. to 6:00 p.m.
- b. Operations in other times must be performed under the constraints established at the need of each occurrence.

4. Air Resources:

- a. Prevent creation of dust, air pollution, and odors.
- b. Sequence construction to avoid disturbance to Site to the greatest extent possible.
- c. Use mulch, water sprinkling, temporary enclosures, and other appropriate methods to limit dust and dirt rising and scattering in air to lowest practical level. Do not use water when it may create hazardous or other adverse conditions such as flooding and pollution.
- d. Store volatile liquids, including fuels and solvents, in closed containers.
- e. Properly maintain equipment to reduce gaseous pollutant emissions.
- f. Dust Suppressants:
 - 1) Products formulated to reduce or eliminate the spread of dust associated with gravel roads, dirt parking lots, or similar sources of dust.

- 2) If employing these materials, products must include minimum 85 percent biobased content.
- g. Provide construction dust control to comply with SCAQMD Rule 403.

END OF SECTION

SECTION 02 41 10

DEMOLITION AND SITE CLEARING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this Section specifies all site preparation Work, demolition and removal of structures, pavements, and utilities and other structures and debris.

1.2 RELATED WORK

- A. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- E. Waste Management: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- F. Demolition and removal of roads, walks, curbs, and on grade slabs outside buildings to be demolished: Section 31 20 00, EARTH MOVING.

1.3 PROTECTION

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities, and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required, for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.10 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or

objectionable condition such as, but not limited to, ice, flooding, or pollution.
Vacuum or use sweeper at the Work area daily.

- E. In addition to previously listed fire and safety rules to be observed in performance of Work, include following:
 - 1. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
 - 2. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 15 feet of fire hydrants.
- F. Before beginning any demolition Work, the Contractor shall survey the site and examine the Drawings and Specifications to determine the extent of the Work. The Contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Cemetery; any damaged items shall be repaired or replaced as approved by the COR. The Contractor shall coordinate the Work of this Section with all other Work and shall construct and maintain shoring, bracing, and supports as required. Repairs, reinforcement, or replacement must have COR's approval.
- G. The Work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- H. The Work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROJECT HEALTH AND SAFETY.

1.4 UTILITY SERVICES

- A. Demolish and remove outside utility service lines shown to be removed. Cap ends of utility services lines at end of removals. Verify all connecting pipes are indicated on the plan prior to capping any utility lines. If any utility is not as indicated, notify the COR immediately.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SITE CLEARING

- A. General: Remove trees, shrubs, grass, and other vegetation, pavements, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.

1. Cut minor roots (less than 1 inch and outside of drip line of the tree) and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
- B. Erosion Control: Contractor shall provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. Contractor shall install silt fence and inlet protection as shown on the Contract Drawings and as per requirements of the SWPPP, prior to any soil disturbance activities. Provide temporary seeding as required by the SWPPP.
- C. Maintain site controls in accordance with Storm Water Pollution Prevention Plan and repair as directed by COR to sustain compliance with NPDES permit. Maintain all records as required by the SWPPP. Perform inspections as required by the SWPPP.
- D. Topsoil - On-site: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 6 inches. Satisfactory topsoil is reasonably free and/or screened of subsoil, clay lumps, stones, and other objects over 1 inch in diameter, and without weeds, roots, and other objectionable material.
 1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.
 - a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
 2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles to prevent wind erosion in accordance with the Storm Water Pollution Prevention requirements of the State.
 - a. Stockpile shall be contained with erosion and sediment controls (silt fence, fiber roll) and stabilized if undisturbed in accordance with the Storm Water Pollution Prevention requirements of the State.
 3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material only after approval of the COR.
- E. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.
 1. Completely remove stumps, roots, and other debris protruding through ground surface. Grind tree stumps and roots to a minimum of 18 inches below existing ground or finished surface, whichever is lower.
 2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
 3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.

- F. Removal of Improvements: Remove existing above-grade and below-grade improvements, including gravel base materials, as indicated and as necessary to facilitate new construction.
- G. Abandonment or removal of certain underground pipe or conduits may be indicated on Drawings and is included under Work of this Section and related Division 33 Sections. Removing abandoned underground piping and conduits interfering with construction is included under this Section, except as indicated to be abandoned in-place.
- H. Continue maintenance of erosion controls in compliance with the requirements of the State and Project SWPPP until the Work is completed and the threat of erosion is gone by either ground surface stabilizer or lawn "grow-in" is at 85% complete. Temporary erosion control devices shall not be removed until the area is certified as being stabilized by the COR.

3.2 DEMOLITION

- A. Completely demolish and remove utilities, including all appurtenances related or connected thereto, as noted below:
 - 1. As required for completion of Work, installation of new utility service lines, and as shown on the Drawings.
 - 2. To full depth.
 - 3. Record on As-Built Drawings any remaining lines (location, size, type, material, and depth) which have been abandoned in place.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Cemetery Property to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the COR. Contractor shall dispose debris in compliance with applicable Federal, State or local permits, rules and/or regulations.
- C. Remove and legally dispose of all materials and debris (including brick, concrete, stone, metals and similar materials), other than earth or items to remain as part of Project Work. Materials removed shall become property of Contractor and shall be disposed of in compliance with applicable Federal, State or local permits, rules, and/or regulations. All materials indicated to be removed shall be included as part of the lump sum compensation for the Work of this Section.
 - 1. Materials that are located beneath the surface of the surrounding ground more than 5 feet, or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.
 - 2. Burning is not permitted on the property.
- D. Remove existing utilities as indicated or uncovered by Work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the COR. When utility lines are encountered that are not indicated on the Construction Documents, the COR shall be notified prior to further Work in that area.

3.3 CLEAN-UP

- A. Upon completion of Work of this Section and after removal of all debris, leave site in clean condition satisfactory to COR. Clean-up shall include off the Cemetery Property disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

END OF SECTION

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SECTION 03 21 00

REINFORCING STEEL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Requirements of Division 1 apply to all work of this Section.

1.2 SCOPE

- A. Unless noted otherwise, furnish and install reinforcing for all concrete, including dowels, chairs, spacers, bolsters, etc., necessary for supporting and fastening reinforcement in place as shown on the Drawings and specified herein.

1.3 RELATED WORK

- A. Cast-In-Place Concrete: Section 03 30 00

1.4 QUALITY ASSURANCE

- A. General:
 - 1. Acceptable Manufacturers: Regularly engaged in the manufacture of steel bar and welded wire fabric reinforcing.
 - 2. Installer Qualifications: Installation shall be done only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics working under an experienced supervisor.
 - 3. Welding Qualifications: Welding procedures, welding operators and welders shall be qualified in accordance with AWS D1.4 "Structural Welding Code Reinforcing Steel".
 - a. Welders whose work fails to pass inspection shall be re-qualified before performing further welding.
 - 4. Reinforcement Work shall conform to ACI 301, as minimum standards.
 - 5. Allowable Tolerances:
 - a. Fabrication:
 - 1) Sheared length: 1 inch.
 - 2) Depth of truss bars: Plus 0 minus ½ inch.
 - 3) Ties: Plus or minus ½ inch.
 - 4) All other bends: Plus or minus 1 inch.
 - b. Placement:
 - 1) Concrete cover to form surfaces: Plus or minus ¼ inch.
 - 2) Minimum spacing between bars: Plus or minus ¼ inch.
 - 3) Crosswise of members: Spaced evenly within 2 inches of stated separation.
 - 4) Lengthwise of members: Plus or minus 2 inches.
 - c. Maximum bar movement to avoid interference with other reinforcing steel, conduits, or embedded items: 2 bar diameters.
- B. Standards and References: (Latest Edition unless otherwise noted):

1. American Concrete Institute (ACI).
ACI 301 Specifications for Structural Concrete for Buildings
ACI 315 Details and Detailing of Concrete Reinforcing
ACI 318 Building Code Requirements for Reinforced Concrete
2. American Society for Testing and Materials (ASTM).
A82..... Cold Drawn Wire for Concrete Reinforcement
A185..... Welded Steel Wire Fabric for Concrete Reinforcement
A615..... Deformed and Plain Billet-Steel Bars for Concrete
Reinforcement
A706..... Low Alloy Steel Deformed Bars for Concrete
Reinforcement
3. Concrete Reinforcing Steel Institute (CRSI) – "Manual of Standard Practice".

C. Submittals:

1. Shop Drawings: Prepare in accordance ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars and shapes, dimensions and details of bar reinforcing and assemblies. Correctness of all reinforcing requirements and work is the responsibility of Contractor. Identify such shop drawings with reference thereon to sheet and detail numbers from Contract Drawings.
 - a. Do not use scaled dimensions from Contract Drawings in determining the lengths of reinforcing bars.
 - b. No reinforcing steel shall be fabricated without approved shop drawings.
 - c. Any deviations from the contract documents must be clearly indicated as a deviation on the shop drawings.
 - d. Areas of high congestion, including member joints and embed locations shall be fully detailed to verify clearances and assembly parameters and coordination with other trades.
2. Certified mill test reports of supplied reinforcing indicating chemical and physical analysis. Tensile and bend tests shall be performed by the mill in accordance with ASTM A615.
3. Product Data:
 - a. Manufacturer's specifications and installation instructions for splice devices.
 - b. Bar Supports.
4. Certificates of Compliance with specified standards:
 - a. Reinforcing bars.
 - b. Welding electrodes.
5. Samples: As requested by COR.

D. Tests and Inspections:

1. A testing program is required prior to start of construction. Requirements below are minimum requirements; additional requirements may be required in final testing program.
2. All reinforcing steel whose properties are not identifiable by mill test reports shall be tested in accordance with ASTM A615. One Series of tests for each missing report to be borne by the Contractor.

3. When inspections are indicated for reinforcement placement on the Structural drawings, a special inspector shall be employed to inspect reinforcing placement.
4. When tests are indicated for reinforcing steel on the Drawings, the reinforcing steel used shall be tested in accordance with ASTM A615. One tensile and one bend test for each 2-1/2 tons of steel or fraction thereof, shall be made.
5. Inspect shop and field welding in accordance with AWS D1.4, including checking materials, equipment, procedure and welder qualification as well as the welds. Inspector will use non-destructive testing or any other aid to visual inspection that he deems necessary to assure himself of the adequacy of the weld.
6. Tests and inspection shall be performed by testing agency; the cost of tests and retests and reinspection shall be borne by the Contractor.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- B. Handle and store materials to prevent contamination.
 1. Store reinforcement in a manner that will prevent excessive rusting or coating with grease, oil, dirt, and other objectionable materials. Storage shall be in separate piles or racks so as to avoid confusion or loss of identification after bundles are broken.
- C. Deliver and store welding electrodes in accordance with AWS D12.1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Reinforcement Bars: ASTM A615, Grade 40 for No. 3 and smaller bars; ASTM A615, Grade 60 for No. 4 and larger bars.
 1. Bar reinforcement to be welded shall meet chemical requirements of ASTM A706.
- B. Stirrups and Ties: ASTM A615, Grade 40 for No.3 and smaller bars, ASTM A615, Grade 60 for No. 4 and larger bars.
- C. Steel Dowels: Same grade as bars to which dowels are connected.
- D. Tie Wires: FS-QQ-W-461, annealed steel, black, 16 gauge minimum.
- E. Welding Electrodes: AWS D1.4, low hydrogen, E70XX series.

- F. Bar Supports:
 - 1. Typical, unless noted otherwise; CRSI Class 2 wire supports.
 - a. Do not use wood, brick or other objectionable materials.
 - b. Do not use galvanized supports.
 - 2. Supports placed against ground: Pre-cast concrete blocks not less than 4 inches square with embedded wire.
- G. Mechanical Couplers: Comply with ACI 318 section 12.14.3.

PART 3 - EXECUTION

3.1 FABRICATION

- A. Shop fabricate reinforcement to meet requirements of Drawings.
- B. Fabricate reinforcement in accordance with the requirements of ACI 315 where specific details are not shown or where Drawings and Specifications are not more demanding.
- C. Steel reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the Drawings shall not be used. Heating of bars for bending will not be permitted.
- D. Reinforcing shall not be field bent or straightened without COR's review.
- E. Provide offsets in rebar (1:6 maximum) where required to maintain clearances.

3.2 CONDITION OF SURFACES

- A. Examine surfaces and conditions receiving or affecting the work. Do not proceed until unsuitable conditions have been corrected.

3.3 GENERAL

- A. Concrete shown without reinforcing shall be reinforced as similar parts shown with reinforcing except where concrete is specifically noted to be unreinforced.

3.4 PLACEMENT

- A. All reinforcement shall be accurately set in place, lapped, spliced, spaced rigidly and securely held in place and tied with specified wire at all splices and crossing points. All wire tie ends shall point away from the form. Carefully locate all dowel steel to align with wall and column steel.
 - 1. Bars shall be in long lengths with laps and splices as shown. Offset laps in adjacent bars. Place steel with clearances and cover as shown. Bar laps shall be as indicated on the Drawings. Tie all laps and intersections with the specified wire.
 - 2. Maintain clear space between parallel bars not less than 1-1/2 times nominal diameter, but in no case shall clear space be less than 1-1/2 times maximum size concrete aggregate.

3. Reinforcing dowels for slabs shall be placed as detailed. Sleeves may be used if reviewed by the COR before installation. Install dowel through all construction and expansion joints for all slabs on grade.
- B. Bar Supports: Support and securely fasten bars with chairs, spacers and ties to prevent displacement by construction loads or placement of concrete beyond the tolerances specified. Conform to CRSI as a minimum standard.
- C. Steel Adjustment:
 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
 2. Do not move bars beyond allowable without concurrence of COR.
 3. Do not heat, bend, or cut bars without concurrence of COR.
 4. Reinforcement shall not be bent after being embedded in hardened concrete.
- D. Splices:
 1. Splice reinforcing as shown.
 2. Lap Splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
 3. Splice Devices: Install in accordance with manufacturer's written instructions. Obtain COR's review before using.
 4. Do not splice bars except at locations shown without concurrence of COR.
 - a. Where splices in addition to those indicated are required, indicate location on shop drawings clearly and highlight "for COR's approval".
- E. Welding:
 1. Welding is not permitted unless specifically detailed on Drawings or approved by COR.
 2. Employ shielding metal-arc method and meet requirements of AWS D1.4.
 3. Welding is not permitted on bars where the carbon equivalent is unknown or is determined to exceed 0.55.
 4. Welding shall not be done within two bar diameters of any bent portion of a bar which has been bent cold.
 5. Welding of crossing bars is not permitted.
- F. Reinforcement shall be free of mud, oil or other materials that may reduce bond at the time concrete is placed. Reinforcement with tightly adhered rust or mill scale will be accepted without cleaning provided that rusting has not reduced dimensions and weights below applicable standards. Remove loose rust.
- G. Protection against rust:
 1. Where there is danger of rust staining adjacent surfaces, wrap reinforcement with impervious tape or otherwise prevent rust staining.
 2. Remove protective materials and clean reinforcement as required before proceeding with concrete placement.
- H. Drawing Notes: Refer to notes on Drawings for additional reinforcement requirements.

END OF SECTION

SECTION 03 30 00

CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 SCOPE

- A. The Work of this Section includes furnish, place and finish cast in place concrete and related Work as indicated on the Construction Documents and specified here.
 - 1. Provide and erect formwork as required.
 - 2. Install miscellaneous metal and other items furnished by other trades to be installed in concrete work.
 - 3. Provide facilities for job curing of test cylinders and transporting to Testing Laboratory.

1.2 RELATED WORK

- A. Concrete Paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- B. Section 33 49 00, STORM DRAINAGE STRUCTURES.

1.3 QUALITY ASSURANCE

- A. Standards and References: (Latest Edition unless otherwise noted)
 - 1. 2009 International Building Code (IBC).
 - 2. American Association Of State Highway And Transportation Officials (AASHTO)
 - M31 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - M42 Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
 - M55 Plain Steel Welded Wire Fabric for Concrete Reinforcement
 - 3. American Concrete Institute (ACI)
 - 117 Standard Tolerances for Concrete Construction and Materials
 - 305R Hot Weather Concreting
 - 306 Cold Weather Concreting
 - 318 Building Code Requirements for Reinforced Concrete
 - SP-66 Detailing Manual
 - 4. American Society For Testing And Materials (ASTM)
 - A618..... Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
 - C31 Making and Curing Concrete Test Specimens in the Field
 - C33 Concrete Aggregates
 - C39 Compressive Strength of Cylindrical Concrete Specimens

C42	Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C94	Ready-Mixed Concrete
C138	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C143	Slump of Hydraulic Cement Concrete
C150	Portland Cement
C172	Sampling Freshly Mixed Concrete by the Volumetric Method
C173	Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
C192	Making and Curing Concrete Test Specimens in the Laboratory
C260	Air-Entraining Admixtures for Concrete
C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
C494	Chemical Admixtures for Concrete
C618	Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C1064	Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

B. Submittals:

1. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Concrete mix designs. See "Mix Design" below. Include results of test data used to establish proportions.
3. Certificates of Compliance from Manufacturer
 - a. Cement
 - b. Aggregates
 - c. Admixtures
 - d. Other Products specified herein
4. Transit-mix delivery slips:
 - a. Keep record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slips certifying contents of the pour.
 - b. Make the record available to the COR for his inspection upon request.
 - c. Upon completion of this portion of the Work, deliver the record and the delivery slips to the COR.
5. Manufacturer's Certificates: Air entraining admixture, chemical admixtures, curing compounds.
6. Product data for all Products specified

C. Tests and Inspections:

1. Per the requirements of Section 01 45 29.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Portland Cement: ASTM C 150, Type I or Type II. One brand of cement shall be used throughout to maintain uniform color for all exposed concrete.
- B. Concrete Aggregate: Fine and coarse Aggregates shall be regarded as separate ingredients. Each size of coarse Aggregate, as well as combination of sizes when two or more are used, shall conform to grading requirements of appropriate ASTM Standards.
 - 1. Concrete Aggregates for Standard Weight Concrete: ASTM C 33.
 - 2. Aggregate shall be crushed granite or Perkins type. Max size is 1 inch.
- C. Water: Clean and free from injurious amounts of oil, acids, alkali, organic matter and other deleterious substances; suitable for domestic consumption per ACI 318.
- D. Admixtures shall be subject to prior approval by the COR, in accordance with ACI 318, Calcium Chloride is not permitted.
 - 1. Water Reducing
 - a. ASTM C494 Type A - for use in cool weather.
 - b. ASTM C494 Type D - for use in hot weather.
 - 2. Air Entraining
 - a. Conform to ASTM C 260
 - 3. Fly Ash
 - a. Conform to ASTM C 618
 - 4. Mid-Range Water-Reducers
 - a. Master Builders "Polyheed" or approved equal.
 - 5. Fly Ash Pozzolan
 - a. Conforming to ASTM A618 Class F.
- E. Sand: Clean, dry, well graded.
- F. Expansion Joint Filler:
 - 1. Joint fill shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.
- G. Expansion Anchors: All expansion bolts installed in concrete shall be KB-TZ expansion bolts as manufactured by Hilti Inc. See Drawings for installation requirements and tension testing requirements as applicable. See Drawings for special head requirements as needed. Substitution of other brands or anchors shall proceed only after written approval from the COR has been obtained.
- H. Reinforcing Steel:
 - 1. Reinforcing bars in accordance with ASTM 615.
 - 2. Dowels shall be plain steel bars conforming to AASHTO M31 or M42. Tie bars shall be deformed steel bars conforming to AASHTO M31 or M42.

2.2 CONCRETE

A. Concrete Mixes:

1. Type A Concrete:

- a. Strength: 4000 lbs. per square inch at 28 days.
- b. Maximum Aggregate Size: 1 inch.
- c. Minimum Cement Content: As required by mix design (ACI 318 Section 5.2).
- d. 6.5 sacks per yard minimum.
- e. Maximum Water to Cement Ratio: 0.50
- f. Admixture: Water reducing, Air entraining.
- g. Weight: 145 lbs. per cubic foot
- h. Use for concrete exterior walls
- i. Maximum Fly Ash content as a percentage of total cementitious material: 15%

2. Type C Concrete:

- a. Strength: 4000 lbs. per square inch at 28 days.
- b. Maximum Aggregate Size: 1 inch.
- c. Minimum Cement Content: As required by mix design (ACI 318 Section 5.2).
- d. 6.5 sacks per yard minimum.
- e. Maximum Water to Cement Ratio: 0.50
- f. Admixture: Water reducing, Air entraining.
- g. Weight: 145 lbs. per cubic foot
- h. Use for concrete exterior paving, sidewalks, curb, gutters, elevated slabs, and as otherwise specified
- i. Maximum Fly Ash content as a percentage of total cementitious material: 15%

B. Consistency of Concrete: Concrete slump, measured in accordance with ASTM C 143, shall fall within following limits.

1. For General concrete placement: 3 inch plus or minus 1 inch.
2. Mixes employing the specified mid-range water reducer shall provide a measured slump not to exceed 7 inch +1 inch after dosing, 2 inch +1 inch before dosing.
3. Concrete slump shall be taken at point of placement. Use water reducing admixtures as required to provide a workable consistency for pump mixers. Water shall not be added at the jobsite without written review by the COR.

C. Mix Design:

1. Initial mix design shall be prepared for Type A and Type C concrete by recognized testing laboratory (approved by the COR) in accordance with IBC Section 1905.3 or IBC Section 1905.4. In the event that additional mix designs are required due to depletion of Aggregate sources, Aggregate not conforming to Specifications, or at request of Contractor, these mixes shall be prepared as above.
2. Contractor shall notify the Testing Laboratory and COR of intent to use concrete pumps to place concrete so that mix designs can be modified accordingly.

3. Fly ash shall not exceed the percentages of the total cementitious material listed in the Concrete Mixes above.
4. Provide 3-6% air entrainment.
5. COR shall review and approve all mix designs before use.
6. If special mixes are required for slip form or machined place concrete, Contractor is to submit these separately and indicate them as such.

D. Mixing:

1. Equipment: All concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials.
2. Method of Mixing:
 - a. Transit Mixing: Comply with ASTM C 94. Ready mixed concrete shall be used throughout, except as specified below.
 - b. On-Site Mixing: Use only if method of storing material, mixing of material and type of mixing equipment is approved by the COR. Approval of site mixing does not relieve Contractor of any other requirements of Specifications.
 - c. Mixing shall be in accordance with IBC Section 1905.8.
3. Mixing Time: After mix water has been added, concrete shall be mixed not less than 1-1/2 minutes nor more than 1-1/2 hours. Concrete shall be rejected if not deposited within the time specified.
4. Admixtures:
 - a. Air entraining and chemical admixtures shall be charged into mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by manufacturer. Accuracy of measurement of any admixture shall be within plus or minus 1.5%.
 - b. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence, and provided further that admixtures used in that combination retain full efficiency and have no deleterious effect on concrete or on properties of each other.
 - c. All admixtures are to be approved by COR prior to commencing this Work.
5. Retempering:
 - a. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall be discarded, not retempered.
 - b. Indiscriminate addition of water to increase slump is prohibited.
 - c. When concrete arrives at project with slump below that suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded. Water shall be incorporated by additional mixing equal to at least half of total mixing time required. Any addition of water above that permitted by limitation of water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain proper water-cement ratio. Such additions shall only be used if approved by COR. In any event, with or without addition of cement, not more than 2 gallons of water per cubic yard of concrete, over that specified in design mix, shall be added.

6. Cold Weather Batching: When temperature is below 40 degrees F or is likely to fall below 40 degrees F during 24 hour period after placing, provide adequate equipment for heating concrete materials. No frozen materials or materials containing ice shall be used. Temperatures of separate materials, including mixing water, when placed in mixer shall not exceed 100 degrees F. When placed in forms, concrete shall have a temperature between 50 degrees F and 85 degrees F.
7. Hot Weather Batching: Concrete deposited in hot weather shall have a placing temperature below 85 degrees F. If necessary, ingredients shall be cooled to accomplish this.

PART 3 - EXECUTION

3.1 PLACEMENT

- A. Before any concrete is placed, the following items of Work shall have been completed in the area of placing.
 1. Forms shall have been erected, adequately braced, cleaned, sealed, lubricated if required, and bulkheaded where placing is to stop.
 2. Any wood forms other than plywood shall be thoroughly water soaked before placing any concrete. The wetting of forms shall be started at least 12 hours before concreting.
 3. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
 4. Reinforcing steel shall have been placed, tied, and supported.
 5. Embedded Work of all trades shall be in place in the forms and adequately tied and braced including weepholes, screens and sleeves.
 6. The entire place of deposit shall have been cleaned of wood chips, sawdust, dirt, debris, hardened concrete, and other foreign matter. No wooden ties or blocking shall be left in the concrete except where indicated for attachment of other Work.
 7. Reinforcing steel, at the time the concrete is placed around it, shall be cleaned of scale, mill scale, or other contaminants that will destroy or reduce bond.
 8. Concrete surfaces to which fresh concrete is to be bonded shall be brush cleaned to remove all dust and foreign matter and to expose the Aggregate, and then coated with the bonding adhesive herein specified.
 9. Prior to placing concrete for any slabs on grade, the moisture content of the subgrade below the slabs shall be adjusted to at least optimum moisture.
 10. No concrete shall be placed until the COR has observed formwork and reinforcement. Clean forms of all debris and remove standing water. Thoroughly clean reinforcement and all handling equipment for mixing and transporting concrete. Concrete shall not be placed against reinforcing steel that is hot to the touch. Notify COR 48 hours in advance of concrete pour.

- B. Machine Placed Concrete: Control lines and surfaces shall be carefully checked and prepared to reflect drawings and specifications. Abrupt changes in direction or grade not indicated will require replacement.
- C. Conveying: Handle concrete from mixer to place of final deposit by methods which will prevent separation or loss of ingredients. Deposit concrete in forms as nearly as practicable at its final position in a manner which will insure that required quality is obtained. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.
- D. Depositing: Deposit concrete into forms in horizontal layers not exceeding 24 inches in thickness, proceeding along forms at a uniform rate and consolidating into previous pour. In no case shall concrete be poured into an accumulation of water ahead of pour, nor shall concrete be flowed along forms to its final place of deposit. Fresh concrete shall not be permitted to fall from a height greater than 6 feet without use of adjustable length pipes or, in narrow walls, of adjustable flexible hose sleeves. Concrete shall be scheduled so that placing is a continuous operation for the completion of each section between predetermined construction joints. If any concreting operation, once planned, cannot be carried on in a continuous operation, concreting shall stop at temporary bulkheads, located where resulting construction joints will least impair the strength of the structure. Location of construction joints shall be as shown on the Drawings or as approved by the COR. The rate of rise in walls shall not be less than 2 feet per hour.
 - 1. Consolidation: Concrete shall be thoroughly compacted and worked to all points with solid continuous contact to forms and reinforcement to eliminate air pockets and honeycombing. Power vibrators of approved type shall be used immediately following pour. Spading by hand, hammering of forms or other combination of methods will be allowed only where permitted by COR. In no case shall vibrators be placed against reinforcing steel or used for extensive shifting of deposited fresh concrete. Provide and maintain standby vibrators, ready for immediate use.
 - 2. Hot Weather Concreting: Unless otherwise directed by the COR, perform all Work in accordance with ACI 305 when air temperature rises above 75 degrees F and the following:
 - a. Mixing Water: Keep water temperature as low as necessary to provide for the required concrete temperature at time of placing. Ice may be required to provide for the design temperature.
 - b. Aggregate: Keep Aggregate piles continuously moist by sprinkling with water.
 - c. Temperature of Concrete: The temperature of the concrete mix at the time it is being placed in the forms shall not exceed 85 degrees F. The method employed to provide this temperature shall in no way alter or endanger the design mix or the design strength required.
 - d. Dampen subgrade and formwork before placing concrete. Remove all excess water before placing concrete. Keep concrete continuously wet when air temperature exceeds 85 degrees F for a minimum of 48 hours after placing concrete.

- e. Protection: Minimize evaporation from concrete in place by providing shade and windbreaks. Maintain such protection in place for 14 days minimum.
- 3. Cold Weather Concreting: Follow recommended ACI 306 procedures when air temperature falls below 40 degrees F, as approved by the COR. Concrete placed in freezing temperatures shall have a temperature of not less than 50 degrees F. Maintain this temperature for at least 7 days. No chemicals or salts shall be used to prevent freezing and no accelerating agents shall be used without prior approval from the COR.
- E. Construction Joints: Install as indicated and noted on Drawings. Joints not indicated on Drawings shall be so located, when approved, as to least impair strength of structure and shall conform to typical details. Construction joints shall have level tops, vertical sides. Horizontal construction joints shall be thoroughly cleaned and roughened by removing entire surface film and exposing clean Aggregate solidly embedded in mortar matrix. Joints between concrete and masonry shall be considered construction joints. Vertical construction joints need not be roughened. See Drawings for doweling and required keys.
 - 1. Roughen construction joints by any of following methods:
 - a. By sandblasting joint.
 - b. By thoroughly washing joint, using a high pressure hose, after concrete has taken initial set. Washing shall be done not less than 2 hours nor more than 4 hours after concrete has been poured, depending upon setting time.
 - c. By chipping and wire brushing.
 - 2. All decisions pertaining to adequacy of construction joint surfaces and to compliance with requirements pertaining to construction joints shall rest exclusively with COR.
 - 3. Just before starting new pour, horizontal and vertical joint surfaces shall be dampened (but not saturated).
 - 4. Before placing regular concrete mix, horizontal construction joint surfaces shall be covered with a layer of mortar composed of cement and fine Aggregate of same proportions as that used in prescribed mix, but omitting coarse Aggregate.

3.2 REINFORCEMENT

- A. Details of concrete reinforcement, unless otherwise shown, in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.3 CONCRETE WALLS

- A. Cast-in-place concrete installed as wall elements to have concrete (on or above finished grade) constructed to dimensions indicated on Drawings within 1/4 inch of location and elevation.
- B. Engage a professional surveyor to survey the form work for the exposed portions of the foundations for the walls, including wall segments, prior to concrete being poured. If the forms are not correct, they must be corrected and resurveyed. When correct, provide a written certification from the surveyor to the COR that

the forms are set according to the plans, within the allowable tolerances for elevation, location, orientation, and dimensions called for on the plans.

- C. Properly brace the forms so the set concrete is correct within the allowable construction tolerances when the forms are removed.
- D. Upon removal of the forms, the professional surveyor must survey the placed concrete and provide information to the COR where the Work is not in conformance with the Drawings, within the allowable construction tolerances. The Work cannot progress until the exposed concrete for the foundations are brought into compliance.
- E. Remedial Work necessary for correcting installations that is in excess of allowable tolerances are the responsibility of the Contractor.
- F. Erected Work that exceeds specified tolerance limits must be remedied or removed and replaced, at no additional cost to the Government.
- G. Any remediation Work is subject to approval of the COR in advance of the Work.
- H. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.
- I. Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is the Contractor's sole responsibility.
- J. Immediately remove loose materials, after forms have been removed and work has been examined and approved by COR, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar made with 1 part portland cement and 2 to 3 parts sand.

3.4 CONCRETE SLABS ON GRADE (EXTERIOR)

- A. Exterior concrete slabs on grade shall be poured as required under this Section and Section 32 05 23. Base shall be accurately leveled and compacted prior to placing of concrete.
- B. Control Jointing - Slabs on Grade:
 - 1. Joints shall be in locations indicated on Drawings, or as directed by COR.
 - 2. Control jointing in exterior paving slabs shall be poured in a checkerboard pattern with joint edges tooled to provide a uniform joint at least 3/8 inch in depth.
 - a. Slab reinforcing need not be terminated at control joints.
 - b. Construction and expansion joints shall be counted as control joints.
- C. Expansion Joints - Slabs on Grade:
 - 1. Unless otherwise indicated, use 1/2 inch thick expansion joint filler.

2. Joints in exterior slabs on grade shall be installed at each side of fixed structures, walls, at curb transitions opposite apron joints, at ends of curb returns, at back of curb when adjacent to sidewalk or other concrete pad, and at uniformly spaced intervals not exceeding 20 feet.
 3. Edges of concrete at joints shall be edger finished to approximately 3/8 inch radius.
 4. Interrupt reinforcing at all expansion joints.
- D. Score markings on exterior slabs on grade shall be located as indicated. Where not indicated, mark slabs into rectangles of not less than 12 square feet nor more than 20 square feet using a scoring tool which will leave edges of score markings rounded.

3.5 CURING AND PROTECTION

- A. Curing: Exposed surfaces of all concrete used in structure shall be maintained in a moist condition for at least 7 days after placing. The following final curing processes shall normally be considered to accomplish this. Concrete shall be maintained at not less than 50 degrees F nor more than 100 degrees F for a period of 72 hours after being deposited.
1. Initial Curing Process - Flat Work:
 - a. Mist Spraying: As soon as troweling of concrete surfaces is completed, exposed concrete shall be sprayed continuously with a special atomizer spray nozzle, capable of producing a fine mist. Spraying shall be done without any dripping of water from nozzle. Amount of spraying shall be such as to maintain surface of concrete moist without any water accumulating on surface. Maintain spraying for a minimum of 12 hours, or until such time as hereinafter described curing process is applied. Mist spraying will not normally be required when the ambient air temperature is below 90 degrees F.
 2. Final Curing Process - Flatwork: Except as noted, use any of following:
 - a. Water Curing: Concrete shall be kept wet by mechanical sprinklers or by any other approved method which will keep surfaces continuously wet.
 - b. Saturated Burlap Curing: Finished surfaces shall be covered with a minimum of two layers of heavy burlap which shall be kept saturated during the curing period.
 - c. Curing Compounds: Apply a water based curing compound as indicated in Materials in Section 32 05 23 Article 2.4. Membrane curing compounds of chlorinated rubber or resin type conforming to ASTM C309 may be used only if specifically approved by COR. Use of membrane curing compound will not be permitted on surfaces to be painted, membrane water-proofing or hardeners and sealers. Agitate curing compounds thoroughly by mechanical means continuously during use and spray or brush uniformly in accordance with manufacturer's recommendations. Apply immediately following final finishing operation. All curing compounds shall conform to State of Louisiana VOC Regulations.

- B. Protection: Contractor shall be responsible for protection of finished concrete against injury by rain, cold, vibration, animal tracks, marking by visitors, vandalism, etc.
- C. Provide additional curing agents or compounds, not necessarily listed herein, but as recommended and/or required for use with shake type hardeners or other special coatings and coverings by their manufacturers for a complete and proper installation.

3.6 FINISHES

- A. Flatwork:
 - 1. Unless otherwise indicated or specified, flatwork shall have an integral monolithic finish.
 - 2. Integral Monolithic Finish: Apply as soon as freshly poured concrete slabs will bear weight of workers. Pour slabs full thickness to finish elevations indicated. At proper time, tamp surface repeatedly with a wire mesh or grid tamper in a manner to force Aggregate down below surface and to bring sufficient mortar to surface to provide for a smooth coating of cement mortar over entire surface. Allow surface mortar to partially set, then float with wooden floats and finish with the following:
 - a. Broom Finish: Steel trowel surface to a smooth dense surface free of lines, tool marks, cat faces, and other imperfections. After troweling, and before final set, give surface a broom finish, brushing in direction noted on Drawings, or as directed. Broom finish shall be used typically on exterior flatwork except as otherwise indicated or specified and shall be "light" texture as approved by COR.
 - b. Sandblast finish: As indicated in 32 05 23.
 - 3. Tolerances:
 - a. For tolerances not indicated, refer to ACI 117.
 - b. Finished surfaces of exterior integral finished flatwork shall not vary more than 1/4 inch from a 10' long straightedge, except at grade changes.

3.7 DEFECTIVE CONCRETE

- A. Defective concrete shall mean any of the following:
 - 1. Concrete not meeting 100 percent of the specified 28 day compressive strength.
 - 2. Concrete exhibiting rock pockets, voids, spalls, streaks, cracks, exposed reinforcing to extent that strength, durability, or appearance is adversely affected.
 - 3. Concrete significantly out of place, line, or level.
 - 4. Concrete not containing the required embedded items.
- B. Upon determination that concrete strength is defective:
 - 1. Should cylinder tests fall below minimum strength specified, concrete mix for remainder of Work shall be adjusted to produce required strength. Core samples shall be taken and tested from cast-in-place concrete

where cylinders and samples indicate inferior concrete with less than minimum specified strength.

- a. Cores of hardened concrete shall be taken and tested in accordance with ASTM C 42 and C 39. Number and location of such cores shall be subject to the approval of COR.
 - b. Cost of core sampling and testing will be paid for by the Contractor.
 - c. "500 psi" and "85 percent" reduction in IBC Section 1905.6 will not justify low cylinder tests.
- C. Upon determining that concrete surface is defective, Contractor may restore concrete to acceptable condition by cutting, chipping, pointing, patching, grinding, if this can be done without significantly altering strength of structure or appearance. Permission to patch defective areas will not be considered a waiver of the right to require removal if patching does not, in the opinion of the COR, satisfactorily restore quality and appearance.
- D. If core tests indicate that concrete is below the strength specified, or if patching does not restore concrete to specified quality and appearance, the concrete shall be deemed defective, and shall be removed and replaced without additional cost to the Government.
- E. No repair Work shall begin until procedure has been reviewed and approved by the COR.

3.8 ADJUSTING AND CLEANING

- A. Remove all debris, excess materials, tools and equipment resulting from or used in this operation at completion of this Work.

END OF SECTION

SECTION 04 05 13
MASONRY MORTARING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies mortar materials and mixes.

1.2 RELATED WORK

- A. Mortar used in Section:
 - 1. Section 04 05 16, MASONRY GROUTING.
 - 2. Section 04 43 00, NATURAL STONE VENEER.

1.3 TESTING LABORATORY CONTRACTOR RETAINED

- A. Engage a commercial testing laboratory approved by COR to perform tests specified below.
- B. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to COR.

1.4 TESTS

- A. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
- B. Mortar:
 - 1. Test for compressive strength and water retention; ASTM C270.
 - 2. Mortar compressive strengths 28 days as follows:
 - a. Type M: Minimum 2,500 psi at 28 days.
 - b. Type S: Minimum 1,800 psi at 28 days.
 - c. Type N: Minimum 750 psi at 28 days.
- C. Cement:
 - 1. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
 - 2. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.
- D. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Certificates:

1. Testing laboratory's facilities and qualifications of its technical personnel.
 2. Indicating that following items meet specifications:
 - a. Portland cement.
 - b. Masonry cement.
 - c. Mortar cement.
 - d. Hydrated lime.
 - e. Fine aggregate (sand).
 - f. Color admixture.
- C. Laboratory Test Reports:
1. Mortar, each type.
 2. Admixtures.
- D. Manufacturer's Literature and Data:
1. Cement, each kind.
 2. Hydrated lime.
 3. Admixtures.
 4. Liquid acrylic resin.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.
- B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):

C40 04	Organic Impurities in Fine Aggregates for Concrete
C91 05	Masonry Cement
C109 07	Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 MM Cube Specimens)
C144 04	Aggregate for Masonry Mortar
C150-05	Portland Cement
C207 06	Hydrated Lime for Masonry Purposes
C270 07	Mortar for Unit Masonry
C595 08	Blended Hydraulic Cement
C780 07	Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C979 05	Pigments for Integrally Colored Concrete
C1329-05	Mortar Cement

PART 2 - PRODUCTS

2.1 HYDRATED LIME

- A. ASTM C207, Type S.

2.2 AGGREGATE FOR MASONRY MORTAR

- A. ASTM C144 and as follows:
 - 1. Light colored sand for mortar for laying face stone.
- B. Test sand for color value in accordance with ASTM C40. Sand producing color darker than specified standard is unacceptable.

2.3 BLENDED HYDRAULIC CEMENT

- A. ASTM C595, Type IS, IP.

2.4 MASONRY CEMENT

- A. ASTM C91. Type N, S, or M.

2.5 MORTAR CEMENT

- A. ASTM C1329, Type N, S or M.

2.6 PORTLAND CEMENT

- A. ASTM C150, Type I.

2.7 LIQUID ACRYLIC RESIN

- A. A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

2.8 WATER

- A. Potable, free of substances that are detrimental to mortar, masonry, and metal.

2.9 MASONRY MORTAR

- A. Conform to ASTM C270.
- B. Admixtures:
 - 1. Do not use mortar admixtures, except color admixtures if approved by COR.
 - 2. Submit laboratory test report showing effect of proposed admixture on strength, water retention, and water repellency of mortar.
 - 3. Do not use antifreeze compounds.
- C. Colored Mortar:
 - 1. Maintain uniform mortar color for exposed work throughout.

2. Match mortar color in approved sample or mock-up.

D. Color Admixtures:

1. Proportion as specified by manufacturer.

2.10 COLOR ADMIXTURE

- A. Pigments: ASTM C979.
- B. Pigments shall not exceed 10 percent of Portland cement by weight.
- C. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
- D. Use mineral pigments only. Organic pigments are not acceptable.
- E. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

PART 3 - EXECUTION

3.1 MIXING

- A. Mix in a mechanically operated mortar mixer.
 1. Mix mortar for at least three minutes but not more than five minutes.
- B. Measure ingredients by volume. Measure by the use of a container of known capacity.
- C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.
- D. Mortar that has stiffened because of loss of water through evaporations:
 1. Re-tempered by adding water to restore to proper consistency and workability.
 2. Discard mortar that has reached its initial set or has not been used within two hours.

3.2 MORTAR USE LOCATION

- A. Use Type M mortar for waterproof parging below grade.
- B. Use Type S mortar for masonry below grade and setting natural stone.
- C. Use Type N mortar for copings, except as otherwise specified.

END OF SECTION

SECTION 04 05 16
MASONRY GROUTING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies grout materials and mixes.

1.2 RELATED WORK

- A. Grout used in Section:
 - 1. Section 04 43 00, NATURAL STONE VENEER.
 - 2. Grout color: Provide samples for each type.

1.3 TESTS

- A. Test grout and materials specified.
- B. Certified test reports.
- C. Identify materials by type, brand name and manufacturer or by origin.
- D. Do not use materials until laboratory test reports are approved by COR.
- E. After tests have been made and materials approved, do not change without additional test and approval of COR.
- F. Testing:
 - 1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
 - 2. Grout:
 - a. Test for compressive strength; ASTM C1019.
 - b. Grout compressive strength of 2,000 psi at 28 days.
 - 3. Cement:
 - a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
 - b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.
 - 4. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Certificates:
 - 1. Indicating that following items meet specifications:

- a. Portland cement.
- b. Masonry cement.
- c. Grout.
- d. Hydrated lime.
- e. Fine aggregate (sand).
- f. Coarse aggregate for grout.
- g. Color admixture.

C. Laboratory Test Reports:

- 1. Grout, each type.
- 2. Admixtures.

D. Manufacturer's Literature and Data:

- 1. Cement, each kind.
- 2. Hydrated lime.
- 3. Admixtures.
- 4. Liquid acrylic resin.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.
- B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C40 04 Organic Impurities in Fine Aggregates for Concrete
 - C91 05 Masonry Cement
 - C150-07 Portland Cement
 - C207 06 Hydrated Lime for Masonry Purposes
 - C404 07 Aggregate for Masonry Grout
 - C476 08 Grout for Masonry
 - C595 08 Blended Hydraulic Cement
 - C979 05 Pigments for Integrally Colored Concrete
 - C1019-09 Sampling and Testing Grout

PART 2 - PRODUCTS

2.1 HYDRATED LIME

- A. ASTM C207, Type S.

2.2 AGGREGATE FOR MASONRY GROUT

- A. ASTM C404, Size 8.

2.3 BLENDED HYDRAULIC CEMENT

- A. ASTM C595, Type IS, IP.

2.4 MASONRY CEMENT

- A. ASTM C91. Type N, S, or M.

2.5 PORTLAND CEMENT

- A. ASTM C150, Type I.

2.6 LIQUID ACRYLIC RESIN

- A. A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

2.7 WATER

- A. Potable, free of substances that are detrimental to grout, masonry, and metal.

2.8 GROUT

- A. Conform to ASTM C476 except as specified.
- B. Grout type proportioned by volume as follows:
 - 1. Fine Grout:
 - a. Portland cement or blended hydraulic cement: one part.
 - b. Hydrated lime: 0 to 1/10 part.
 - c. Fine aggregate: 2 1/4 to three times sum of volumes of cement and lime used.
 - 2. Coarse Grout:
 - a. Portland cement or blended hydraulic cement: one part.
 - b. Hydrated lime: 0 to 1/10 part.
 - c. Fine aggregate: 2 1/4 to three times sum of volumes of cement and lime used.
 - d. Coarse aggregate: one to two times sum of volumes of cement and lime used.
 - 3. Sum of volumes of fine and coarse aggregates: Do not exceed four times sum of volumes of cement and lime used.

2.9 COLOR ADMIXTURE

- A. Pigments: ASTM C979.
- B. Use mineral pigments only. Organic pigments are not acceptable.

- C. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

PART 3 - EXECUTION

3.1 MIXING

- A. Mix in a mechanically operated grout mixer.
 - 1. Mix grout for at least five minutes.
- B. Measure ingredients by volume. Measure by the use of a container of known capacity.
- C. Mix water with grout dry ingredients in sufficient amount to bring grout mixture to a pouring consistency.

3.2 GROUT USE LOCATIONS

- A. Use fine grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is 2 inches or less.
- B. Use either fine grout or coarse grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is greater than 2 inches.

END OF SECTION

SECTION 04 43 00
NATURAL STONE VENEER

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Work of this Section specifies requirements for construction of natural stone veneer for retaining walls and seatwalls.

1.2 RELATED WORK

- A. Mortars and grouts: Section 04 05 13, MASONRY MORTARING, Section 04 05 16, MASONRY GROUTING.
- B. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
- C. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Samples:
 - 1. Stone Veneer, sample, 8 inches by 16 inches, showing full color range and texture of stone, bond, and proposed mortar joints.
 - 2. Anchors, and ties, one each and joint reinforcing 48 inches long.
- C. Certificates signed by stone source, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies; indicate that the stone veneer meets specification requirements.
- D. Manufacturer's Literature and Data:
 - 1. Anchors, ties, and reinforcement.
 - 2. Reinforcing bars.

1.4 SAMPLE PANEL

- A. Before starting masonry, lay up a sample panel as specified:
 - 1. Use stone units from random pallets of units delivered on site.
 - 2. Include reinforcing, ties, and anchors.
 - 3. Provide a 4 feet x 5 feet panel.
 - 4. Include stone cap and both mortared and sealed joint types.
- B. Use sample panels approved by COR for standard of workmanship of new masonry Work.
- C. Use sample panel to test cleaning methods.

1.5 WARRANTY

- A. Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be five years.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American Society for Testing and Materials (ASTM):
 - A82/A82M-07 Steel Wire, Plain, for Concrete Reinforcement
 - A153/A153M-09 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A951/A951M-11 Steel Wire for Masonry Joint Reinforcement
 - C119-11 Standard Terminology Relating to Dimension Stone
 - C615/C615M-11 Granite Dimension Stone
 - C1242-12ae1 Selection, Design, and Installation of Dimension Stone Attachment Systems
 - C1515-11 Cleaning of Exterior Dimension Stone, Vertical and Horizontal Surfaces, New or Existing
 - C1528-12b Selection of Dimension Stone
 - D1056-07 Flexible Cellular Materials – Sponge Expanded Rubber
 - D7089-06 Determination of the Effectiveness of Anti-Graffiti Coating for Use on Concrete, Masonry, and Natural Stone Surfaces by Pressure Washing
- C. Masonry Industry Council:
All Weather Masonry Construction Manual, 2000
- D. International Masonry Industry All Weather Council (IMIAC):
Recommended Practices and Guide Specification for Cold Weather Masonry Construction

1.7 PRE-INSTALLATION CONFERENCE

- A. Convene a meeting on site, after submittals are received and approved but before any Work, to review Drawings and Specifications, submittals, schedule, manufacturer instructions, site logistics and pertinent matters of coordination, temporary protection, governing regulations, tests and inspections; participants to include COR and all parties whose work is effected or related to the Work of this section.

PART 2 - PRODUCTS

2.1 ACCEPTABLE STONE PRODUCTS

- A. Granite Veneer: Meet ASTM C615.

1. Face Size: As indicated.
2. Color Range, finish to match existing bridge rock face wall.

2.2 REINFORCEMENT AND ANCHORAGES

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with paragraphs below, unless otherwise indicated.
 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82; with ASTM A153/153M, Class B-2 coating.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but at least 5/8 inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches.
 1. Where withes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 2. Wire: Fabricate from 3/16 inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls, unless otherwise indicated.
 3. Basis of Design for Acceptable Product: Heckman Building Products, Inc.; No. 262.
- D. Adjustable Masonry-Veneer Anchors:
 1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100 lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
 2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
 - a. Anchor Section: Zinc-allow barrel section with flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.
 - b. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188 inch diameter, hot-dip galvanized steel wire.
 - c. Acceptable Product: Heckmann Building Products, Inc.; No. 75 Pos-I-Tie.

2.3 ACCESSORIES

- A. Joint Sealant: Refer to Section 07 92 00.
- B. Nailing Strips: Western softwood, preservative treated, sized to masonry joints.

- C. Weep Holes: Leave-out of full head mortar joints.
- D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings.
- E. Mortar: Refer to Section 04 05 13.
- F. Expansion Joint Fillers: ASTM D1056 Class RE-11.
- G. Cementitious Dampproofing: Cementitious formulation nonstaining to stone; compatible with joint sealants and noncorrosive to anchors and attachments.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Beginning of installation means installer accepts existing conditions.

3.2 PREPARATION

- A. Verify items provided by other Sections of work are properly sized and located.
- B. Establish lines, levels, and coursing; protect from disturbance.
- C. Provide temporary bracing during erection of masonry work. Maintain in place until building structure provides permanent bracing.
- D. Scaffolding: Provide, erect, maintain, move, and finally remove scaffolding and staging required for masonry installation. Construct and maintain scaffolding in compliance with applicable ordinances, laws, rules and regulations. Scaffolding shall be sufficiently substantial to support workmen, and necessary materials and equipment. Provide adequate guard rails for protection of property, workmen, and passerby.
- E. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- F. Coat stone with dampproofing to extent indicated below:

1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
2. Stone Extending Below Grade: Beds, joints, back surfaces, and face surfaces below grade.
3. Allow dampproofing to cure before setting dampproofed stone. Do not damage or remove dampproofing while handling and setting stone.

3.3 COURSING

- A. Place masonry to lines and level indicated.
- B. Arrange and trim stones for adequate fit in pattern indicated with course heights as indicated, random lengths, uniform joint widths with offset between vertical joints as indicated.

3.4 PLACING AND BONDING

- A. Lay masonry in full bed of mortar (horizontal, vertical, and collar joints), properly jointed with other work. Buttering corners of joints and deep or excessive furrowing of mortar joints is not permitted.
- B. Fully bond intersections, and external and internal corners.
- C. Do not shift, or tap masonry units after mortar has taken initial set. Where adjustment must be made, remove mortar and replace.
- D. Remove excess mortar on surface and in cavities.
- E. Perform job site saw cutting with proper tools to provide straight unchipped edges. Take care to prevent breaking masonry unit corners or edges.

3.5 TOLERANCES

- A. Alignment of Columns: Maximum of 1/4 inch from true line.
- B. Variation from Unit to Adjacent Unit: 1/32 inch maximum.
- C. Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- D. Variation from Plumb: 1/4 inch per story non-cumulative, 1/2 inch in two stories or more.
- E. Variation from Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; 1/4 inch maximum.
- F. Variation of Joint Thickness: 1/8 inch in 3 feet.
- G. Maximum variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

3.6 REINFORCEMENT AND ANCHORAGES

- A. Attach wall ties to wall studs (or other solid and secure framing members) for veneer construction at maximum 16 inches on center vertically and 16 inches on center horizontally. Place at maximum 8 inches on center (or every third course) each way around perimeter of openings, within 12 inches of openings.
- B. Anchor stone veneer to unit masonry with metal veneer anchors as follows:
 - 1. Secure wire anchors by inserting pintles into eyes of masonry wall reinforcement projecting from horizontal mortar joints.
 - 2. Embed anchors in veneer mortar joints to within 1 inch of face.

3.7 MASONRY FLASHINGS

- A. Extend flashings to exterior face of veneer, turn up a minimum of 8 inches and seal onto face of sheathing over stud framed back-up.
- B. Lap end joints minimum 6 inches and seal watertight per manufacturer's recommendation.
- C. Use flashing manufacturer's recommended adhesive and termination sealant.

3.8 LINTELS

- A. Install loose steel lintels as scheduled or shown. Leave space at end of lintels to expand.

3.9 WEEPS AND VENTS

- A. Install weep holes in veneer at 24 inches on center horizontally above through-wall flashing, above shelf angles, and at bottom of walls.

3.10 CONTROL/EXPANSION JOINTS

- A. Size control joints in accordance with Section 07 92 00 for sealant performance, but in no case larger than adjacent mortar joints.
- B. Provide expansion joints as indicated.

3.11 BUILT-IN WORK

- A. As work progresses, build-in metal door frames, fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, and other items to be built in the work supplied by other Sections.
- B. Build-in items plumb and level.
- C. Bed anchors of metal door and glazed frames in mortar joints. Fill frame voids solid with mortar.
- D. Do not build-in organic materials subject to deterioration.

3.12 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Cooperate with other Sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting any area not indicated or where appearance or strength of masonry work may be impaired.

3.13 CLEANING

- A. Remove excess mortar and smears.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with non-acidic solution which will not harm masonry or adjacent materials. Consult masonry manufacturer for acceptable cleaners. Leave surfaces thoroughly clean and free of all mortar and other soiling.
- D. Use non-metallic tools in cleaning operations.
- E. Comply with ASTM C1515 and D7089.

3.14 PROTECTION

- A. Maintain protective boards at exposed external corners which may be damaged by construction activities.
- B. Provide protection without damaging completed work.
- C. Keep expansion joint voids clear of mortar.

END OF SECTION

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SECTION 07 11 13

BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies materials and workmanship for bituminous dampproofing on concrete and masonry surfaces.

1.2 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Product description.
 - 2. Application instructions.

1.3 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - D226-06 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
 - D449-03(R2008) Asphalt Used in Dampproofing and Waterproofing
 - D1227-95(R2007) Emulsified Asphalt Used as a Protective Coating for Roofing

PART 2 - PRODUCTS

2.1 ASPHALT (HOT APPLIED)

- A. ASTM D449, Type I.

2.2 ASPHALT SATURATED FELT

- A. ASTM D226, Type I, 7 kg (15 pound).

2.3 ASPHALT EMULSION (COLD APPLIED)

- A. ASTM D1227, Type III (spray grade)

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Surfaces to receive dampproofing shall be clean and smooth.
- B. Remove foreign matter, loose particles of mortar or other cementitious droppings.
- C. Clean and wash soil or dirt particles from surface.
- D. Remove free water; surfaces may remain damp.

3.2 APPLICATION

- A. Comply with Manufacturer written instructions for methods and rates of dampproofing application, cleaning and installation of any protection course.
- B. Apply each coat at the rate of not less than 1 L/m² (2-1/2 gallons per 100 square feet) and allow not less than 24 hours drying time after application.

3.3 LOCATION

- A. Apply to surfaces where shown.
- B. Apply to exterior surface of inner wythe of masonry cavity walls where shown. Coordinate application with masonry work.

END OF SECTION

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Formed sheet metal Work for flashing under wall copings is specified in this section.

1.2 RELATED WORK

- A. Sealant compound and installation: Section 07 92 00, JOINT SEALANTS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Flashings
- C. Manufacturer's Literature and Data:
 - 1. Two-piece counterflashing
 - 2. Thru wall flashing
 - 3. Non-reinforced, elastomeric sheeting
- D. Certificates: Stating that aluminum has been given - specified, finish ,and thickness of anodizing. Coating formulators approvals as specified.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below for a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A167-99-09..... Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - A653/A653M-08..... Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process
 - B32-08..... Solder Metal
 - B209-07..... Aluminum and Aluminum-Alloy Sheet and Plate
 - B370-09..... Copper Sheet and Strip for Building Construction
 - D412-06..... Vulcanized Rubber and Thermoplastic Elastomers- Tension
 - D1187-97 (R2002) Asphalt Base Emulsions for Use as Protective Coatings for Metal
 - :

- C. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
Architectural Sheet Metal Manual (2003 Edition).
- D. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06..... Metal Finishes Manual
- E. American Architectural Manufacturers Association (AAMA):
605-98 Voluntary Specification for High Performance Organic
Coatings on Architectural Extrusions Panels
- F. Federal Specification (Fed. Spec):
A-A-1925A Shield, Expansion; (Nail Anchors)
UU-B-790A Building Paper, Vegetable Fiber
- G. International Building Code (IBC):
2009 Edition

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.
- B. Stainless Steel: ASTM A167, Type 302B, dead soft temper.
- C. Copper ASTM B370, cold-rolled temper.
- D. Bituminous Coated Copper: Minimum copper ASTM B370, copper sheets may be bonded between two layers of coarsely woven bitumen-saturated cotton fabric ASTM D173.
- E. Copper Covered Paper: Fabricated of electro-deposit pure copper sheets ASTM B 370.
- F. Polyethylene Coated Copper: Copper sheet ASTM B370.
- G. Aluminum Sheet: ASTM B209, alloy 3003-H14.
- H. Galvanized Sheet: ASTM, A653.
- I. Non-reinforced, Elastomeric Sheeting: ASTM D412J.
- J. Bituminous Paint: ASTM D1187, Type I.
- K. Fasteners:
 - 1. As recommended by the manufacturer for each type, unless specified otherwise.

2.2 SHEET METAL THICKNESS

- A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
- B. Concealed Locations (Built into Construction):
 - 1. Copper: 30g (10 oz) minimum 0.33 mm (0.013 inch thick).
 - 2. Stainless steel: 0.25 mm (0.010 inch) thick.
 - 3. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.
 - 4. Galvanized steel: 0.5 mm (0.021 inch) thick.
- C. Exposed Locations:
 - 1. Stainless steel: 0.4 mm (0.015 inch).
- D. Thickness of aluminum or galvanized steel is specified with each item.

2.3 FABRICATION, GENERAL

- A. General: Fabricate sheet metal flashing and trim to comply with SMACNA guidelines.
- B. Joints:
 - 1. Form nonexpansion, but moveable in metal to accommodate sealant to comply with SMACNA guidelines.
 - 2. Conceal all fasteners where possible.
- C. Flat and lap joints shall be made in direction of flow.
- D. Edges of bituminous coated copper, copper covered paper, non-reinforced elastomeric sheeting and polyethylene coated copper shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
- E. Soldering:
 - 1. Comply with ASTM B32
- F. Expansion and Contraction Joints:
 - 1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations.
- G. Cleats:
 - 1. Fabricate cleats, metal edges, drips, edge strips, and attachment devices from the same material as accessory being anchored.
- H. Metal Options:
 - 1. Where options are permitted for different metals use only one metal throughout.
 - 2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.

2.4 FINISH

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual, unless otherwise specified.

2.5 THROUGH-WALL FLASHINGS

- A. Flexible flashing not exposed to exterior
 - 1. Copper Laminated; 1500 grams/square meter (5 oz/square foot) copper sheet bonded with asphalt between 2 layers of glass fiber cloth.
 - 2. Rubberized Asphalt Flashing; Composite flashing consisting of a pliable adhesive rubberized asphalt compound not less than 8 mm (0.30 inch) thick.
 - 3. Elastomeric Thermoplastic Flashing; Composite flashing product consisting of polyester-reinforced ethylene interpolymers as follows:
 - a. Monolithic Sheet: Elastomeric thermal flashing 1 mm (0.04 inch) thick.
 - b. Self Adhesive Sheet: Elastomeric thermal flashing 0.635 mm (0.025 inch) thick with 0.40 mm (0.015 inch) thick coating of rubberized asphalt adhesive.
 - 4. EPDM Flashing: Sheet flashing product made from Ethylene-Propylene-Dieterpolymer, 1mm (0.04 inch) thick.

2.6 COUNTERFLASHING

- A. Either copper or stainless steel, unless specified otherwise.
- B. Comply with SMACNA guidelines for installation tolerances.
- C. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip.
- D. One-piece Counterflashing:
 - 1. Back edge turned up and fabricates to lock into reglet in concrete.
 - 2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).
- E. Two-Piece Counterflashing:
 - 1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
 - 2. Counterflashing upper edge designed to snap lock into receiver.
- F. Surface Mounted Counterflashing; one or two piece:
 - 1. Use at existing or new surfaces where flashing cannot be inserted in vertical surface.
 - 2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between

end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.

3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Anchor sheet metal flashing and trim and other components of the work securely in place with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete flashing and trim assemblies.
2. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
3. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
4. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
5. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
6. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nails not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.

13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
 - a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
 - b. Paint dissimilar metal with a coat of bituminous paint.
 - c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
 - a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
 - b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counter flashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.

11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
 12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
 13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
 14. Continue flashing around columns:
 - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
 - b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).
- B. Flashing at Masonry, Stone, or Precast Concrete Copings:
1. Install flashing with drips on both wall faces unless shown otherwise.
 2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

3.3 COUNTERFLASHING

- A. General:
1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
 2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
 3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
 4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.
 5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.
 6. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.
- B. One Piece Counterflashing:
1. Where flashing is installed at new masonry, coordinate to insure proper height, embed in mortar, and end lap.
 2. Where flashing is installed in reglet in concrete insert upper edge into reglet. Hold flashing in place with lead wedges spaced not more than 200 mm (8 inch) apart. Fill joint with sealant.
 3. Where flashing is surface mounted on flat surfaces.
 - a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center:
 - 1) Locate fasteners in masonry mortar joints.
 - 2) Use screws to sheet metal or wood.
 - b. Fill joint at top with sealant.

4. Where flashing or hood is mounted on pipe.
 - a. Secure with draw band tight against pipe.
 - b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
 - c. Completely fill joint at top with sealant.
- C. Two-Piece Counterflashing:
 1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.
 2. Surface applied type receiver:
 - a. Secure to face construction in accordance, with manufacturer's instructions.
 - b. Completely fill space at the top edge of receiver with sealant.
 3. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this Section covers all sealant materials and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK

- A. Sealing of site Work concrete paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- B. Sealing joints in stone veneer: Section 04 43 00, NATURAL STONE VENEER.
- C. Sealing joints around concrete detectable warning pavers: Section 32 14 00, UNIT PAVERS.

1.3 QUALITY CONTROL

- A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 3. Determine sealants will not stain joint substrates according to ASTM C1248.
- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field-test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
 - 1. Locate test joints where indicated or, if not indicated, as directed by COR.
 - 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.

3. Notify COR seven days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present. Provide written acceptance from manufacturer's technical representative that materials pass for adhesion and compatibility.
- E. Meet VOC requirements of pertinent CARB and/or SCAQMD Rule for sealants VOC (4 percent by weight VOC or less in less than 16 ounce package or less than 250 g/L in larger package). All non-porous sealant primers must be below 250g/L and primers for porous substrates less than 775 g/L.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this Section.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
1. Caulking compound.
 2. Primers.
 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 4. Joint fillers.
 5. Joint sealant backing.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations:
1. Do not proceed with installation of joint sealants under following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40° F.
 - b. When joint substrates are wet.
- B. Joint-Width Conditions:
1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

- C. Joint-Substrate Conditions:
 - 1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 DELIVERY, HANDLING, AND STORAGE

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.
- C. Do not subject to sustained temperatures less than 40° F or exceeding 90° F.

1.7 DEFINITIONS

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.8 WARRANTY

- A. Warranty exterior sealing against leaks, adhesion and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that Warranty period shall be extended to two years.
- B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

1.9 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Use the latest edition of the referenced publication.
- B. American Society for Testing and Materials (ASTM):
 - C612-10..... Mineral Fiber Block and Board Thermal Insulation
 - C717 Standard Terminology of Building Seals and Sealants
 - C734-06(2012)..... Low Temperature Flexibility of Latex Sealants after Artificial Weathering
 - C834-10..... Latex Sealants
 - C920-11 Elastomeric Joint Sealants
 - C1021-08..... Laboratories Engaged in Testing of Building Sealants
 - C1193-13..... Use of Joint Sealants
 - C1248-08(2012)..... Staining of Porous Substrate by Joint Sealants

- C1330-02(2013)..... Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
- D1056-07 Flexible Cellular Materials—Sponge or Expanded Rubber
- E84-12c Surface Burning Characteristics of Building Materials
- C. California Air Resources Board (CARB)
- D. Sealant, Waterproofing and Restoration Institute (SWRI):
The Professionals' Guide

PART 2 - PRODUCTS

2.1 SEALANTS

- A. S-1:
 - 1. ASTM C920, polyurethane.
 - 2. Type M.
 - 3. Class 25.
 - 4. Grade NS.
 - 5. Shore A hardness of 20-40.
- B. S-2:
 - 1. ASTM C920, polyurethane.
 - 2. Type M.
 - 3. Class 25.
 - 4. Grade P.
 - 5. Shore A hardness of 25-40.
- C. S-6:
 - 1. ASTM C920, silicone, neutral cure.
 - 2. Type S.
 - 3. Class: 25 Joint movement range of plus 100 percent to minus 50 percent.
 - 4. Grade NS.
 - 5. Shore A hardness of 15-20.

2.2 CAULKING COMPOUND

- A. C-1: ASTM C834, acrylic latex.

2.3 COLOR

- A. Sealants used with exposed masonry shall match color of mortar joints.
- B. Sealants used with unpainted concrete shall match color of adjacent concrete.
- C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise.

2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; 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, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056 Class RE-11, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 □ C (minus 26
- F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 FILLER

- A. Mineral fiber board: ASTM C612, Type IVA.
- B. Thickness same as joint width.
- C. Depth to fill void completely behind back-up rod.

2.6 PRIMER

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.7 CLEANERS-NON POURIOUS SURFACES

- A. Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.

- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS

- A. Prepare joints in accordance with manufacturer's instructions and as specified only when installers are ready to initiate sealant application as soon as practicable after preparation and before subsequent surface deterioration.
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
 - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
 - 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.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
 - 1. Apply primer prior to installation of back-up rod or bond breaker tape.
 - 2. Use brush or other approved means that will reach all parts of joints.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION

- A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 1/8 inch for sealant depths specified.
- E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.4 SEALANT DEPTHS AND GEOMETRY

- A. At widths up to 1/4 inch, sealant depth equal to width.
- B. At widths over 1/4 inch, sealant depth 1/2 of width up to 1/2 inch maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written installation instructions for products and applications indicated.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.

3.6 CLEANING

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
- B. After filling and finishing joints, remove masking tape.
- C. Leave adjacent surfaces in a clean and unstained condition.

3.7 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 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.

3.8 LOCATIONS

- A. Exterior Wall Joints, Horizontal and Vertical:
 - 1. Metal to Metal: Type S-6.
 - 2. Metal to Masonry or Stone: Type S-1.
 - 3. Masonry to Masonry or Stone: Type S-1.
 - 4. Stone to Stone: Type S-1.
 - 5. Masonry Expansion and Control Joints: Type S-6.
- B. Metal Reglets and Flashings:
 - 1. Flashings to Wall: Type S-6.
 - 2. Metal to Metal: Type S-6.
- C. Horizontal Traffic Joints:
 - 1. Concrete Paving, Unit Pavers: Type S-2.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.
- B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

1.2 RELATED WORK

- A. Bedding of conduits: Section 31 20 00, EARTH MOVING.
- B. Sealing around conduit penetrations to prevent moisture migration into the building: Section 07 92 00, JOINT SEALANTS.

1.3 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
- B. Shop Drawings:
 - 1. Size and location of pull boxes
 - 2. Layout of required conduit penetrations.
 - 3. The specific item proposed and its area of application shall be identified on the catalog cuts.
- C. Certification: Prior to final inspection, deliver to the COR four copies of the certification that the material is in accordance with the Drawings and Specifications and has been properly installed.

1.4 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. National Fire Protection Association (NFPA):
 - 70-08 National Electrical Code (NEC)
- C. Underwriters Laboratories, Inc. (UL):
 - 1-05 Flexible Metal Conduit
 - 5-04 Surface Metal Raceway and Fittings
 - 6-07 Rigid Metal Conduit
 - 50-07 Enclosures for Electrical Equipment

360-09	Liquid-Tight Flexible Steel Conduit
467-07	Grounding and Bonding Equipment
514A-04	Metallic Outlet Boxes
514B-04	Fittings for Cable and Conduit
514C-96	Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers
651-05	Schedule 40 and 80 Rigid PVC Conduit
651A-00	Type EB and A Rigid PVC Conduit and HDPE Conduit
797-07	Electrical Metallic Tubing
1242-06	Intermediate Metal Conduit

- D. National Electrical Manufacturers Association (NEMA):
- | | |
|---------------|--|
| TC-3-04 | PVC Fittings for Use with Rigid PVC Conduit and Tubing |
| FB1-07 | Fittings, Cast Metal Boxes and Conduit Bodies for
Conduit, Electrical Metallic Tubing and Cable |

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Conduit Size: In accordance with the NEC, but not less than 1/2 inch unless otherwise shown. Where permitted by the NEC, 1/2 inch flexible conduit may be used for tap connections to recessed lighting fixtures.
- B. Conduit:
1. Rigid galvanized steel: Shall Conform to UL 6, ANSI C80.1.
 2. Flexible galvanized steel conduit: Shall Conform to UL 1.
 3. Direct burial plastic conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high density polyethylene (PE).
- C. Conduit Fittings:
1. Rigid steel and IMC conduit fittings:
 - a. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
 - b. Standard threaded couplings, locknuts, bushings, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
 - c. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
 - d. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
 - e. Erickson (union type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.

- f. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.
 - 2. Flexible steel conduit fittings:
 - a. Conform to UL 514B. Only steel or malleable iron materials are acceptable.
 - b. Clamp type, with insulated throat.
 - 3. Direct burial plastic conduit fittings:
 - a. Fittings shall meet the requirements of UL 514C and NEMA TC3.
 - b. As recommended by the conduit manufacturer.
 - 4. Expansion and deflection couplings:
 - a. Conform to UL 467 and UL 514B.
 - b. Accommodate, 19 mm (0.75 inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
 - c. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
 - d. Jacket: Flexible, corrosion resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.
- D. Conduit Supports:
 - 1. Parts and hardware: Zinc coat or provide equivalent corrosion protection.
- E. Outlet, Junction, and Pull Boxes:
 - 1. UL-50 and UL-514A.
 - 2. Cast metal, and equipped with rustproof boxes.
- F. Warning Tape: Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape non-detectable type, red with black letters, and imprinted with "CAUTION BURIED ELECTRIC LINE BELOW".

PART 3 - EXECUTION

3.1 PENETRATIONS

- A. Cutting or Holes:
 - 1. Locate holes in advance.
 - 2. Cut holes through concrete and masonry with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the COR as required by limited working space.
- B. Waterproofing: At floor conduit penetrations, completely seal clearances around the conduit and make watertight as specified in Section 07 92 00, JOINT SEALANTS.

3.2 INSTALLATION, GENERAL

- A. In accordance with UL, NEC, as shown, and as hereinafter specified.
- B. Install conduit as follows:
 - 1. In complete runs before pulling in cables or wires.
 - 2. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
 - 3. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
 - 4. Mechanically and electrically continuous.
 - 5. Support within 1 foot of changes of direction, and within 1 foot of each enclosure to which connected.
 - 6. Close ends of empty conduit with plugs or caps at the rough in stage to prevent entry of debris, until wires are pulled in.
 - 7. Secure conduits to junction boxes, pull boxes and outlet boxes with bonding type locknuts. For rigid and IMC conduit installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make conduit connections to junction box covers.
 - 8. Do not use aluminum conduits in wet locations.
 - 9. Unless otherwise indicated on the Drawings or specified herein, all conduits shall be installed concealed below grade.
- C. Conduit Bends:
 - 1. Make bends with standard conduit bending machines.
 - 2. Conduit hickey may be used for slight offsets, and for straightening stubbed out conduits.
 - 3. Bending of conduits with a pipe tee or vise is prohibited.
- D. Layout and Homeruns:
 - 1. Install conduit with wiring, including homeruns, as shown.
 - 2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted approved by the COR.

3.3 CONCEALED WORK INSTALLATION

- A. In Concrete:
 - 1. Conduit: Rigid steel or IMC. Do not install EMT in concrete slabs that are in contact with soil, gravel or vapor barriers.
 - 2. Align and run conduit in direct lines.
 - 3. Installation of conduit in concrete that is less than 3 inches thick is prohibited.
 - a. Conduit outside diameter larger than 1/3 of the slab thickness is prohibited.
 - b. Space between conduits in slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
 - c. Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (3/4 inch) of concrete around the conduits.

4. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to insure low resistance ground continuity through the conduits. Tightening set screws with pliers is prohibited.

3.4 DIRECT BURIAL INSTALLATION

- A. Exterior routing of Lighting Systems and Other Branch circuits (600 Volt and Less, and 1500 mm (5 feet) from the buildings):
 1. Conduit: Thick wall PVC or high density PE, unless otherwise shown.
 2. Mark conduit at uniform intervals to show the kind of material, direct burial type, and the UL approval label.
 3. Install conduit fittings and terminations as recommended by the conduit manufacturer.
 4. Tops of conduits shall be as follows unless otherwise shown:
 - a. Not less than 600 mm (24 inches) below finished grade.
 - b. Not less than 750 mm (30 inches) below road and other paved surfaces.
 5. Work with extreme care near existing ducts, conduits, cables, and other utilities to avoid damaging them.
 6. Excavation for conduit bedding and back-filling of trenches is specified in Section 31 20 00, EARTH MOVING.
 - a. Cut the trenches neatly and uniformly.
 - b. Do not kink the conduits.
 7. Seal conduits, including spare conduits, at outdoor terminations for equipment with a suitable compound that prevents the entrance of moisture and gases.
 8. Where metal conduit is shown, install threaded heavy wall rigid steel galvanized conduit or type A20 rigid steel galvanized conduit coated with .5 mm (20 mil) bonded PVC, or rigid steel or IMC, PVC coated or standard coated with bituminous asphaltic compound.
 9. Warning tape shall be continuously placed 300 mm (12 inches) above conduits or electric lines.

3.5 HAZARDOUS LOCATIONS

- A. Use rigid steel conduit only, notwithstanding requirements otherwise specified in this or other sections of these specifications.
- B. Install UL approved sealing fittings, that prevent passage of explosive vapors, in hazardous areas equipped with explosive proof lighting fixtures, switches, and receptacles, as required by the NEC.

3.6 WET OR DAMP LOCATIONS

- A. Unless otherwise shown, use conduits of rigid steel or IMC.
- B. Provide sealing fittings, to prevent passage of water vapor, where conduits pass from warm to cold locations, i.e., (refrigerated spaces, constant temperature rooms, air conditioned spaces building exterior walls, roofs) or similar spaces.

- C. Unless otherwise shown, use rigid steel or IMC conduit within 1500 mm (5 feet) of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers. Conduit shall include an outer factory coating of .5 mm (20 mil) bonded PVC or field coat with asphaltum before installation. After installation, completely coat damaged areas of coating.

3.7 EXPANSION JOINTS

- A. Install expansion and deflection couplings where shown.

3.8 BOX INSTALLATION

- A. Boxes for Concealed Conduits:
 - 1. Flush mounted.
 - 2. Provide raised covers for boxes to suit the floor slab, construction and finish.
- B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling in operations.
- C. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap in metal covers for sheet metal boxes.
- D. Outlet boxes in the same wall mounted back to back are prohibited. A minimum 600 mm (24 inch), center-to-center lateral spacing shall be maintained between boxes.)
- E. Minimum size of outlet boxes for ground fault interrupter (GFI) receptacles is 100 mm (4 inches) square by 55 mm (2 1/8 inches) deep, with device covers for the wall material and thickness involved.
- F. Stencil or install phenolic nameplates on covers of the boxes identified on riser diagrams; for example "SIG FA JB No. 1".
- G. On all Branch Circuit junction box covers, identify the circuits with black marker.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this Section specifies the requirements for furnishing all equipment, materials, labor, tools, and techniques for earthwork including, but not limited to, the following:
 - 1. Site preparation.
 - 2. Subsoil and topsoil materials.
 - 3. Excavation.
 - 4. Filling and backfilling.
 - 5. Grading.
 - 6. Soil Disposal.
 - 7. Clean Up.

1.2 DEFINITIONS

- A. Unsuitable Materials:
 - 1. Fills: Topsoil; frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 3 inches; organic material, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable and any material with a liquid limit and plasticity index exceeding 35 and 25 respectively. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction, as defined by ASTM D698.
 - 2. Existing Subgrade (Except Footing Subgrade): Same materials as 1.2.A.1, that are not capable of direct support of slabs, pavement, and similar items with possible exception of improvement by compaction, proofrolling, or similar methods.
 - 3. Existing Subgrade (Footings Only): Same as 1.2.A.1, but no fill or backfill. If materials differ from reference borings and design requirements, excavate to acceptable strata subject to COR's approval.
- B. Building Earthwork: Earthwork operations required in area enclosed by a line located 5 feet outside of principal building perimeter. It also includes earthwork required for auxiliary structures and buildings.
- C. Trench Earthwork: Trenchwork required for utility lines.
- D. Site Earthwork: Earthwork operations required in area outside of a line located 5 feet outside of principal building perimeter and within new construction area with exceptions noted above.
- E. Degree of compaction: Degree of compaction is expressed as a percentage of maximum density obtained by laboratory test procedure. This percentage of

maximum density is obtained through use of data provided from results of field test procedures presented in ASTM D1557.

- F. Fill: Satisfactory soil materials used to raise existing grades. In the Construction Documents, the term “fill” means fill or backfill as appropriate.
- G. Backfill: Soil materials or controlled low strength material used to fill an excavation.
- H. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or indicated lines and dimensions without written authorization by the COR. No payment will be made for unauthorized excavation or remedial Work required to correct unauthorized excavation.
- I. Authorized additional excavation: Removal of additional material authorized by the COR based on the determination by the soils testing agency that unsuitable bearing materials are encountered at required subgrade elevations. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in Work.
- J. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base, drainage fill, or topsoil materials.
- K. Structure: Buildings, foundations, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- L. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- M. Drain rock: Smooth, rounded rock, 2 inches to 4 inches in diameter, used at exposed surface runoff areas.
- N. Drainage fill: Free draining, uniformly graded crushed gravel for use with perforated piping.
- O. Bedding course: Layer placed over the excavated sub-grade in a trench before laying pipe. Bedding course shall extend up to the springline of the pipe.
- P. Base Course: Layer placed between the subgrade and asphalt paving or layer placed between the subgrade and a concrete pavement or walk.
- Q. Utilities include on-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- R. Debris: Debris includes all materials located within the designated Work area not covered in the other definitions and shall include but not be limited to items like vehicles, equipment, appliances, building materials or remains thereof, tires, any solid or liquid chemicals or products stored or found in containers or spilled on the ground.

- S. Contaminated soils: Soil that contains contaminants as defined and determined by the COR or the Government's testing agency.

1.3 RELATED WORK

- A. Safety requirements: Section 01 00 00, GENERAL REQUIREMENTS, HEALTH AND SAFETY PLAN.
- B. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.
- D. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- E. Erosion Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- F. Site preparation: Section 02 41 10, DEMOLITION AND SITE CLEARING.
- G. Concrete placement: Section 03 30 00 CAST-IN-PLACE CONCRETE.
- H. Paving subgrade requirements: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- I. Utilities: Section 33 46 13 FOUNDATION DRAINAGE, Section 33 49 00 STORM DRAINAGE STRUCTURES.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Furnish to COR:
 - 1. Contactor shall furnish resumes with all personnel involved in the Project including Project Manager, Superintendent, and on-site Engineer. Project Manager and Superintendent should have at least 3 years of experience on projects of similar size.
 - 2. Soil samples.
 - a. Classification in accordance with ASTM D2487 for each on-site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
 - b. Laboratory compaction curve in accordance with ASTM D698 for each on site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
 - c. Test reports for compliance with ASTM D2940 requirements for sub-base material.
 - d. Pre-excavation photographs and videotape in the vicinity of the existing structures to document existing site features, including

- surfaces finishes, cracks, or other structural blemishes that might be misconstrued as damage caused by earthwork operations.
- e. The Contractor shall submit a scale plan daily that defines the location, limits, and depths of the area excavated.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Use the latest edition of the referenced publication.
- B. American Association of State Highway and Transportation Officials (AASHTO):
- M6 Standard Specification for Fine Aggregate for Hydraulic Cement Concrete
- T99-01(2004) Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop
- T180-01(2004) Moisture-Density Relations of Soils using a 4.54 kg (10 lb) Rammer and a 457 mm (18 inch) Drop
- C. American Society for Testing and Materials (ASTM):
- C33 Standard Specification for Concrete Aggregates
- D448 Standard Classification for Sizes of Aggregate for Road and Bridge Construction
- D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft. lbf/ft³ (600 kN m/m³))
- D1556 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2700 kN m/m³))
- D2167-08 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- D2487 Standard Classification of Soil for Engineering Purposes (Unified Soil Classification System)
- D2922-05 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- D2940 Standard Specifications for Graded Aggregate Material for Bases or Subbases for Highways or Airports
- D2974 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- D. Society of Automotive Engineers (SAE):
- J732-92 Specification Definitions - Loaders
- J1179-02 Hydraulic Excavator and Backhoe Digging Forces

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide borrow soil material when sufficient satisfactory soil materials are not available from excavations.
- B. Fills: Material in compliance with ASTM D2487 Soil Classification Groups CL (silty clays), CL (sandy clays), or SC (clayey sands), or any combination of these groups; free of rock or gravel larger than 2.5 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material approved from on-site or off-site sources having a minimum dry density of 110 pcf, a Plasticity Index within the range of 5 to 12, and a maximum Liquid Limit of 35; resistivity no less than that for the onsite soils; pH between 6 and 8.5; total water soluble chloride concentration less than 300 ppm; and total water soluble sulfate concentration less than 500 ppm.
1. Native soil fill: Native excavated and re-used material; limiting organic content to no more than 3% and no large roots allowed.
- C. Engineered Fill: Naturally or artificially graded mixture of compliance with ASTM D2487 Soil Classification Groups CL (silty clays), CL (sandy clays), or SC (clayey sands), or any combination of these groups, or as approved by the COR or material with at least 90 percent passing a 1 1/2-inch sieve and not more than 12 percent passing a No. 200 sieve, per ASTM D2940. Minimum dry density of 110 pcf, a Plasticity Index within the range of 5 to 12, and a maximum Liquid Limit of 35; resistivity no less than that for the onsite soils; pH between 6 and 8.5; total water soluble chloride concentration less than 300 ppm; and total water soluble sulfate concentration less than 500 ppm. Fill shall be approved by COR and Project Geotechnical Engineer at least 48 hours prior to being transported to the site.
- D. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; meeting the requirements for Caltrans Class 2 permeable material.
- E. Drain Rock: Rounded river cobble, 2" to 4" in size.
- F. Drainage Fill: Washed, narrowly graded mixture of crushed stone or crushed or uncrushed gravel; free of shale, clay, friable material, and debris; ASTM D448; coarse-aggregate grading Size 67; with the following gradation:

DRAINAGE FILL #67	
Sieve Size	Percent Passing
1"	100
3/4"	90 – 100
3/8"	25 – 55
No. 4	0 - 10
No. 8	0-5

G. Granular Fill:

1. Under concrete slab, crushed stone or gravel graded from 1 inch to No. 4, per ASTM D2940.

2.2 FINE AGGREGATE MATERIALS

- A. Sand: Natural river or bank sand conforming to AASHTO M6 or ASTM C33; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded within the following limits:

SAND	
Sieve Sizes	Percent Passing
No. 4	90-100
No. 200	<5

PART 3 - EXECUTION

3.1 SITE PREPARATION

- A. Call Underground Service Alert (USA, 811) before starting any Work.
- B. Clearing: Clear within limits of earthwork operations as indicated. Work includes removal of surface vegetation, shrubs, fences, foundations, incidental structures, paving, debris, trash, and other obstructions. Remove materials from Cemetery property.
- C. Grubbing: Remove stumps and roots 2 inch and larger diameter. Undisturbed sound stumps, roots up to 2 inch diameter, and nonperishable solid objects a minimum of 3 feet below subgrade or finished embankment may be left. Do not leave material within burial profile up to 8 feet below finished grade.
- D. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from areas within 15 feet of new construction Work and 7.5 feet of utility lines when removal is approved in advance by COR. Remove materials from Cemetery property. Trees and shrubs, shown to be transplanted, shall be dug with a ball of earth and burlapped in accordance with latest issue of, "American Standard for Nursery Stock" of the American Association of Nurserymen, Inc. Transplant trees and shrubs to a permanent or temporary position within two hours after digging. Maintain trees and shrubs held in temporary locations by watering as necessary and feeding semiannually with liquid fertilizer with a minimum analysis of 5 percent nitrogen, 10 percent phosphorus, and 5 percent potash. Maintain plants moved to permanent positions as specified for plants in temporary locations until conclusion of Contract. Box, and otherwise protect from damage, existing trees and shrubs which are not shown to be removed in Work area. Immediately repair damage to existing trees and shrubs by trimming, cleaning and painting damaged areas, including roots, in accordance with standard industry horticultural practice for the geographic area and plant species. Do not store building materials closer to trees and shrubs, which are to remain, than farthest extension of their limbs.

- E. Stripping Topsoil: Strip topsoil from within limits of earthwork operations as specified. Topsoil shall be a fertile, friable, natural topsoil of loamy character and characteristic of locality. Topsoil shall be capable of growing healthy horticultural crops of grasses. Stockpile topsoil and protect as directed by COR. Eliminate foreign materials, such as weeds, roots, stones, subsoil, frozen clods, and similar foreign materials larger than 1/2 cubic foot in volume, from soil as it is stockpiled. Retain topsoil on station. Remove foreign materials larger than 2 inches in any dimension from topsoil used in final grading. Topsoil Work, such as stripping, stockpiling, and similar topsoil Work shall not, under any circumstances, be carried out when soil is wet so that the composition of the soil will be destroyed.
1. Test the soil for chemicals, pesticides and fertilizers to verify suitability for use as topsoil in the Cemetery where new lawn areas are to be established.
- F. Stockpile materials on-site at locations designated by COR or as indicated on the Drawings. Stockpile in sufficient quantities to meet Project schedule and requirements. Separate differing materials with dividers or stockpile apart to prevent mixing. Direct surface water away from stockpile site to prevent erosion or deterioration of materials. Material shall be stockpiled on impervious material and covered over with same material until disposal. Place erosion control measures as required by Storm Water Pollution Prevention requirements of the state of Louisiana. Remove stockpile at end of construction or when no longer needed, whichever is earlier; leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.
- G. Concrete Slabs and Paving: Score deeply or saw cut to insure a neat, straight cut, sections of existing concrete slabs and paving to be removed where excavation or trenching occurs. Extend pavement section to be removed a minimum of 12 inches on each side of widest part of trench excavation and insure final score lines are approximately parallel unless otherwise indicated. Remove material from Cemetery Property.
- H. Lines and Grades: Registered Professional Land Surveyor or Registered Civil Engineer, specified in Section 01 00 00, GENERAL REQUIREMENTS, shall establish lines and grades.
1. Grades shall conform to elevations indicated on plans within the tolerances herein specified. Generally grades shall be established to provide a smooth surface, free from irregular surface changes. Grading shall comply with compaction requirements of the Geotechnical Engineer and grade cross sections, lines, and elevations indicated. Where spot grades are indicated the grade shall be established based on interpolation of the elevations between the spot grades while maintaining appropriate transition at structures and paving and uninterrupted drainage flow into inlets.
 2. Locations of existing elevations indicated on Drawings, except spot elevations, are approximate from a site survey that measured spot elevations and subsequently generated existing contours and spot elevations. Proposed spot elevations and contour lines have been developed utilizing the existing conditions survey and developed contour lines and may be approximate. Contractor is responsible to notify COR of any differences between existing elevations shown on plans and those

encountered on-site by Surveyor described above. Notify COR of any differences between existing or constructed grades, as compared to those shown on the Drawings.

3. Subsequent to establishment of lines and grades, Contractor will be responsible for any additional cut and/or fill required to ensure that site is graded to conform to elevations indicated on plans.

- I. Disposal: All materials removed from the property shall be disposed of at a legally approved site, for the specific materials, and all removals shall be in accordance with all applicable Federal, State and local regulations. No burning of materials is permitted on-site.

3.2 EXCAVATION

- A. Shoring, Sheet piling and Bracing: Shore, brace, or slope, its angle of repose or to an angle considered acceptable by the local OSHA and Authority, banks of excavations to protect workmen, banks, adjacent paving, structures, and utilities.
 1. Design of the temporary support of excavation system is the responsibility of the Contractor.
 2. Construction of the support of excavation system shall not interfere with the permanent Work and may begin only after a review by the COR.
 3. Extend shoring and bracing to a minimum of 5 feet below the bottom of excavation. Shore excavations that are carried below elevations of adjacent existing foundations.
 4. If bearing material of any foundation is disturbed by excavating, improper shoring or removal of existing or temporary shoring, placing of backfill, and similar operations, the Contractor shall provide a concrete fill support under disturbed foundations, as directed by COR, at no additional cost to the Government. Do not remove shoring until permanent work in excavation has been inspected and approved by COR.
- B. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required to keep excavation free of water and subgrade dry, firm, and undisturbed until approval of permanent Work has been received from COR. Approval by the COR is also required before placement of the permanent Work on all subgrades.
- C. Subgrade Protection: Protect subgrades from softening, undermining, washout, or damage by rain or water accumulation. Reroute surface water runoff from excavated areas and not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. When subgrade for preplaced urn crypts has been disturbed by water, remove disturbed material to firm undisturbed material after water is brought under control. Replace disturbed subgrade in trenches with concrete or material approved by the COR.
- D. Blasting: Not permitted.
- E. Proofrolling:
 1. After rough grade has been established in cut areas and prior to placement of fill in fill areas under preplaced urn crypts and paving,

proofroll exposed subgrade with a fully loaded dump truck to check for pockets of soft material.

2. Proofrolling shall consist of at least two complete passes with one pass being in a direction perpendicular to preceding one. Remove any areas that deflect, rut, or pump excessively during proofrolling, or that fail to consolidate after successive passes, to suitable soils and replace with compacted fill. Maintain subgrade until succeeding operation has been accomplished.

F. Trench Earthwork:

1. Wall Footing:
 - a. Excavation shall be accomplished as required by Drawings and Specifications.
 - b. Excavate footing excavations to solid undisturbed subgrade.
 - c. Remove loose or soft materials to a solid bottom.
 - d. Fill excess cut under footings with 3,000 psi concrete poured separately from the footings.
 - e. Do not tamp earth for backfilling in footing bottoms, except as specified.
 - f. Slope grades to direct water away from excavations and to prevent ponding.
2. Sanitary and storm sewer trenches:
 - a. Trench width below a point 6 inches above top of pipe shall be 24 inches maximum for pipe up to and including 12 inches diameter. Width of trench above that level shall be as necessary for sheeting and bracing and proper performance of the work.
 - b. Bed bottom quadrant of pipe on granular fill.
 - 1) Granular Fill: Depth of fill shall be a minimum of 3 inches plus one sixth of pipe diameter below pipe to 12 inches above top of pipe. Place and tamp fill material by hand.
 - c. Place and compact as specified remainder of backfill using acceptable excavated materials. Do not use unsuitable materials.
 - d. Use granular fill for bedding where rock or rocky materials are excavated.

G. Site Earthwork: Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation. Excavation shall be accomplished as required by Drawings and Specifications. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other Work, complying with OSHA requirements, and for inspections.

1. Remove subgrade materials that are determined by COR as unsuitable and replace with acceptable material. If there is a question as to whether material is unsuitable or not, the Contractor shall obtain samples of the material, under the direction of the COR, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable or not. When unsuitable material is encountered and removed, Contract price and time will be adjusted in

accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL REQUIREMENTS as applicable. Adjustments to be based on volume in cut section only.

2. Upon excavating to subgrade elevation, scarify subgrade to a depth of 12 inches, moisture condition to slightly over optimum water content, and compact to the requirements indicated on the Drawings and required by the Geotechnical Investigation for the cover material specified.

H. Site Grading:

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
3. Slope grades to direct water away from buildings and to prevent ponds from forming where not designed. Finish subgrades to required elevations within the following tolerances:
 - a. Lawn or Unpaved Areas: Plus or minus 1 inch.
 - b. Walks: Plus or minus 1 inch.
 - c. Pavements: Plus or minus 1 inch.
 - d. Grading Inside Footing: Finish subgrade to a tolerance of 1/2 inch when tested with a 10 foot straightedge.

3.3 FILLING AND BACKFILLING

- A. General: Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation. For fill and backfill, use excavated materials and borrow meeting the criteria specified herein, as applicable. Borrow will be supplied at no additional cost to the Government. Do not use unsuitable excavated materials. Do not backfill until preplaced urn crypts have been completed above grade and adequately braced, foundation subdrainage and pipes coming in contact with backfill have been installed, and Work inspected and approved by COR.
- B. Placing: Place materials in horizontal layers not exceeding 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers and then compacted. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. Place no material on surfaces that are muddy, frozen, or contain frost.
- C. Placing Drain Rock and Filter Fabric: Excavate to 12 inches below final finished grade. Place Mirafi 140N or approved equal filter fabric per manufacturer's recommendations. Please Drain Rock to 12 inch depth unless indicated otherwise on the Drawings.
- D. Compaction: Compact with approved tamping rollers, sheepfoot rollers, pneumatic tired rollers, steel wheeled rollers, vibrator compactors, or other approved equipment (hand or mechanized) well suited to soil being compacted. Moisten or aerate material as necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Compact

soil to not less than the following percentages of maximum dry density, according to ASTM D698 or ASTM D1557 as specified below:

1. Fills, Embankments, and Backfill
 - a. Under proposed structures, slabs, steps, and paved areas, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material in accordance with ASTM D1557, 95 percent.
 - b. Curbs, curbs and gutters, 12 inch depth, ASTM D1557, 95 percent.
 - c. Under Sidewalks, scarify and recompact top 12 inches below subgrade and compact each layer of backfill or fill material in accordance with ASTM D1557, 95 percent.
 - d. Landscaped areas, top 16 inches, ASTM D698, 85 percent.
 - e. Landscaped areas, below 16 inches of finished grade, ASTM D698, 90 percent.
2. Natural Ground (Cut or Existing)
 - a. Under slabs, steps and paved areas, top 12 inches, ASTM D1557, 95 percent.
 - b. Curbs, curbs and gutters, top 12 inches, ASTM D1557, 95 percent.
 - c. Under sidewalks, top 12 inches ASTM D1557, 95 percent.

3.4 GRADING

- A. General: Uniformly grade the areas within the limits of this Section, including adjacent transition areas. Smooth the finished surface within specified tolerance. Provide uniform levels or slopes between points where elevations are indicated, or between such points and existing finished grades. Provide a smooth transition between abrupt changes in slope.
- B. Cut rough or sloping rock to level beds for foundations. In pipe spaces or other unfinished areas, fill low spots and level off with coarse sand or fine gravel.
- C. Finish grade earth floors in pipe basements as shown to a level, uniform slope and leave clean.
- D. Place crushed stone or gravel fill under concrete slabs on grade, tamped, and leveled. Thickness of fill shall be 6 inches unless otherwise shown.
- E. Finish subgrade in a condition acceptable to COR at least one day in advance of paving operations. Maintain finished subgrade in a smooth and compacted condition until succeeding operation has been accomplished. Scarify, compact, and grade subgrade prior to further Work when approved compacted subgrade is disturbed by Contractor's subsequent operations or adverse weather.
- F. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 0.25 inches of indicated grades.

3.5 FINISH OF DISTURBED LANDSCAPED AREAS

- A. Place topsoil and uniformly grade with smooth transition between existing grade and adjacent finished grade. Plant turf sod which is compatible with existing adjacent sod.

3.6 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL

- A. Remove surplus waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Cemetery property.
- B. Transport surplus satisfactory soil to designated storage areas on Cemetery property. Stockpile or spread soil as directed by COR.
 - 1. Transport off of Cemetery property at the completion of construction as directed by COR.
- C. Place excess excavated materials suitable for fill and/or backfill on site where directed during construction operations.
- D. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- E. Segregate all excavated contaminated soil designated by the COR from all other excavated soils, and stockpile on site on two 6 mil polyethylene sheets with a polyethylene cover. A designated area shall be selected for this purpose. Dispose of excavated contaminated material in accordance with State and Local requirements.

3.7 CLEAN UP

- A. Upon completion of earthwork operations, clean areas within Contract limits, remove tools and equipment. Provide site clear, clean, free of debris, and suitable for subsequent construction operations. Remove all debris, rubbish, and excess material from Cemetery property.

END OF SECTION

SECTION 32 05 23

CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this Section shall cover site work concrete constructed upon the prepared subgrade or base course per Drawings and in conformance with the lines, grades, thickness, and cross sections shown. Construction shall include, but not limited to, the following:
 - 1. Curb, gutter, and combination curb and gutter.
 - 2. Concrete pads and walks; mow strips; ramps.
 - 3. Vehicular concrete pavement.

1.2 RELATED WORK

- A. Laboratory and Field Testing Requirements: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Subgrade Preparation: Section 31 20 00, EARTH MOVING.
- C. Concrete Materials, Quality, Mixing, Design and Other Requirements: Section 03 30 00, CAST-IN-PLACE CONCRETE.

1.3 DESIGN REQUIREMENTS

- A. Design all elements with the latest published version of applicable codes.

1.4 WEATHER LIMITATIONS

- A. Placement of concrete shall be as specified for Cold Weather Placement and Hot Weather Placement of 03 30 00, CAST-IN-PLACE CONCRETE.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
- B. Manufacturers' Certificates and Data certifying that the following materials conform to the requirements specified:
 - 1. Expansion joint filler
 - 2. Hot poured sealing compound
 - 3. Reinforcement
 - 4. Curing materials
- C. Data and Test Reports:
 - 1. Base material.
 - 2. Job-mix formula.

3. Source, gradation, liquid limit, plasticity index, percentage of wear, and other tests as specified and in referenced publications.
- D. Samples
1. Submit sample not less than 48 inches by 48 inches in size of sandblast finish. Sample shall be approved by COR for standard of workmanship for all new sandblast finish concrete prior to proceeding with concrete work.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Refer to the latest edition of all referenced Standards and codes.
- B. American Association of State Highway and Transportation Officials (AASHTO):
- | | |
|------------|--|
| M31..... | Deformed and Plain Billet Steel Bars for Concrete Reinforcement (ASTM A615/A615M-96A) |
| M42..... | Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement |
| M55..... | Welded Steel Wire Fabric for Concrete Reinforcement (ASTM A185) |
| M147..... | Materials for Aggregate and Soil Aggregate Subbase, Base and Surface Courses (R 1996) |
| M148..... | Liquid Membrane-Forming Compounds for Curing Concrete (ASTM C309A) |
| M171..... | Sheet Materials for Curing Concrete (ASTM C171) |
| M182..... | Burlap Cloth Made from Jute or Kenaf |
| M213..... | Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Type) (ASTM D1751) |
| T99 | Moisture Density Relations of Soils Using a 2.5 kg. (5.5 lb) Rammer and a 305 mm (12 in.) Drop |
| T180 | Moisture Density Relations of Soils Using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop |
- C. American Society for Testing and Materials (ASTM):
- | | |
|------------|------------------------------------|
| C94..... | Ready-Mixed Concrete |
| C143 | Slump of Hydraulic Cement Concrete |
| C1116..... | Fiber Reinforced Concrete |

PART 2 - PRODUCTS

2.1 GENERAL

- A. Concrete shall be Type C, air-entrained as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, with the following exceptions:

TYPE	MAXIMUM SLUMP*
Curb & Gutter	3"
Pedestrian Pavement	3"
Vehicular Pavement	2" (Machine Finished) 4" (Hand Finished)
* For concrete to be vibrated: Slump as determined by ASTM C143. Tolerances as established by ASTM C94.	

2.2 REINFORCEMENT

- A. The type, amount, and locations of steel reinforcement shall be as shown on the Drawings and in the Specifications.
- B. Bars shall conform to ASTM 615.
- C. Dowels shall be plain steel bars conforming to AASHTO M31 or M42. Tie bars shall be deformed steel bars conforming to AASHTO M31 or M42.

2.3 FORMS

- A. Use metal or wood forms that are straight and suitable in cross-section, depth, and strength to resist springing during depositing and consolidating the concrete, for the Work involved.
- B. Do not use forms if they vary from a straight line more than 1/8 inch in any ten foot long section, in either a horizontal or vertical direction.
- C. Wood forms should be at least 2 inches thick (nominal). Wood forms shall also be free from warp, twist, loose knots, splits, or other defects. Use approved flexible or curved forms for forming radii.

2.4 CONCRETE CURING MATERIALS

- A. Concrete curing materials shall conform to one of the following:
 - 1. Burlap conforming to AASHTO M182 having a weight of seven ounces or more per square yard when dry.
 - 2. Impervious Sheeting conforming to AASHTO M171.
 - 3. Liquid Membrane Curing Compound conforming to AASHTO M148 (ASTM C309), Type 2 and shall be free of paraffin or petroleum.

2.5 EXPANSION JOINT FILLERS

- A. Joint filler shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; 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, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26° F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.7 COLOR

- A. Sealants used with unpainted concrete shall match color of adjacent concrete.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

- A. Prepare, construct, and finish the subgrade as specified in Section 31 20 00, EARTH MOVING.
- B. Maintain the subgrade in a smooth, compacted condition, in conformance with the required Section, and established grade until the succeeding operation has been accomplished.

3.2 SETTING FORMS

- A. Base Support:
 - 1. Compact the base material under the forms true to grade so that, when set, they will be uniformly supported for their entire length at the grade as shown.
 - 2. Correct imperfections or variations in the base material grade by cutting or filling and compacting.

- B. Form Setting:
 - 1. Set forms sufficiently in advance of the placing of the concrete to permit the performance and approval of all operations required with and adjacent to the form lines.
 - 2. Set forms to true line and grade and use stakes, clamps, spreaders, and braces to hold them rigidly in place so that the forms and joints are free from play or movement in any direction.
 - 3. Forms shall conform to line and grade with an allowable tolerance of 1/8 inch when checked with a straightedge and shall not deviate from true line by more than 1/4 inch at any point.
 - a. Slopes of walks shall not exceed those allowable by ADA.
 - 4. Do not remove forms until removal will not result in damaged concrete or at such time to facilitate finishing.
 - 5. Clean and oil forms each time they are used.
- C. The Contractor's Registered Professional Land Surveyor, specified in Section 01 00 00, GENERAL REQUIREMENTS, shall establish and control the alignment and the grade elevations of the forms or concrete slipforming machine operations.
 - 1. Make necessary corrections to forms immediately before placing concrete.
 - 2. When any form has been disturbed or any subgrade or subbase or base has become unstable, reset and recheck the form before placing concrete.

3.3 EQUIPMENT

- A. The COR shall approve equipment and tools necessary for handling materials and performing all parts of the Work prior to commencement of Work.
- B. Maintain equipment and tools in satisfactory working condition at all times.

3.4 PLACING REINFORCEMENT

- A. Reinforcement shall be free from dirt, oil, rust, scale or other substances that prevent the bonding of the concrete to the reinforcement.
- B. Before the concrete is placed, the COR shall approve the reinforcement, which shall be accurately and securely fastened in place with suitable supports and ties. The type, amount, and position of the reinforcement shall be as shown.

3.5 PLACING CONCRETE - GENERAL

- A. Obtain approval of the COR before placing concrete.
- B. Remove debris and other foreign material from between the forms before placing concrete.
- C. Before the concrete is placed, uniformly moisten the subgrade, base, or subbase appropriately, avoiding puddles of water.

- D. Convey concrete from mixer to final place of deposit by a method which will prevent segregation or loss of ingredients. Deposit concrete so that it requires as little handling as possible.
- E. While being placed, spade or vibrate and compact the concrete with suitable tools to prevent the formation of voids or honeycomb pockets. Vibrate concrete well against forms and along joints. Over-vibration or manipulation causing segregation will not be permitted. Place concrete continuously between joints without bulkheads.
- F. Install a construction joint whenever the placing of concrete is suspended for more than 30 minutes and at the end of each day's Work.
- G. Workmen or construction equipment coated with foreign material shall not be permitted to walk or operate in the concrete during placement and finishing operations.

3.6 PLACING CONCRETE FOR CURB AND GUTTER, PEDESTRIAN PAVEMENTS, PADS

- A. Place concrete in the forms in one layer of such thickness that, when compacted and finished, it will conform to the cross section as shown.
- B. Deposit concrete as near to joints as possible without disturbing them but do not dump onto a joint assembly.
- C. After the concrete has been placed in the forms, use a strike-off guided by the side forms to bring the surface to the proper section to be compacted.
- D. Consolidate the concrete thoroughly by tamping and spading, or with approved mechanical finishing equipment.
- E. Finish the surface to grade with a wood or metal float.
- F. All Concrete pads and pavements shall be constructed with sufficient slope to drain properly.
 - 1. Pavements for pedestrian access shall not exceed 2% cross slope.

3.7 PLACING CONCRETE FOR VEHICULAR PAVEMENT

- A. Deposit concrete into the forms as close as possible to its final position.
- B. Place concrete rapidly and continuously between construction joints.
- C. Strike off concrete and thoroughly consolidate by a finishing machine, vibrating screed, or by hand finishing.
- D. Finish the surface to the elevation and crown as shown.
- E. Deposit concrete as near the joints as possible without disturbing them but do not dump onto a joint assembly. Do not place adjacent lanes/areas without approval by the COR.

3.8 CONCRETE FINISHING - GENERAL

- A. The sequence of operations, unless otherwise indicated, shall be as follows:
 - 1. Consolidating, floating, straight-edging, troweling, texturing, and edging of joints.
 - 2. Maintain finishing equipment and tools in a clean and approved condition.

3.9 CONCRETE FINISHING CURB AND GUTTER

- A. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/4 inch or as otherwise detailed.
- B. Float the surfaces and finish with a smooth wood or metal float until true to grade and section and uniform in textures.
- C. Finish the surfaces, while still wet, with a bristle type brush with longitudinal strokes.
- D. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the surface, while still wet, in the same manner as the gutter and curb top.
- E. Except at grade changes or curves, finished surfaces shall not vary more than 1/8 inch for gutter and 1/4 inch for top and face of curb, when tested with a 10 foot straightedge.
- F. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.
- G. Correct any depressions which will not drain.
- H. Visible surfaces and edges of finished curb, gutter, and combination curb and gutter shall be free of blemishes, form marks, and tool marks, and shall be uniform in color, shape, and appearance.

3.10 CONCRETE FINISHING PEDESTRIAN PAVEMENT

- A. Walks, mow strips, ramps, pads, Plaza areas where indicated on Drawings:
 - 1. Finish the surfaces to grade and cross section with a metal float, trowled smooth and finished with a broom moistened with clear water.
 - 2. Brooming shall be transverse to the line of traffic.
 - 3. Finish all slab edges, including those at formed joints, carefully with an edger having a radius as shown on the Drawings.
 - 4. Unless otherwise indicated, edge the transverse joints before brooming. The brooming shall eliminate the flat surface left by the surface face of the edger. Execute the brooming so that the corrugation, thus produced, will be uniform in appearance and not more than 1/16 inch in depth.
 - 5. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the

pavement shall not vary more than 3/16 inch when tested with a 10 foot straightedge.

6. The thickness of the pavement shall not vary more than 1/4 inch.
7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.

B. Paving Bands and walks where indicated on Drawings:

1. General:
 - a. Apply sandblast finish to exposed concrete surfaces where indicated.
 - b. Perform sandblasting at least 72 hours after placement of concrete. Coordinate with formwork removal to ensure that surfaces to be sandblast finished are blasted at the same age for uniform results.
 - c. Determine the type of nozzle, nozzle pressure, and sandblasting techniques required to match the approved mockup sample.
 - d. Abrasive sandblast corners and edge of patterns carefully, using backup boards, to maintain uniform corner or edge line.
2. Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surface to match the approved mockup sample.
 - a. Medium Sandblast: Generally expose coarse aggregate, 3/16 inch to 1/4 inch reveal.
3. Surface Continuity: Perform sandblast finishing in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish on each surface or area of work. Maintain patterns of variances in depths of cuts as indicated.
4. Construction Joints: Use technique acceptable to the COR to achieve uniform treatment of construction joints.
5. Protection and Repair:
 - a. Protect adjacent materials and finishes from dust, dirt, and other surface or physical damage during abrasive sandblast finishing operations. Provide protection as required and remove from Site at completion of the Work.
 - b. Repair or replace other Work damaged by finishing operations.
6. Clean-up: Maintain control of concrete chips, dust, and debris in each area of Work. Clean up and remove such material at the completion of each day of operation. Prevent migration of airborne materials by use of tarpaulins, wind breaks, and similar containing devices.

3.11 CONCRETE FINISHING FOR VEHICULAR PAVEMENT

- A. Accomplish longitudinal floating with a longitudinal float not less than 10 feet long and 6 inches wide, properly stiffened to prevent flexing and warping. Operate the float from foot bridges in a sawing motion parallel to the direction in which the pavement is being laid from one side of the pavement to the other, and advancing not more than half the length of the float.
- B. After the longitudinal floating is completed, but while the concrete is still plastic, eliminate minor irregularities in the pavement surfaces by means of metal floats, 5 feet in length, and straightedges, 10 feet in length. Make the final finish with the straightedges, which shall be used to float the entire pavement surface.

- C. Test the surface for trueness with a 10 foot straightedge held in successive positions parallel and at right angles to the direction in which the pavement is being laid and the entire area covered as necessary to detect variations. Advance the straightedge along the pavement in successive stages of not more than one half the length of the straightedge. Correct all irregularities and refinish the surface.
- D. The finished surface of the pavement shall not vary more than 1/4 inch in both longitudinal and transverse directions when tested with a 10 foot straightedge.
- E. The thickness of the pavement shall not vary more than 1/4 inch.
- F. When most of the water glaze or sheen has disappeared and before the concrete becomes nonplastic, give the surface of the pavement a broomed finish with an approved fiber broom not less than 18 inches wide. Pull the broom gently over the surface of the pavement from edge to edge. Brooming shall be transverse to the line of traffic and so executed that the corrugations thus produced will be uniform in character and width, and not more than 1/8 inch in depth. Carefully finish the edge of the pavement along forms and at the joints with an edging tool. The brooming shall eliminate the flat surface left by the surface face of the edger.
 - 1. Medium sandblast where indicated on Drawings per 3.10.B.
- G. The finish surfaces of new and existing abutting pavements shall coincide at their juncture.

3.12 JOINTS - GENERAL

- A. Place joints, where shown, conforming to the details as shown, and perpendicular to the finished grade of the concrete surface.
- B. Joints shall be straight and continuous from edge to edge of the pavement.

3.13 CONTRACTION JOINTS

- A. Cut joints to depth as shown with a grooving tool or jointer of a radius as shown or by sawing with a blade producing the required width and depth.
- B. Construct joints in curbs and gutters by inserting 1/8 inch steel plates conforming to the cross sections of the curb and gutter.
- C. Plates shall remain in place until concrete has set sufficiently to hold its shape and shall then be removed.
- D. Finish edges of all joints with an edging tool having the radius as shown.
- E. Score pedestrian pavement and/or pads with a standard grooving tool or jointer.

3.14 EXPANSION JOINTS

- A. Use a preformed expansion joint filler material of the thickness as indicated to form expansion joints.

- B. Material shall extend the full depth of concrete, cut and shaped to the cross section as shown, except that top edges of joint filler shall be below the finished concrete surface where shown to allow for sealing.
- C. Anchor with approved devices to prevent displacing during placing and finishing operations.
- D. Round the edges of joints with an edging tool.
- E. Form expansion joints as follows:
 - 1. Without dowels, about structures and features that project through, into, or against any site work concrete construction.
 - 2. Using joint filler of the type, thickness, and width as indicated.
 - 3. Installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

3.15 CONSTRUCTION JOINTS

- A. Locate longitudinal and transverse construction joints between slabs of vehicular pavement as indicated.
- B. Place transverse construction joints of the type shown, where indicated and whenever the placing of concrete is suspended for more than 30 minutes.
- C. Use a butt-type joint with dowels in curb and gutter if the joint occurs at the location of a planned joint.
- D. Use keyed joints with tiebars if the joint occurs in the middle third of the normal curb and gutter joint interval.

3.16 FORM REMOVAL

- A. Forms shall remain in place at least 12 hours after the concrete has been placed. Remove forms without injuring the concrete.
- B. Do not use bars or heavy tools against the concrete in removing the forms. Promptly repair any concrete found defective after form removal.

3.17 CURING OF CONCRETE

- A. Cure concrete by one of the following methods appropriate to the weather conditions and local construction practices, against loss of moisture, and rapid temperature changes for at least seven days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready to install before actual concrete placement begins. Provide protection as necessary to prevent cracking of the pavement due to temperature changes during the curing period. If any selected method of curing does not afford the proper curing and protection against concrete cracking, remove and replace the damaged pavement and employ another method of curing as directed by the COR.

- B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 6 inches.
- C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at least 4 mils in thickness. Wet the entire exposed concrete surface with a fine spray of water and then cover with the sheeting material. Sheets shall overlap each other at least 12 inches. Securely anchor sheeting.
- D. Liquid Membrane Curing:
 - 1. Apply pigmented membrane-forming curing compound in two coats at right angles to each other at a rate of 200 square feet per gallon for both coats.
 - 2. Do not allow the concrete to dry before the application of the membrane.
 - 3. Cure joints designated to be sealed by inserting moistened paper or fiber rope or covering with waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint.
 - 4. Immediately re-spray any area covered with curing compound and damaged during the curing period.

3.18 CLEANING

- A. After completion of the curing period:
 - 1. Remove the curing material (other than liquid membrane).
 - 2. Sweep the concrete clean.
 - 3. After removal of all foreign matter from the joints, seal joints as herein specified.
 - 4. Clean the entire concrete of all debris, equipment marks or stains, and construction equipment as soon as curing and sealing of joints has been completed.

3.19 PROTECTION

- A. The Contractor shall protect the concrete against all damage prior to final acceptance by the Government. Remove concrete containing excessive cracking, fractures, spalling, or other defects and reconstruct the entire section between regularly scheduled joints, when directed by the COR, and at no additional cost to the Government. Exclude traffic from vehicular pavement until the concrete is at least seven days old, or for a longer period of time if so directed by the COR.

3.20 FINAL CLEAN-UP

- A. Remove all debris, rubbish and excess material from the Cemetery.

END OF SECTION

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SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work shall cover the composition, mixing, construction upon the prepared subgrade, and the protection of hot asphalt concrete pavement and cold milling. The hot asphalt concrete pavement shall consist of an aggregate and/or asphalt base course and asphalt surface course constructed in conformity with the lines, grades, thickness, and cross sections as indicated. Each course shall be constructed to the depth, section, or elevation required by the Drawings and shall be rolled, finished, and approved before the placement of the next course.
- B. The Contractor shall retain a laboratory to perform said duties or to obtain certification from the asphalt paving producer. Certificate of compliance shall cover quality and gradation of aggregate base, quality and grades of asphalt course materials, and that the job mixture meets or exceeds the State requirements.

1.2 RELATED WORK

- A. Laboratory and field testing requirements: Section 01 00 0, GENERAL REQUIREMENTS.
- B. Laboratory and field testing requirements: Section 01 45 29, TESTING LABORATORY SERVICES.
- C. Subgrade Preparation: Section 31 20 00, EARTH MOVING.

1.3 INSPECTION OF PLANT AND EQUIPMENT

- A. The COR shall have access at all times to all parts of the material producing plants for checking the mixing operations and materials and the adequacy of the equipment in use.

1.4 ALIGNMENT AND GRADE CONTROL

- A. The Contractor's Registered Professional Land Surveyor specified in Section 01 00 00, GENERAL REQUIREMENTS shall establish and control the pavement (aggregate or asphalt base course and asphalt surface course) alignments, grades, elevations, and cross sections as shown on the Drawings.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:

- B. Data and Test Reports:
 - 1. Aggregate Base Course: Sources, gradation, liquid limit, plasticity index, percentage of wear, and other tests required by State Highway Department.
 - 2. Asphalt Base/Surface Course: Aggregate source, gradation, soundness loss, percentage of wear, and other tests required by State Highway Department.
 - 3. Job mix formula.
- C. Certifications:
 - 1. Asphalt prime and tack coat material certificate of conformance to State Highway Department requirements.
 - 2. Asphalt cement certificate of conformance to State Highway Department requirements.
 - 3. Job mix certification Submit plant mix certification that mix equals or exceeds the State Highway Specification.
- D. Provide MSDS (Material Safety Data Sheets) for all chemicals used on ground.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - HM29M..... Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 29th Edition and AASHTO Provisional Standards, 2009 Edition
 - MP1 Specification for Performance Graded Asphalt
 - T 283 Standard Method of Test for Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage
- C. American Society for Testing and Materials (ASTM):
 - C29-07..... Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
 - C977-03..... Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization
 - D3786 Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method
 - D4355-07 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
 - D4632-08 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - D6390-05 Standard Test Method for Determination of Draindown Characteristics in Uncompacted Asphalt Mixtures

- D. National Asphalt Paving Association (NAPA):
131 (2003) Design, Construction, and Maintenance Guide for Porous
Asphalt Pavements, Information Series

PART 2 - PRODUCTS

2.1 GENERAL

- A. Aggregate base and asphalt concrete materials shall conform to the requirements of the following and other appropriate sections of the latest version of the State Highway Material Specifications, including amendments, addenda and errata. Where the term "Engineer" or "Commission" is referenced in the State Highway Specifications, it shall mean the VA COR.

2.2 AGGREGATES ASPHALT PAVING

- A. Provide aggregates consisting of crushed stone, gravel, sand, or other sound, durable mineral materials processed and blended, and naturally combined.
- B. Aggregate Base: In accordance with State of California Department of Transportation for Class 2 Aggregate Base.
- C. Aggregate for Binder Course Mix: In accordance with Type A for 3/4" maximum Aggregate (coarse) for the intermediate or binder course in accordance with State of California Department of Transportation Standard Specification Section 39:
1. Aggregates shall be clean and free from decomposed materials, organic material and other deleterious substances. Coarse Aggregate is material retained on the 4.75-mm {No. 4} sieve; fine Aggregate is material passing the 4.75-mm {No. 4} sieve; and supplemental fine Aggregate is added fine material passing the 600- μ m {No. 30} sieve, including, but not limited to, cement and stored fines from dust collectors.
 2. The Aggregate grading of the various types of asphalt concrete shall conform to the following:

Type	Grading
A	3/4 inch maximum, coarse

3. The proposed gradation shall meet the gradation shown in the table below. Changes from one mix design to another shall not be made during the progress of the Work unless permitted by the COR. However, changes in proportions to conform to the approved mix design shall not be considered changes in mix design.

3/4 inch Maximum

Sieve Sizes	Operating Range
25-mm {1"}	100
19-mm {3/4"}	90-100
9.5-mm {3/8"}	60-75
4.75-mm {No. 4}	45-55
2.36-mm {No. 8}	32-40
600-µm {No. 30}	12-21
75-µm {No. 200}	2-7

- D. Aggregate for Wearing (Surface) Course Mix: In accordance with Type B for 1/2" maximum Aggregate (medium) for the finish or wearing course in accordance with State of California Department of Transportation standard specification Section 39:

Type	Grading
B	1/2 inch maximum, Medium

- The proposed gradation shall meet the gradation shown in the table below. Changes from one mix design to another shall not be made during the progress of the Work unless permitted by the COR.

1/2 inch Maximum, Medium

Sieve Sizes	Operating Range
19-mm {3/4"}	100
12.5-mm {1/2"}	95-99
9.5-mm {3/8"}	75-95
4.75-mm {No. 4}	55-66
2.36-mm {No. 8}	38-49
600-µm {No. 30}	15-27
75-µm {No. 200}	2-8

- At Contractor's option, the Wearing Course Mix (Type B, 1/2 inch maximum, medium gradation) may be used for both wearing course and base/binder course.
- E. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.

2.3 ASPHALTS

- A. Asphalt Cement: In accordance with State of California Department of Transportation standard specification:
- Asphalts shall be classified by penetration grade, PG 64-10.

2. Asphalt shall not be heated during the process of its manufacture or during construction so as to cause injury as evidenced by the formation of carbonized particles.
 3. During the progress of the Work no change affecting the uniformity of the asphalt shall be made in either the source of crude stock or the method of manufacture without notifying the COR of the proposed change and obtaining the COR's approval.
- B. Prime Coat: ASSHTO MC-250. In accordance with State of California Department of Transportation standard specification.
- C. Tack Coat: ASSHTO SS1H. In accordance with State of California Department of Transportation standard specification.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Asphalt Concrete Paving equipment, weather limitations, job mix formula, mixing, construction methods, compaction, finishing, tolerance, and protection shall conform to the requirements of the appropriate sections of the State Highway Specifications for the type of material specified.

3.2 MIXING ASPHALTIC CONCRETE MATERIALS

- A. Provide hot plant-mixed asphaltic concrete paving materials.
1. Temperature leaving the plant: 290 degrees F minimum, 320 degrees F maximum.
 2. Temperature at time of placing: 280 degrees F minimum.

3.3 SUBGRADE

- A. Shape to line and grade and compact with self-propelled rollers.
- B. All depressions that develop under rolling shall be filled with acceptable material and the area re-rolled.
- C. Soft areas shall be removed and filled with acceptable materials and the area re-rolled.
- D. Should the subgrade become rutted or displaced prior to the placing of the subbase, it shall be reworked to bring to line and grade.
- E. Proof-roll the subgrade with maximum 50 ton gross weight dump truck as directed by COR. If pumping, pushing, or other movement is observed, rework the area to provide a stable and compacted subgrade.

3.4 BASE COURSES

- A. Base
1. Spread to the thickness shown on the Drawings.

2. Compact to 95 percent per ASTM D1557.
 3. Rolling shall begin at the sides and continue toward the center and shall continue until there is no movement ahead of the roller.
 4. After completion of the base rolling there shall be no hauling over the base other than the delivery of material for the top course.
- B. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 0.0" to plus 0.5".
- C. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 3/16 inch in ten feet.
- D. Moisture content: Use only the amount of moisture needed to achieve the specified compaction.

3.5 PLACEMENT OF ASPHALTIC CONCRETE PAVING

- A. Remove all loose materials from the compacted base.
- B. Apply the specified prime coat, and tack coat where required, and allow to dry in accordance with the manufacturer's recommendations as approved by the COR.
- C. A tack coat shall be furnished and shall be applied to all vertical surfaces of existing pavement (or horizontal surfaces where milling has occurred), curbs, gutters and construction joints in the surfacing against which additional material is to be placed, to a pavement to be surfaced and to other surfaces designated in the special provisions.
1. Tack coat shall be applied in one application at a rate of from 0.05- to 0.15-gallon per square yard of surface covered.
- D. Receipt of asphaltic concrete materials:
1. Do not accept material unless it is covered with a tarpaulin until unloaded, and unless the material has a temperature of not less than 280 degrees F.
 2. Do not commence placement of asphaltic concrete materials when the atmospheric temperature is below 50 degrees F, not during fog, rain, or other unsuitable conditions.
- E. Spreading:
1. Spread material in a manner that requires the least handling.
 2. Where thickness of finished paving will be 3" or less, spread in one layer.
- F. Rolling:
1. After the material has been spread to the proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the drawings.
 2. Roll in at least two directions until no roller marks are visible.
 3. Finished paving smoothness tolerance:
 - a. No depressions which will retain standing water.
 - b. No deviation greater than 1/8" in six feet.

3.6 PATCHING

- A. Hot Mix Asphalt Pavement: Sawcut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing aggregate base course to provide new subgrade.
- B. Tack Coat: Apply uniformly to vertical and horizontal surfaces abutting area to receive new hot mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure before applying hot mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, remove spillage and clean affected surfaces.
- C. Patching: Fill excavated pavement with hot mix asphalt wearing course mix for full thickness of patch; while still hot compact flush with adjacent pavement surface.

3.7 PROTECTION

- A. Protect the asphaltic concrete paved areas from traffic until the sealer is set and cured and does not pick up under foot or wheeled traffic.

3.8 FINAL CLEAN-UP

- A. Remove all debris, rubbish, and excess material from the work area.

END OF SECTION

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SECTION 32 14 00

UNIT PAVERS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section includes:
 - 1. Exterior paving – Concrete Truncated Dome Pavers with Thinset mortar setting.

1.2 RELATED SECTIONS

- A. Division 07 Section "Joint Sealants" for sealing joints in stone.
- B. Division 32 Section "Cement and Concrete for Exterior Improvements" for ramp and sidewalk paving.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - ASTM C 33 Specification for Concrete Aggregates
 - ASTM C 150 Specification for Portland Cement
 - ASTM C 1260 Method of Sampling and Testing Brick and Structural Clay Tile
 - ASTM C 140 Specification for Concrete
- B. Tile Council of America (TCA)
 - TCA F102 Installation Method Cement Mortar Bonded
 - TCA F101 Installation Method Cement Mortar Bonded
- C. American National Standards Institute (ANSI)
 - ANSI A-118.4..... Latex Portland Cement Mortar
 - ANSI A-118.6..... Grout - Latex

1.4 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including but not limited to:
 - 1. Test Reports: Three copies, showing compliance with specified ASTM requirements.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- B. Shop Drawings: Show fabrication and installation details:
 - 1. Layout drawings of each paved area showing the pattern of pavers, indicate pavers requiring cutting, indicate setting bed methods in each

area, drainage patterns and drains. Include details of setting beds, noting all materials and their thickness, show details at curbs and vertical surfaces.

- C. Samples: For each finish product specified, three sample pavers of each manufactured, type, size and color selected or specified.
 - 1. Submit a minimum of 2 each, 12 inches x 12 inches in size, in each color and finish specified.
 - 2. Mortar Samples: Full range of exposed color and texture.
 - 3. Sealant Samples: For each type and color of joint sealant required.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Products shall be produced by a single manufacturer unless otherwise specified.
 - 2. Manufacturer shall submit evidence of having not less than fifteen years successful production of this product.
 - 3. The paver manufacturer shall demonstrate, either by proven field performance or a laboratory freeze-thaw test, that the paving units have adequate durability if they are to be subjected to a freeze-thaw environment.
 - a. Satisfactory field performance is indicated when units similar in composition and made with the same manufacturing process as those to be supplied to the purchaser, do not exhibit objectionable deterioration after at least 3 years.
 - b. The units used as the basis for proven field performance shall have been exposed to the same general type of environment, temperature range and traffic volume as is contemplated for the units supplied to the purchaser.
- B. Installer Qualifications:
 - 1. Subcontractor shall submit evidence of skill and not less than five years specialized experience with this product.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Size: 60 inches x 36 inches
 - 2. Finish areas designated by COR.
 - 3. Do not proceed with remaining work until workmanship, color, and sheen are approved by COR.
 - 4. Refinish mock-up area as required to produce acceptable work.
 - 5. Mockups may become part of the completed Work if approved by COR in writing at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and handle precast concrete pavers in such a manner as to prevent damage. Units shall be stored above ground on pallets. Pallets shall be clean and non-staining. All damaged or otherwise unsuitable material shall be immediately removed from the job site.

- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
 - 1. Do not work during freezing weather or on wet or frozen subgrade or base.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Wausau Tile Co., or approved equal, which is located at: P. O. Box 1520 9001 Bus Hwy. 51 ; Wausau, WI 54402-1520; Toll Free Tel: 800-388-8728; Tel: 715-359-3121; Email: wtile@wausautile.com; Web: www.wausaupaving.com.

2.2 PAVERS

- A. Concrete Pavers: Detectable Warning Pavers as manufactured by Wausau Tile Co. or approved equal.
 - 1. Thickness: Standard, 2 inches - 2-3/4 inches.
 - 2. Nominal Size: 12 inches square or as indicated on Drawings.
 - 3. Model: Tactile Warning, ADA-2.
 - 4. Color: Dark Gray.
- B. Precast Material Requirements:
 - 1. Precast Cementitious Materials: ASTM C 150 for Portland Cement.
 - 2. Aggregates shall conform to ASTM specifications, except that grading requirements shall not necessarily apply, ASTM C 33 for concrete aggregates, normal weight.
 - 3. Other Constituents: Coloring pigments, integral water repellents, etc., shall be previously established as suitable for use in concrete and either shall conform to ASTM Standards where applicable, or shall be shown by test or experience not to be detrimental to the durability of the concrete.
- C. Paver Performance Requirements:
 - 1. Compressive Strength: At the time of delivery to the work site, the average compressive strength shall not be less than 8,000 psi with no individual unit less than 7,000 psi per ASTM C 140.
 - 2. Absorption: The average shall not be greater than 6 percent per ASTM C140.
 - 3. Flexural Strength: Not less than 800 psi (5500 kPa) per ASTM 293.
 - 4. Load carrying capacity: Paver units shall have a tested center load capacity of 1,850 lb. WT CL96.

5. Freeze/thaw: Durability of the paver shall meet the freeze/thaw tests in accordance with Section 8 of ASTM C1260. Specimens, when tested, shall have no breakage and not greater than 1 percent loss in dry weight of any individual unit when subject to 50 cycles of freeze/ thaw.
6. Sizing: Permissible variations in dimensions shall not differ by more than 1/16 inch from width, height, length or thickness. Standard units are manufactured with a 3/16 inch bevel on all four sides of finished surface. Unit shall conform to a true plane and not differ by more than 1/16 inch in either concave and/or convex warpage.

2.3 INSTALLATION MATERIALS

- A. System: Thinset Mortar Method - Pedestrian Installation.
 1. Latex Mortar Mix: ANSI A-118.4.
 2. Water: Clean and free of deleterious acids, alkalies or organic materials.
 3. Grout: ANSI A-118.6, Grout - Latex.
 4. Sealant: As specified in Section 07 92 00, JOINT SEALANTS.
 5. Back-up: As specified in Section 07 92 00, JOINT SEALANTS.
 6. Bond Breaker: As specified in Section 07 92 00, JOINT SEALANTS.

2.4 ACCESSORIES

- A. As required by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify COR of unsatisfactory preparation before proceeding.
- C. Concrete shall not exceed 1/8 inch in 10 feet from required plane. Concrete to be steel troweled with fine broom finish. No curing or sealing compound used.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Placement Tolerance:
 1. Maximum of 1/16 inch height variation between adjacent pavers.
 2. Individual pavers shall not vary more than 1/16 inch from level across width of the paver.

3. Paved areas shall not vary more than 1/4 inch from level in a distance of 10 feet measured at any location and in any direction.
 4. Joints between pavers to be 3/16 inch or 1/8 inch.
- C. Thinset Mortar Method - Pedestrian Installation:
1. Installation of Mortar bed as per TCA F102. Materials use shall follow instructions of manufacturer for use in mortar method.
 2. Install precast concrete pavers.
 3. Grouting of pavers in strict accordance with grout manufacturer's directions and instructions. Latex or acrylic additives of the same manufacturer as the grout.
 4. Control and expansion joints shall be installed per TCA EJ 171. Joint materials used shall follow manufacturer's directions and instructions.
 5. Rework mixes from time to time to maintain proper consistency, as recommended by manufacturer but do not add ingredients. Discard mortar that has reached its initial set.
 6. Field cut precast pavers in accordance with manufacturer's recommendations for methods, equipment and precautions.
 7. Cleaning: Remove mortar stains and all other types of soiling from exposed paver surfaces, wash and scrub clean.

3.4 PROTECTION

- A. Protect installed products until completion of Project.
- B. Remove and replace pavers which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 32 31 00

ORNAMENTAL FENCE GUARDRAIL

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made part of this Section of the Specifications.

1.2 DESCRIPTION

- A. Work Included: Contractor shall provide all labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
- B. Furnish and install the ornamental fence/guardrail system complete at the location indicated in the Contract Drawings.

1.3 RELATED WORK

- A. The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 03 30 00, CAST-IN-PLACE-CONCRETE
 - 2. Section 31 20 00, EARTH MOVING

1.4 SYSTEM DESCRIPTION

- A. The manufacturer shall supply a total industrial ornamental aluminum fence guardrail system of their published design. The system shall include all components (i.e., pickets, rails, posts, gates and hardware) required.

1.5 QUALITY ASSURANCE

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.6 REFERENCE STANDARDS

- A. The publications listed below form a part of this specification and the work shall comply with pertinent standards of the latest editions as specified below or by industry standards unless designated otherwise herein.
- B. American Society for Testing and Materials (ASTM):
 - B117-07a Practice for Operating Salt-Spray (Fog) Apparatus.
 - B221-01 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
 - D523-08 Test Method for Specular Gloss.

- D822-01(2006)..... Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
- D1654-08..... Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- D2244-07a..... Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- D2794-93(2004)..... Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- D3359-08..... Test Method for Measuring Adhesion by Tape Test.

1.7 SUBMITTAL

- A. Submit the following in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:
 - 1. General: For each item specified in description of work or Part 2 - Products, provide information showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors. Mark items requiring field assembly for erection identification and furnish erection drawings and instruction.
 - 2. Provide templates and rough-in measurements as required.
 - 3. Provide samples of full range of colors and finishes available for review and approval, prior to ordering.

1.8 PRODUCT HANDLING AND STORAGE

- A. Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

PART 2 - MATERIALS

2.1 MANUFACTURER

- A. The industrial ornamental aluminum fence/guardrail system shall be from manufacturer that is an industry in ornamental fence guardrail products with the concealed picket attachment system and conforming with the specifications as indicated or as approved equivalent.

2.2 MATERIAL

- A. Aluminum material for fence guardrail framework (i.e., tubular pickets, rails and posts) shall conform to the requirements of ASTM B221. The aluminum extrusions for posts and rails (outer channel) shall be Alloy and Temper Designation 6005-T5. The aluminum extrusions for pickets and rail inner slide channels shall be Alloy and Temper Designation 6063-T5. fence/guardrail

- B. The manufactured framework shall be subjected to the manufacturers' thermal stratification coating process (high-temperature, in-line, multi-stage, and multi-layer) including, as a minimum, a six-stage pretreatment/wash and an electrostatic spray application of a polyester finish. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 0.0508 mm (2 mils). The color shall be Black. The manufacturer's framework shall be designed based upon the building code wind loading conditions applicable for the location of the site.
- C. Material for fence/guardrail pickets shall be 3/4" square x 0.062" thick extruded tubing. The cross-sectional shape of the rails shall conform to the manufacturer's concealed design system components with outside cross-section dimensions of 1.5" square. The top wall of the outer channel of the rail shall be 0.100" thick; the sidewalls shall be 0.120" thick for superior vertical load strength. The inner slide channel of the rail shall be 0.080" thick. Picket holes in the concealed design system rail shall be spaced 4.715" o.c. Picket retaining rods shall be 0.125" diameter galvanized steel. Fence/guardrail posts shall meet the minimum size requirements of the manufacturers' published Table for minimum sizes for posts for the specific fence/guardrail system. High quality PVC grommets shall be supplied to seal all picket-to-rail intersections. Posts shall be a minimum of 1-1/2" square with a perimeter wall thickness of 0.0800 and an interior reinforcing web thickness of 0.080".
- D. All fasteners shall be stainless steel. Bracket to rail attachments shall be made using specially designed one-way tamperproof security bolts with inverted "t-nuts". Bracket to post connections shall be made using self-drilling hex-head screws.
- E. Aluminum castings shall be used for all rings, post caps, finials, and miscellaneous adornments.

2.3 FABRICATION

- A. Pickets, rails and posts shall be pre-cut to specified lengths. Manufacturers' concealed design system rails shall be pre-punched to accept pickets.
- B. The rail inner slide shall be fully inserted into the rail outer channel to form the raceway for the internal retaining rod. Grommets shall be inserted into the pre-punched holes in the rails, and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal raceway of the two-part concealed design system rails. (Note: This can best be accomplished by using an alignment template). Retaining rods shall be inserted into each concealed design system rail so that they pass through the pre-drilled holes in each picket, thus completing the panel assembly.
- C. Completed panels shall be capable of supporting a 300 lb. load (applied at midspan) without permanent deformation. Panels shall be biasable to a 25% change in grade.

PART 3 - EXECUTION

3.1 PREPARATION

- A. All new installations shall be laid out by the contractor in accordance with the construction plans.

3.2 FENCE/GUARDRAIL INSTALLATION

- A. Fence/guardrail post shall be spaced according to the manufacturer's layout tables for the fence/guardrail being provided (or spaced as indicated on plans), and the brackets to be provided, plus or minus ½ inch. Fence/guardrail panels shall be attached to posts with brackets supplied by the manufacturer. Posts shall be set in concrete walls having a minimum depth of 9", or as indicated in the Contract Drawings, whichever is greater. The "Earthwork" and "Concrete" sections of this specification shall govern material requirements for the concrete footer. Posts setting by other methods such as plated posts or grouted core-drilled footers are permissible only if shown by engineering analysis to be sufficient in strength for the intended application.

3.3 FENCE/GUARDRAIL INSTALLATION MAINTENANCE

- A. When cutting/drilling rails or posts adhere to the following steps to seal the exposed surfaces; 1) Remove all metal shavings from cut area. 2) Apply custom finish paint matching fence/guardrail color. Failure to seal exposed surfaces per steps 1& 2 above will negate warranty. Manufacturer's spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of parts or components, other than those from the fence/guardrail manufacturer, will negate the manufactures' warranty.

3.4 CLEANING

- A. Contractor shall clean the jobsite of excess materials; post-hole excavations shall be cleaned, and debris removed or scattered uniformly away from posts, so as to not disturb the adjoining topsoil and turf growth.

END OF SECTION

SECTION 33 46 13
FOUNDATION DRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work of this Section specifies foundation drainage system, including installation, backfill, and cleanout extensions, to place of connection to on-site storm drain facilities.

1.2 RELATED WORK

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Safety requirements: GENERAL CONDITIONS.
- C. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: For each type of filter fabric, pipe, and fitting indicated
- C. Product Data: Certifications from the manufacturers attesting that materials meet specification requirements.

1.4 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred in the text by basic designation only. Use the latest edition of the referenced publication.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - M006-08-UL..... Standard Specification for Fine Aggregate for Hydraulic Cement Concrete, Single User Digital Publication
 - M252-08-UL..... Corrugated Polyethylene Drainage Pipe
 - M288-06-UL..... Geotextile Specification for Highway Applications

- C. American Society for Testing and Materials (ASTM):
- D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 - D2751-(2005)..... Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
 - D2729 Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - D2737 Standard Specification for Polyethylene (PE) Plastic Tubing
 - D3034-08 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - D4216-06 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly (Vinyl Chloride) (CPVC) Building Products Compounds
 - D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles
 - D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
 - D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
 - F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 - F758 Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
 - F949-(2006a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
 - F2306 Standard Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications
 - F2648 Standard Specification for 2 to 60 inch Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe for foundation drainage system shall be of the type and size indicated. Appropriate transitions, adapters, or joint details shall be used where pipes of different types or materials are connected.

- B. Perforated Drainage Pipe:
 - 1. Dual wall corrugated high-density polyethylene (HDPE) drainage pipe with smooth interior and annular exterior corrugations, per ASTM F2648 with perforations.
 - 2. Pipe shall be joined using bell and spigot joint meeting ASTM F2648. The joint shall be soil-tight and gaskets meeting requirements of ASTM F477. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly. Fittings shall conform to ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of ASTM F2306.
 - 3. Perforations shall be AASHTO Class II Perforation
- C. Cleanout Extension: ASTM D2729 PVC NPS 6. Gravity Sewer pipes shall have a neoprene gasket joints and long sweep elbow fittings. Cleanouts for foundation drains shall be as indicated on the Drawings and shall be set so as to not interfere with mowing operations. Plastic tops for cleanouts in landscape areas shall be provided with concrete anchorage with all features set so as to not cause damage to the mowers. In all other locations, concrete cleanout boxes shall be provided.
- D. Filter Fabric
 - 1. Non-Woven Filter fabric shall be a pervious sheet of polyethylene or polypropylene filaments formed into a uniform pattern with distinct and measurable openings. The filter fabric shall provide an equivalent opening size (AOS) no coarser than the US Standard Sieve No. 80. AOS is defined as the number of the US Standard sieve having openings closest in size to the filter fabric openings. Permittivity shall be minimum 1.5/second and water flow rate shall be minimum 110 gpm/ft². The filaments shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure with minimum UV Resistance of 70% retained at 500 hours. The fabric shall have a minimum grab tensile strength of 200 pounds when tested in accordance with ASTM D4632. Grab elongation shall be 50 percent. Puncture strength shall be 110 pounds when tested in accordance with ASTM D4833. Mullen burst value shall be minimum 350 psi. Trapezoidal tear shall be minimum 80 lb when tested in accordance with ASTM D4533. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.
- E. Drainage Material:
 - 1. Bedding: Drainage fill per Section 31 20 00.
 - 2. Fill: Drainage fill per Section 31 20 00.
- F. Concrete Sand: AASHTO M006.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Trenching and Excavation
 - 1. Perform required trenching and excavation in accordance with Section 31 20 00 EARTH MOVING. Keep trenches dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Use wye fittings at intersections.
- B. Bedding
 - 1. Place graded bedding, minimum 4 inches in depth, in the bottom of trench for its full width and length compacted as specified prior to laying of foundation drain pipe. Each section shall rest firmly upon the bedding, through the entire length, with recesses formed for bell joints. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.
- C. Pipe Laying
 - 1. Lay drain lines to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Clean interior of pipe thoroughly before being laid. When drain lines are left open for connection to discharge lines, the open ends shall be temporarily closed and the location marked with wooden stakes. Perforated pipe shall be laid with perforations facing down. Any length that has had its grade or joints disturbed shall be removed and relaid at no additional cost to the Government. Perforated corrugated polyethylene drainage tubing and plastic piping shall be installed in accordance with manufacturer's specifications and as specified herein. Tubing and piping with physical imperfections shall not be installed.
 - 2. Prior to installation of bedding materials or piping, examination of excavation and subgrades are to be observed by the COR. Invert elevation of drain pipe shall not be higher than the bottom of the adjacent preplaced urn crypts. Lay drain lines and firmly bed in granular material a minimum of 3 inches below invert to top of pipe to true grades and alignment with bells facing upgrade, and to slope uniformly between elevations shown on Drawings. Keep trenches dry until pipe is in place and granular material backfill is completed to 1 foot above top of pipe, unless otherwise noted.
 - 3. Install gaskets, seals, sleeves, and couplings according to manufacturers written instructions and per the applicable standard:
 - a. PE and PVC pipe installation shall be per ASTM D2321 and ASTM F758.
 - b. PE joint construction shall be per ASTM D2737 and AASHTO HB17, Division II, Section 26.4.2.4, "Joint Properties."
 - 4. Lay perforated pipe with perforations down. Lay plain end pipe with closed joints held in place with two No. 9 spring steel wire clips at each joint or by standard clay collars.
 - 5. Install cleanout extensions where shown on the Drawings.
 - 6. Prior to backfilling, check drain lines to assure free flow. Remove obstructions and recheck lines until satisfactory.

- D. Jointing
 - 1. Perforated and porous types of drain pipes shall be laid with closed joints.

- E. Backfilling: Place granular material, hand tamped, as indicated on the Construction Documents. Remainder of backfill shall be comparable to existing adjacent soils.
 - 1. Filter fabric shall be installed per the Drawings.
 - 2. When drain lines are left open for connection to discharge line, the open ends shall be temporarily closed and their location marked with wooden stakes.

END OF SECTION

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SECTION 33 49 00

STORM DRAINAGE STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pre-cast concrete drain inlets / catch basins with inverts to accommodate existing pipe.
- B. Ductile iron and galvanized steel frames, covers, and grates for drain inlets and catch basins.
- C. Cleanouts.

1.2 RELATED SECTIONS

- A. Section 03 30 00, CAST-IN-PLACE CONCRETE
- B. Section 31 20 00, EARTH MOVING
- C. Section 33 46 00, SUBDRAINAGE

1.3 REFERENCES

- A. American Concrete Institute (ACI)
ACI 318..... Building Code Requirements for Reinforced Concrete
- B. American Society for Testing and Materials (ASTM)
A48 Standard Specification for Gray Iron Castings
A536 Ductile Iron Castings
A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
C478 Precast Reinforced Concrete Manhole Sections.
C857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
C913 Standard Specification for Precast Concrete Water and Wastewater Structures
C923 Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
D2729 Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.4 DESIGN REQUIREMENTS

- A. Equivalent strength shall be based on structural design of reinforced concrete as outlined in ACI 318.

- B. Design of lifting devices for precast structures shall conform to ASTM C 913.
- C. Design of joints for precast structures shall conform to ASTM C 913. Joints shall be designed for leakage not to exceed 0.025 gallon per hour per foot of joint at 3 feet of head.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Indicate inlet and cleanout locations, elevations, piping, and conduit sizes and elevations of penetrations.
- C. Product Data: Submit covers, welded grates, component construction, features, configuration, and dimensions and cleanout pipe and box data.

1.6 QUALITY ASSURANCE

- A. Environmental Agency Compliance: Comply with regulations pertaining to storm drainage systems.
- B. Utility Compliance: Comply with regulations pertaining to storm drainage systems. Include standards of water and other utilities where appropriate.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast drainage structures.
- B. Store precast concrete drainage structure to prevent damage to Cemetery property or other private property. Any property so damaged shall be repaired at the Contractor's expense.
- C. Clearly mark each precast structure by indentation or waterproof paint to indicate date of manufacture, manufacturer and identifying symbols and or numbers shown on Drawings to indicate its intended use. Neatly mark same on inside of structures with 12 inch high lettering

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion go any masonry or grouting work.

PART 2 - PRODUCTS

2.1 CLEAN OUT TO GRADE

- A. Plastic Pipe (PVC) ASTM D2729, SDR 35, nominal inside diameter of 6 inch, threaded cleanout adapter and cleanout plug.
- B. Cleanout Box:
 - 1. Provide cast iron with threaded adjustable housing, flanged ferrule with round scoriated cast iron tractor type cover suitable for placement in a concrete slab or collar. Size opening to accommodate riser size. Lid marked "DRAIN". Set in an 18" concrete collar.

2.2 DRAIN INLETS, FRAMES AND GRATES

- A. Precast Catch Basins: Concrete for precast sections shall have a minimum compressive strength of 5,000 psi at 28 days, ASTM A615, Grade 60 reinforcing steel, rated for AASHTO HS20-44 loading with 30 percent impact, and conform to ASTM C857.
- B. Frame and Cover for Gratings: Frame and cover for gratings shall be cast gray iron conforming to ASTM A48; cast ductile iron conforming to ASTM A536. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify items provided by other Sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location and ready for roughing into Work.
- C. Verify excavation and location for cleanouts and drain inlets is correct.

3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe required by other Sections.
- B. Do not install structures under site conditions known to result in loads heavier than that for which the structure was designed.
- C. Inspect precast concrete structures immediately prior to placement in the excavation to verify that they are internally clean and free from damage. Remove damaged units from the construction site and replaced, at no additional cost to the Government.

3.3 INSTALLATION

- A. Excavation and Backfill:
 - 1. Excavate for drainage structures in accordance with Section 31 20 00 in the location and to depth indicated. Provide clearance around the sidewalls of the structure as required for construction.
 - 2. If groundwater is encountered, prevent accumulation of water in excavations. Place drainage structures in a dry trench.
 - 3. Where the possibility exists of a watertight structure becoming buoyant in a flooded excavation, take necessary steps to avoid flotation of the structure.
- B. Place base pad, trowel top surface level.
- C. Place drainage structure sections plumb and level, trim to correct elevations, anchor to base pad. Install seals at all section joints.
- D. Drainage structures shall be supported at proper grade and alignment on crushed stone bedding or other support system, as shown on Drawings.
- E. Backfill excavations for drainage structures in accordance with Section 31 20 00.
- F. Form and place drain structure plumb and level, to correct dimensions and elevations. As Work progresses, build fabricated metal items.
- G. Cut and fit for pipe, conduit, and sleeves.
- H. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- I. Set cover frames and covers/grates level without tipping, to correct elevations.
- J. Coordinate with other Sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE DRAINAGE STRUCTURE INSTALLATION

- A. To ensure safety, lift precast structures at the lifting points designated by the manufacturer.
- B. When lowering drainage structures into the excavations and joining pipe to the units, take precautions to ensure that the interior of the pipeline and structure remains clean.
- C. Set precast structures so that they firmly and fully bear on crushed stone bedding, compacted in accordance with the provisions of Section 31 20 00 or on other support system shown on Drawings.
- D. Assemble multi-section structures by lowering each section into the excavation. Lower, set level, and firmly position the base section before placing additional sections.

- E. Ensure joint integrity by removing all foreign materials from joint surfaces and verifying that sealing materials are placed properly. Avoid misalignment by using guide devices affixed to the lower section.
- F. Joint sealing materials may be installed at the site or at the manufacturer's plant.
- G. Verify that drainage structures installed satisfy required alignment and grade.
- H. Remove knockouts or cut structure to receive piping so as not to create openings more than that required to receive pipe. Fill annular space with mortar and contour finish surfaces on both interior and exterior of structure for a clean, solid appearance.
- I. Cut pipe to finish flush with interior of structure.
- J. Shape inverts through manhole as shown on Drawings to provide positive flow.

3.5 CASTINGS INSTALLATION

- A. Set frames using precast grade rings as required to bring to grade.
- B. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow the area to be graded away from the cover beginning 1 inch below the top surface of the frame.
- C. Provide concrete collar flush with top of frame within unpaved areas.

3.6 FIELD QUALITY CONTROL

- A. Field tests will be used to evaluate and approve cast-in-place concrete in accordance with Section 03 30 00.
- B. Vertical Adjustment of Existing Drainage Structures:
 - 1. Where required, adjust the top elevation of existing drainage structures to suit finished grades shown on Drawings.
 - 2. Reset existing frames, grates and covers, carefully removed, cleaned of all mortar fragments, to the required elevation in accordance with the requirements specified for installation of castings.
 - 3. Remove the concrete so as not to damage the existing vertical reinforcing bars when removal of an existing concrete wall is required. The vertical bars shall be cleaned of all concrete and bent into the new concrete top slab or spliced to required vertical reinforcement, as shown on Drawings.
 - 4. Clean and apply sand-cement bonding compound on all existing concrete surfaces to receive cast-in-place concrete. Sand-cement bonding compound and its application shall be in accordance with Section 03 30 00.

3.7 SCHEDULES

- A. Drain Inlets and Cleanouts: As indicated on Drawings.

END OF SECTION

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June 25, 2014

Ms. Marie Silveira
Jacobs
1050 20th Street, Suite 200
Sacramento, CA 95811

Re: Geotechnical Investigation
Renovate Rostrum and Road, Golden Gate National Cemetery, San Bruno, California
SFB Project No.: 361-18

Ms. Silveira:

As requested, Stevens, Ferrone & Bailey Engineering Company, Inc. has performed a geotechnical investigation for the Renovate Rostrum and Road project at Golden Gate National Cemetery in San Bruno, California. The accompanying report presents the results of our field investigation, laboratory tests, and engineering analysis. The geotechnical conditions are discussed, and recommendations for the geotechnical engineering aspects of the project are presented. Conclusions and recommendations contained herein are based upon applicable standards of our profession at the time this report has been prepared. Should you have any questions or require additional information, please do not hesitate to contact me.

Sincerely,
Stevens, Ferrone & Bailey
Engineering Company, Inc.



Ken Ferrone
President

TC/KCF:lc\encl.
Copies: Addressee (1 by email)

June 25, 2014

**GEOTECHNICAL INVESTIGATION
RENOVATE ROSTRUM AND ROAD
GOLDEN GATE NATIONAL CEMETERY
SAN BRUNO, CALIFORNIA
*SFB PROJECT NO. 361-18***

Prepared For:

Jacobs
1050 20th Street, Suite 200
Sacramento, California 95811

Prepared By:

Stevens, Ferrone & Bailey Engineering Company, Inc.



Taiming Chen, P.E., G.E.
Civil/Geotechnical Engineer



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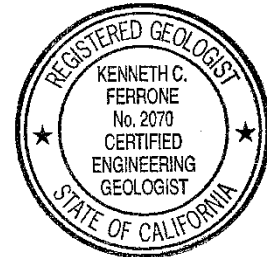


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1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for the proposed Renovate Rostrum and Road project located at Golden Gate National Cemetery in San Bruno, California as shown on the Site Plan, Figure 1. The purpose of our investigation was to evaluate the geotechnical conditions at the site and provide recommendations regarding the geotechnical engineering aspects of the project.

Based on the information indicated on the Site Plan, as well as information provided by Ms. Marie Silveira of Jacobs, it is our understanding that the project will consist of renovating an approximate 1,200-foot section of the existing asphalt concrete paved roadway and expanding an existing concrete covered rostrum. A new retaining wall up to about 4 feet high is also proposed at the back of the rostrum.

The conclusions and recommendations provided in this report are based upon the information presented above; Stevens, Ferrone & Bailey Engineering Company, Inc. (SFB) should be consulted if any changes to the project occur to assess if the changes affect the validity of this report.

2.0 SCOPE OF WORK

This investigation included the following scope of work:

- Reviewing available published and unpublished geotechnical and geological literature relevant to the site;
- Performing reconnaissance of the site and surrounding area;
- Performing a subsurface exploration program, including drilling five exploratory borings to a maximum depth of about 6-1/2 feet;
- Performing laboratory testing of samples retrieved from the borings;
- Performing engineering analysis of the field and laboratory data; and
- Preparing this report.

The data obtained and the analyses performed were for the purpose of providing geotechnical design and construction criteria for site earthwork, installation of underground utilities, drainage, retaining wall foundations, and pavements.

3.0 SITE INVESTIGATION

Reconnaissance of the site and surrounding area was performed on June 5, 2014. Subsurface exploration was performed using a truck-mounted drill rig equipped with 4-inch diameter, continuous flight, solid stem augers. Five exploratory borings were drilled on June 11, 2014 to a maximum depth of about 6-1/2 feet. The approximate locations of SFB's borings are shown on the Site Plan, Figure 1. Logs of SFB's borings and details regarding SFB's field investigation are included in Appendix A. The results of SFB's laboratory tests are discussed in Appendix B. It should be noted that changes in the surface and subsurface conditions can occur over time as a result of either natural processes or human activity and may affect the validity of the conclusions and recommendations in this report.

3.1 Surface

At the time of our investigation and as shown on Figure 1, the project site and roadway (northwestern half of the existing Circle Drive) was located on a hillside. Based on our review of historical topographic maps of the site and vicinity, it is our understanding that cut and fill grading had been performed in the area to create the existing roadway and surrounding slopes. A retaining wall of up to about 8 feet high was located near the middle section of project roadway and retained the existing Assembly Area. The existing road pavement in the project area generally exhibits moderate map cracking with locally moderate to severe alligator/map cracking and raveling. Depressions and water ponding were also observed in some locations. Newer patches are also observed throughout the project roadway. According to Cemetery staff, it is our understanding that the other half of the Circle Drive beyond the project area was reconstructed in 2001 or 2002; the actual details of the reconstruction are unknown.

3.2 Subsurface

Based on the results of our field explorations, the pavement sections at the existing roadway within the project area generally consist of about 2 to 4 inches of asphalt concrete over a layer of gravel base of about 4 to 10 inches thick. Below the pavement sections, sandy or clayey fills and native silty sands were generally encountered that extended to the maximum depth explored of about 6-1/2 feet. The fill thickness is estimated to be as much as about 8 feet behind the existing retaining wall located in the original fill area. Little to no fill may exist in the original cut areas. Water seepage was also encountered in Boring SFB-1 at a depth of about a foot. According to the results of our laboratory testing, the onsite near-surface sandy pavement subgrade soils are generally non-expansive. In addition, the results of our resistance R-Value test on a combined sample of the existing pavement subgrade soils indicated an R-Value of 59 at an exudation pressure of 300 pounds per square inch.

Detailed descriptions of the materials encountered in our exploratory borings are presented on the boring logs in Appendix A. Our attached boring logs and related information depict location specific subsurface conditions encountered during our field investigation. The approximate locations of our borings were determined using pacing or landmark references and should be considered accurate only to the degree implied by the method used.

3.3 Groundwater

No groundwater was encountered by our borings to a maximum depth explored of about 6-1/2 feet. SFB's borings were backfilled prior to leaving the site. It should be noted that our borings might not have been left open for a sufficient period of time to establish equilibrium ground water conditions. In addition, fluctuations in the ground water level could occur due to change in seasons, variations in rainfall, and other factors.

3.4 Geology and Seismicity

According to Bonilla (1998), the site and adjacent areas, below fills if any, are underlain by Pleistocene Colma Formation which is reported to be composed of friable well sorted fine- to medium- grained sand containing a few beds of sandy silt, clay, and gravel¹.

According to U.S. Geological Survey Open-File Report 97-745 (landslide folio of the San Francisco Bay Area), the site is not mapped as having previously identified landslides or earth flows nor is it located within an area having debris flow source potential. We did not observe evidence of active, deep seated slope movement onsite or in the vicinity of the site. It is not uncommon, however, for relatively shallow slope movements to occur within the natural materials blanketing the site and the vicinity. These movements may include down slope creep, erosion, and slumping. Based on the results of our reconnaissance and review of documents, we did not observe evidence of adverse slope stability, erosion, or drainage conditions at the site. It is our opinion that the potential for landsliding impacting the project site is low.

The project site is located in the San Francisco Bay Area that is considered one of the most seismically active regions in the United States. Significant earthquakes have occurred in the San Francisco Bay Area and are believed to be associated with crustal movements along a system of sub-parallel fault zones that generally trend in a northwesterly direction. The approximate direction and distance from the site to nearby active faults are summarized in the table below².

¹Bonilla, 1998, *Preliminary Geologic Map of the San Francisco South 7.5' Quadrangle and Part of the Hunters Point 7.5' Quadrangle, San Francisco Bay Area, California*, USGS Open File Report 98-354.

²Information based on Jennings and Bryant, 2010, *Fault Activity Map of California*, CGS Geological Data Map No.6.

Fault Name	Approximate Distance to Fault (Miles)	Direction to Fault
Serra	0.2	Southwest
San Andreas	1.2	Southwest
Seal Cove	7.3	Southwest
Monte Vista	21.7	Southeast
Frijoles	26.0	South
Calaveras	26.2	Northeast
San Gregorio	27.0	South
Pleasanton	27.8	Northeast

According to the Alquist-Priolo Earthquake Fault Zones Map of the San Francisco South Quadrangle, the site is not located in an earthquake fault zone as designated by the State of California³. Earthquake intensities will vary throughout the San Francisco Bay Area, depending upon numerous factors including the magnitude of earthquake, the distance of the site from the causative fault, and the type of materials underlying the site. The U.S. Geological Survey (2008) indicated that there is a 63 percent chance of at least one magnitude 6.7 or greater earthquake striking the San Francisco Bay region between 2008 and 2037⁴. Therefore, the site will probably be subjected to at least one moderate to severe earthquake that will cause strong ground shaking.

According to the Probabilistic Seismic Hazard Analysis (NSHMP PSHA) interactive deaggregation model developed by U.S. Geological Survey (2008), the site has a 10% probability of exceeding a peak ground acceleration of about 0.6g in 50 years (design basis ground motion based on stiff soil site condition; mean return time of 475 years). The actual ground surface acceleration might vary depending upon the local seismic characteristics of the underlying bedrock and the overlying unconsolidated soils.

³Hart and Bryant, *Fault-Rupture Hazard Zones in California*, CDMG Special Publication 42, Interim Revision 2007.

⁴Field, Edward H., Milner, Kevin R., and the 2007 Working Group on California Earthquake Probabilities, 2008, *Forecasting California's earthquakes; what can we expect in the next 30 years?:* U.S. Geological Survey, Fact Sheet 2008-3027, 4 p.

3.5 Liquefaction

Soil liquefaction is a phenomenon primarily associated with saturated, cohesionless, soil layers located close to the ground surface. These soils lose strength during cyclic loading, such as imposed by earthquakes. During the loss of strength, the soil acquires mobility sufficient to permit both horizontal and vertical movements. Soils that are most susceptible to liquefaction are clean, loose, uniformly graded, saturated, fine-grained sands that lie close to the ground surface.

According to ABAG and the U.S. Geological Survey, site is located in an area mapped as having a very low likelihood of liquefaction in an earthquake and has been characterized as having very low liquefaction susceptibility^{5,6}. As of the date of this report, the liquefaction potential of the site and surrounding area has not been evaluated by the State of California⁷. Based on our review of available literature, it is our opinion that the potential for ground surface damage at the site resulting from liquefaction is low.

⁵Association of Bay Area Governments, 1980, *Liquefaction Susceptibility, San Francisco Bay Region*.

⁶Knudsen, Sowers, Witter, Wentworth, and Helly, 2000, "*Preliminary Maps of Quaternary Deposits and Liquefaction Susceptibility, Nine-County San Francisco Bay Region, California*", USGS Open File Report 00-444.

⁷Seismic Hazards Mapping Act, 1990.

4.0 CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that the site is suitable for the proposed project from a geotechnical engineering standpoint. The conclusions and recommendations presented in this report should be incorporated in the design and construction of the project to reduce soil or foundation related issues. The following are the primary geotechnical considerations for development of the site.

SEEPAGE, SURFACE, AND SUBSURFACE WATER: Water seepage will occur at the site during and after periods of rainfall and as a result of irrigation of surrounding hillsides. To reduce the potential for seepage within roadway subgrade, consideration should be given to installing new subdrains on both edges of the roadway. Surface water should not be allowed to flow over the top of slopes and retaining walls.

EROSION AND SLOPE MAINTENANCE: Drainage and erosion control measures should be maintained during and after construction. Short-term and long-term erosion control are critical for the stability of any exposed cut and fill slopes, and may be necessary for the natural slopes in order to reduce sediment accumulation in the drainage systems. We recommend all exposed cut and fill slopes be seeded or planted with appropriately designed erosion resistant vegetation and fertilizer. The vegetation should be appropriately irrigated in order to establish and maintain growth. Over-watering should be avoided in order to reduce surficial instability and erosion. Vegetation should be deeply rooted to aid in the interlocking of the near-surface soils. Additional seeding and planting may be necessary in localized areas if the initial seeding or planting is unsuccessful. After seeding, fertilizing, and planting, staked erosion control blankets might be necessary to further stabilize the surficial soils.

Additional erosion control measures will need to be designed and implemented prior to the rainy season based upon the site's configuration. The measures could include straw wattles, silt fencing, hay bales, sediment collection basins, and filtration systems. Silt fencing should be designed for the site's soil type. Storm water discharge and release points from silt fencing should be designed to reduce erosion. In areas exposed to winter rains, we recommend an erosion control plan be prepared and implemented at least one month prior to the beginning of the rainy season. The erosion control measures will require inspection, modification, and remediation during the rainy season in order to comply with regulatory requirements. If requested, SFB can provide storm water management services for the site.

ADDITIONAL RECOMMENDATIONS: Detailed drainage, earthwork, retaining wall, and pavement recommendations for use in design and construction of the project are presented below. We recommend SFB review the design and specifications to verify that the

recommendations presented in this report have been properly interpreted and implemented in the design, plans, and specifications. We also recommend SFB be retained to provide consulting services and to perform construction observation and testing services during the construction phase of the project to observe and test the implementation of our recommendations, and to provide supplemental or revised recommendations in the event conditions different than those described in this report are encountered. We assume no responsibility for misinterpretation of our recommendations if we do not review the plans and specifications and are not retained during construction.

4.1 Earthwork

4.1.1 Clearing and Site Preparation

Where new improvements are proposed, we recommend the proposed area be cleared of all obstructions including any existing structures and their entire foundation systems, any designated existing utilities and pipelines and their associated backfill, and debris. Holes resulting from the removal of underground obstructions extending below the proposed finish grade should be cleared and backfilled with fill materials as specified in **Section 4.1.3, *Fill Material***, and compacted to the requirements in **Section 4.1.4, *Compaction***. We recommend backfilling operations for any excavations be performed under the observation and testing of SFB.

From a geotechnical standpoint, any existing trench backfill materials or concrete slabs that are removed can be used as new fill onsite provided debris is removed and it is broken up to meet the size requirement for fill material in **Section 4.1.3, *Fill Material***. The grindings from pavement removal and existing gravel base can be recycled and reused at the site as aggregate base if they meet applicable Caltrans specifications.

4.1.2 Subgrade Preparation

After the completion of clearing and site preparation, soil exposed in areas to receive new improvements (such as structural fill, exterior concrete flatwork, retaining walls, and new pavements) should be scarified to a depth of about 12 inches, moisture conditioned to slightly over optimum water content, and compacted to the requirements for structural fill. If improvement or pavement subgrade are allowed to remain exposed to sun, wind or rain for an extended period of time, or are disturbed by borrowing animals, the exposed improvement or pavement subgrade may need to be reconditioned (moisture conditioned and/or scarified and recompacted) prior to foundation or pavement construction. SFB should be consulted on the need for subgrade reconditioning when the subgrade is left exposed for extended periods of time.

4.1.3 Fill Material

From a geotechnical and mechanical standpoint, onsite fills and soils having an organic content of less than 3 percent by volume can be used as fill. Fill should not contain rocks or lumps larger than 6 inches in greatest dimension with not more than 15 percent larger than 2.5 inches. If required, imported fill should have a plasticity index of 12 or less and have a significant amount of cohesive fines.

In addition to the mechanical properties specifications, all imported fill material should have a resistivity (100% saturated) no less than the resistivity for the onsite soils, a pH of between approximately 6.0 and 8.5, a total water soluble chloride concentration less than 300 ppm, and a total water soluble sulfate concentration less than 500 ppm. We recommend import samples be submitted for corrosion and geotechnical testing at least two weeks prior to being brought onsite.

4.1.4 Compaction

We recommend structural fill be compacted to at least 95 percent relative compaction as determined by ASTM D1557 (latest edition). We recommend the new fill be moisture conditioned to slightly over optimum water content. The upper 12 inches of subgrade soils beneath new pavements should be compacted to at least 95 percent relative compaction. Fill material should be spread and compacted in lifts not exceeding approximately 8 to 12 inches in uncompacted thickness.

4.1.5 Utility Trench Backfill

Pipeline trenches should be backfilled with fill placed in lifts of approximately 8 inches in uncompacted thickness. Thicker lifts can be used provided the method of compaction is approved by SFB and the required minimum degree of compaction is achieved. Backfill should be placed by mechanical means only. Jetting is not permitted.

Onsite trench backfill should be compacted to at least 95 percent relative compaction. Imported sand trench backfill should be compacted to at least 95 percent relative compaction and sufficient water is added during backfilling operations to prevent the soil from "bulking" during compaction. To reduce piping and settlement of overlying improvements, we recommend rock bedding and rock backfill (if used) be completely surrounded by a filter fabric such as Mirafi 140N (or equivalent); alternatively, filter fabric would not be necessary if Caltrans Class 2 permeable material is used in lieu of rock bedding and rock backfill.

Where trenches are located on slopes steeper than 10 horizontal to 1 vertical, or the base of trenches are sloped greater than 10 percent over a distance greater than 50 feet, an impermeable

plug composed of low strength concrete or sand/cement slurry should be installed in the utility trenches every 50 feet on-center. The plug will reduce piping from water seepage that may cause roadway and trench surface settlement. The plug should be at least 12 inches thick, extend at least 1 foot beyond the edges and bottom of the trench, and extend to within 1 foot of the finished ground surface or to the base of the pavement section.

4.1.6 Exterior Flatwork

We recommend that new exterior slabs be placed directly on the properly compacted subgrade. Prior to placing concrete, subgrade soils should be moisture conditioned to increase their moisture content to slightly above laboratory optimum moisture (ASTM D1557).

Consideration should be given to reinforcing new exterior slabs with steel bars in lieu of wire mesh. To reduce potential crack formation, the installation of #3 bars spaced at approximately 18 inches on center in both directions should be considered. Score joints and expansion joints should be used to control cracking and allow for expansion and contraction of the concrete slabs. We recommend appropriate flexible, relatively impermeable fillers be used at all cold/expansion joints. The installation of dowels at all expansion and cold joints will reduce differential slab movements; if used, the dowels should be at least 30 inches long and should be spaced at a maximum lateral spacing of 18 inches. Although exterior slabs that are adequately reinforced will still crack, trip hazards requiring replacement of the slabs will be reduced if the slabs are properly reinforced.

4.1.7 Construction during Wet Weather Conditions

If construction proceeds during or shortly after wet weather conditions, the moisture content of the onsite soils could be significantly above optimum. Consequently, subgrade preparation, placement and/or reworking of onsite soil or fills as structural fill might not be possible. Alternative wet weather construction recommendations can be provided by our representative in the field at the time of construction, if appropriate. All the drainage measures recommended in this report should be implemented and maintained during and after construction, especially during wet weather conditions.

4.1.8 Surface Drainage, Irrigation, and Landscaping

Ponding of surface water must not be allowed adjacent to foundations, at the top or bottom of slopes, and at the top or adjacent to retaining walls. Ponding of water should also not be allowed on the ground surface adjacent to or near exterior slabs, including driveways, walkways, and patios. Surface water should not be allowed to flow over the top of slopes, down slope faces, or over retaining walls.

We recommend positive surface gradients of at least 2 percent be provided adjacent to foundations to direct surface water away from the foundations and toward suitable discharge facilities. We recommend the surface drainage be designed in accordance with the latest edition of the California Building Code.

In order to reduce differential foundation movements, landscaping should be placed uniformly adjacent to the foundation and exterior slabs. We recommend trees be no closer to the structure or exterior slabs than half the mature height of the tree; in no case should tree roots be allowed to extend near or below the foundations or exterior slabs.

Landscaping drainage inlets and/or drainage swales should be provided and maintained around structures at all times that adequately collect irrigation and storm water and direct the water onto pavement or into storm water collection systems. Drainage inlets should be provided within enclosed planter areas and the collected water should be discharged onto pavement, into drainage swales, or into an enclosed storm drain system. The drainage inlets and associated swales should be designed and constructed so that the moisture content of the soils surrounding the foundations do not become elevated and no ponding of water occurs. The inlets should be kept free of debris and be lower in elevation than the adjacent ground surface.

We recommend regular maintenance of the drainage systems be performed, including maintenance prior to rainstorms. The inspection should include checking drainage patterns to make sure they are performing properly, making sure drainage systems and inlets are functional and not clogged, and checking that erosion control measures are adequate for anticipated storm events. Immediate repairs should be performed if any of these measures appears to be inadequate.

Irrigation should be performed in a uniform, systematic manner as equally as possible on all sides of the foundations and exterior slabs to maintain moist soil conditions. Over-watering must be avoided. To reduce moisture changes in the natural soils and fills in landscaped areas, we recommend that drought resistant plants and low flow watering systems be used. All irrigation systems should be inspected for leakage regularly.

4.1.9 Subsurface Drainage

In order to reduce the potential for water seepage within roadway subgrade, we recommend subdrains be installed on both edges of the project roadway. During the earthwork operations, additional subdrains may be necessary in areas of encountered or anticipated seepage. The actual location and extent of subdrains should be assessed by SFB during the development of the grading and improvement plans, and determined in the field by SFB at the time of construction.

Where used, subdrains should consist of 4 inch diameter, rigid perforated pipe (perforations down) surrounded by free draining, uniformly graded, 1/2 to 3/4 inch crushed gravel wrapped in filter fabric such as Mirafi 140N or equivalent. The pipe should be underlain by about 1/2 to 1 inch of the gravel, and on the sides by at least 4 inches of gravel. The filter fabric should overlap approximately 12 inches or more at joints. Subdrain pipes should consist of rigid ABS (SDR-35) or PVC A-2000 (or equal). Subdrains should be connected to a solid, rigid, collector pipe with a minimum diameter of 4 inches. Collector pipes should be connected to appropriate discharge facilities such as storm drains, drainage inlets, or storm drain manholes. Subdrain clean-outs should be provided. The clean-out locations should be based upon the reach of the rotary cleaning systems and the restrictions of pipe bends. Caltrans Class 2 permeable material may be used in lieu of gravel and filter fabric. The roadway subdrain trenches should be at least 12 inches wide and about 3 feet deep below finish pavement surface.

4.1.10 Future Maintenance

In order to reduce water created issues, we recommend regular maintenance of the site be performed, including maintenance prior to rainstorms. Maintenance should include the recompaction of loosened soils, collapsing and infilling holes with compacted soils or low strength sand/cement grout, removal and control of digging animals, modifying storm water drainage patterns to allow for sheet flow into drainage inlets or ditches rather than concentrated flow or ponding, removal of debris within drainage ditches and inlets, and immediately repairing any erosion or soil flow. The inspection should include checking drainage patterns, making sure drainage systems are functional and not clogged, and erosion control measures are adequate for anticipated storm events. Immediate repair should be performed if any of these measures appears to be inadequate. Temporary and permanent erosion and sediment control measures should be installed over any exposed soils immediately after repairs are made.

Differential movement of exterior slabs can occur over time as a result of numerous factors. We recommend the project owners perform inspections and maintenance of the slabs, including infilling significant cracks, providing fillers at slab offsets, and replacing slabs if severely damaged.

4.1.11 Additional Recommendations

We recommend the drainage, irrigation, landscaping, and maintenance recommendations provided in this report be forwarded to your designers and contractors.

4.2 Retaining Walls

If segmental block walls with geogrid will be used at the site, SFB should be contacted to provide block wall and geogrid designs and specifications. Where walls retain soil, they must be designed to resist both lateral earth pressures and any additional lateral loads caused by surcharging such as building and roadway loads. The recommendations provided below are for retaining walls that are located at least $1.5H$ feet away from a building, where H is the height of the retaining portion of the walls. Where concrete or masonry walls are used to retain soil, we recommend unrestrained walls (walls free to deflect and disconnected from other structures) be designed to resist an equivalent fluid pressure of 35 pounds per cubic foot. This assumes a level backfill. Restrained walls (walls restrained from deflection) should be designed to resist an equivalent fluid pressure of 35 pounds per cubic foot plus a uniform pressure of $7H$ pounds per square foot, where H is the height of the wall in feet. Walls with inclined backfill should be designed for an additional equivalent fluid pressure of 1 pound per cubic foot for every 2 degrees of slope inclination. Walls subjected to surcharge loads should be designed for an additional uniform lateral pressure equal to one-third and one-half the anticipated surcharge load for unrestrained and restrained walls, respectively. These lateral pressures depend upon the moisture content of the retained soils to be constant over time; if the moisture content of the retained soils will fluctuate or increase compared to the moisture content at time of construction, then SFB should be consulted and provide written modifications to this design criteria.

For retaining walls located within $1.5H$ feet (where H is the height of the retaining portion of the walls) from a building or walls that are designed to resist seismic lateral forces from the retained soils, we recommend the walls also be designed to resist a triangular pressure distribution equal to an equivalent fluid pressure of 55 pounds per cubic foot based on the ground acceleration from a design basis earthquake. This seismic pressure is in addition to the pressures noted above. Due to the transient nature of the seismic loading, a factor of safety of at least 1.1 can be used in the design of the walls when they resist seismic lateral loads. Some movement of the walls may occur during moderate to strong earthquake shaking and may result in distress as is typical for all structures within the San Francisco Bay Area subjected to earthquake shaking.

The recommended lateral pressures assume walls are fully-back drained to prevent the build-up of hydrostatic pressures. This can be accomplished by using $\frac{1}{2}$ to $\frac{3}{4}$ inch crushed, uniformly graded gravel entirely wrapped in filter fabric such as Mirafi 140N or equal (an overlap of at least 12 inches should be provided at all fabric joints). The gravel and fabric should be at least 8 inches wide and extend from the base of the wall to within 12 inches of the finished grade at the top (Caltrans Class 2 permeable material (Section 68) may be used in lieu of gravel and filter fabric). A 4-inch diameter, perforated pipe should be installed at the base and centered within the gravel. The perforated pipe should be connected to a solid collector pipe that transmits the

water directly to a storm drain, drainage inlet, or onto pavement. If weep holes are used in the wall, the perforated pipe within the gravel is not necessary provided the weep holes are kept free of animals and debris, are located no higher than approximately 6 inches from the lowest adjacent grade, and are able to function properly. As an alternative to using gravel, drainage panels (such as AWD SITEDRAIN Sheet 94 for walls or equal) may be used behind the walls in conjunction with perforated pipe (connected to solid collector pipe), weep holes, or strip drains (such as SITEDRAIN Strip 6000 or equal). If used, the drainage panels can be spaced on-center at approximately 2 times the panel width.

If heavy compaction equipment is used behind the walls, the walls should be appropriately designed to withstand loads exerted by the heavy equipment and/or temporarily braced. Fill placed behind walls should conform to the recommendations provided in **Section 4.1.3, *Fill Material***, and **Section 4.1.4, *Compaction***.

Retaining walls can be supported on drilled, cast-in-place, straight shaft friction piers that develop their load carrying capacity in the materials underlying the site. The piers should have a minimum diameter of 12 inches and a center-to-center spacing of at least three times the shaft diameter. We recommend that piers be at least 6 feet long. The pier reinforcing should be based on structural requirements but in no case should less than two #4 bars for the entire length of the pier be used.

The actual design depth of the piers should be determined using an allowable skin friction of 500 pounds per square foot (psf) for dead plus live loads, with a one-third increase for all loads including wind or seismic. Seventy percent of the skin friction value can be used to resist uplift. Lateral load resistance can be developed in passive resistance for pier foundations. A passive resistance equal to an equivalent fluid weighing 350 pounds per cubic foot acting against twice the projected diameter of pier shafts can be used. The upper two feet of pier embedment should be neglected in the vertical and passive resistance design as measured from finished grade. The portion of the pier shaft located within 10 feet (as measured laterally) of the nearest slope face should also be ignored in the design.

We recommend the pier foundations be located outside of (or beyond) a 1:1 (horizontal to vertical) plane projected upward from the base of any wall or utility trench, or the portion of a pier located within this zone should be ignored in the design of the pier.

The bottoms of the pier excavations should be relatively dry and free of all loose cuttings or slough prior to placing reinforcing steel and concrete. Any accumulated water in pier excavations should be removed prior to placing concrete. We recommend that the excavation of all piers be performed under the direct observation of SFB to confirm that the pier foundations

are founded in suitable materials and constructed in accordance with the recommendations presented herein. Preliminarily, we recommend concrete pours of pier excavations be performed within 24 hours of excavation and prior to any rainstorms. Where caving or high ground water conditions exist, additional measures such as using casing, tremie methods, and pouring concrete immediately after excavating may be necessary. SFB should be consulted on the need for additional measures for pier construction as needed during construction.

As an alternative to pier foundations, the new retaining walls can be supported by conventional spread footings that bear on properly prepared subgrade as described in our report **Section 4.1.2, *Subgrade Preparation***, or on competent native soils. Footings should be at least 12 inches wide and should be founded at least 24 inches below lowest adjacent finished grade. Continuous footings should be designed with steel reinforcing, both top and bottom, to provide structural continuity and permit spanning of local irregularities.

The footings should be designed for an allowable bearing pressure of 2,000 pounds per square foot due to dead loads, 3,000 pounds per square foot due to dead plus live loads, and 4,000 pounds per square foot for all loads, including wind or seismic. These allowable bearing pressures are net values; therefore, the weight of the footing can be neglected for design purposes. Lateral load resistance can be developed by friction between the footing foundation bottom and the supporting subgrade. A friction coefficient of 0.35 is considered applicable. As an alternative, a passive resistance equal to an equivalent fluid weighing 350 pcf acting against the vertical face of the foundations can be used; however the upper 24 inches should be ignored in the passive resistance design. If foundations are poured neat against the subgrade, the friction and passive resistance can be used in combination. At least 10 feet of soil cover must be provided between the face of the footings and the face of slopes, as measured horizontally. The portion of the footing located closer than 10 feet from the face of slopes should be ignored in both the vertical and lateral load design. Where foundations are located adjacent to utility trenches (such as the existing oil pipeline and proposed new utility pipelines), the foundation bearing surface should bear below an imaginary 1.5 horizontal to 1 vertical plane extending upward from the bottom edge of the adjacent utility trench. Alternatively, the foundation reinforcing could be increased to span the area defined above assuming no soil support is provided or pier foundations should be used for the entire length of walls in the area. Wetting prior to construction of the foundations should close any visible cracks in the bottoms of the footing excavations. We recommend that we observe the footing excavations prior to placing reinforcing steel or concrete to check that footings are founded on appropriate material.

4.3 Seismic Design Criteria

For seismic resistance design in accordance with 2012 International Building Code (IBC) and 2013 California Building Code (CBC), we recommend the following seismic design values be used. The following parameters are calculated using the U.S. Seismic Design Map program (Version 3.1.0)⁸, and the 2012 IBC data set, and are based on the site being located at approximate latitude 37.634°N and longitude 122.435°W.

2012 IBC AND 2013 CBC SEISMIC PARAMETERS		
Seismic Parameter	Design Value	Reference
Site Class	D	Section 1613.3.2
S _s	2.54	Figure 1613.3.1(1)
S ₁	1.22	Figure 1613.3.1(2)
F _a	1.0	Table 1613.3.3(1)
F _v	1.5	Table 1613.3.3(2)

4.4 Pavements

Our pavement recommendations provided below are based on the assumption that traffic will consist mainly of relatively light vehicles and equipment such as “bobtail” dump trucks, rubber tired backhoes, pickup trucks, flatbed trucks, and other similar maintenance vehicles. We also assumed that heavy vehicles such as fully loaded ten wheel dump trucks or other similar heavy construction equipment will not use the pavement. We should be consulted if the pavement use will differ than what we have assumed.

We recommend regular maintenance of the asphalt concrete be performed at approximately five year intervals. Maintenance may include sand slurry sealing, crack filling, and chip seals as necessary. If regular maintenance is not performed, the asphalt concrete layer could experience premature degradation requiring more extensive repairs.

4.4.1 New Asphalt Concrete Pavement

Based on the results of laboratory testing of onsite subgrade materials, we recommend that an R-value of 50 be used in asphalt concrete pavement design. We recommend additional R-value tests be performed once the pavement subgrade is established to confirm the R-value used in the design.

We developed the following alternative preliminary pavement sections using Topic 608 of the State of California Department of Transportation Highway Design Manual, the recommended R-

⁸USGS Website, <http://earthquake.usgs.gov/hazards/designmaps/usdesign.php>, Version 3.1.0, last updated 7/11/13.

value, and an assumed Traffic Index (T.I.) of 6.0 for typical cemetery operations as described in previous section. The project's Civil Engineer or appropriate agency should determine actual traffic indices. The pavement thicknesses shown below are SFB's recommended minimum values.

PRELIMINARY PAVEMENT DESIGN ALTERNATIVES SUBGRADE R-VALUE = 15			
Location	Pavement Components		Total Thickness (inches)
	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)	
T.I. = 6.0	3.0	8.0	11.0

Pavement baserock and asphalt concrete should be compacted to at least 95 percent relative compaction. The asphalt concrete compacted unit weight should be determined using Caltrans Test Method 308-A or ASTM Test Method D1188. Asphalt concrete should also satisfy the S-value requirements by Caltrans.

4.4.2 Full Depth Rehabilitation

As an alternative to new asphalt concrete pavement construction, Full Depth Rehabilitation (FDR) can be used to strengthen the existing pavement section and upper portion of the subgrade soils. If FDR is used, we recommend the existing AC and base materials and upper portion of the subgrade soils be pulverized and blended in-place to a depth of 15 inches (1.25 feet) below the finished pavement surface elevation. The upper approximately 3 inches of the mixture should be removed and off-hauled to a suitable storage area and stockpiled for later use, such as using it to replace unstable materials in trenches. The properly blended materials should be mixed with varying amounts of Portland cement and water and compacted to 95 percent relative compaction in order to achieve a minimum 28 day compressive strength of 300 pounds per square inch (psi). Compression testing of the compacted mix should be performed to confirm the appropriate strength has been achieved. Any new underground utility pipes should be installed prior to adding the cement and water to the pulverized mixture. The amount of cement required will likely vary between 4 to 6 percent to obtain the required 28 day compressive strength of 300 psi or greater. The actual amount of cement should be determined basing on the results of laboratory compression tests on the onsite blended materials. Once the mixture is properly compacted, a new layer of asphalt concrete at least 3 inches thick should be placed in one lift and compacted to 95 percent relative compaction.

5.0 CONDITIONS AND LIMITATIONS

SFB is not responsible for the validity or accuracy of information, analyses, test results, or designs provided to SFB by others or prepared by others. The analysis, designs, opinions, and recommendations submitted in this report are based in part upon the data obtained from our field work and upon information provided by others. Site exploration and testing characterizes subsurface conditions only at the locations where the explorations or tests are performed; actual subsurface conditions between explorations or tests may be different than those described in this report. Variations of subsurface conditions from those analyzed or characterized in this report are not uncommon and may become evident during construction. In addition, changes in the condition of the site can occur over time as a result of either natural processes (such as earthquakes, flooding, or changes in ground water levels) or human activity (such as construction adjacent to the site, dumping of fill, or excavating). If changes to the site's surface or subsurface conditions occur since the performance of the field work described in this report, or if differing subsurface conditions are encountered, we should be contacted immediately to evaluate the differing conditions to assess if the opinions, conclusions, and recommendations provided in this report are still applicable or should be amended.

We recommend SFB be retained to provide geotechnical services during design, reviews, earthwork operations, paving operations, and foundation installation to confirm and observe compliance with the design concepts, specifications and recommendations presented in this report. Our presence will also allow us to modify design if unanticipated subsurface conditions are encountered or if changes to the scope of the project, as defined in this report, are made.

This report is a design document that has been prepared in accordance with generally accepted geological and geotechnical engineering practices for the exclusive use of Jacobs for specific application to the proposed Renovate Rostrum and Road project at Golden Gate National Cemetery in San Bruno, California, and is intended to represent our design recommendations to Jacobs for specific application to the Renovate Rostrum and Road project. The conclusions and recommendations contained in this report are solely professional opinions. It is the responsibility of Jacobs to transmit the information and recommendations of this report to those designing and constructing the project. We will not be responsible for the misinterpretation of the information provided in this report. We recommend SFB be retained to review geological and geotechnical aspects of the construction calculations, specifications, and plans; we should also be retained to participate in prebid and preconstruction conferences to clarify the opinions, conclusions, and recommendations contained in this report.

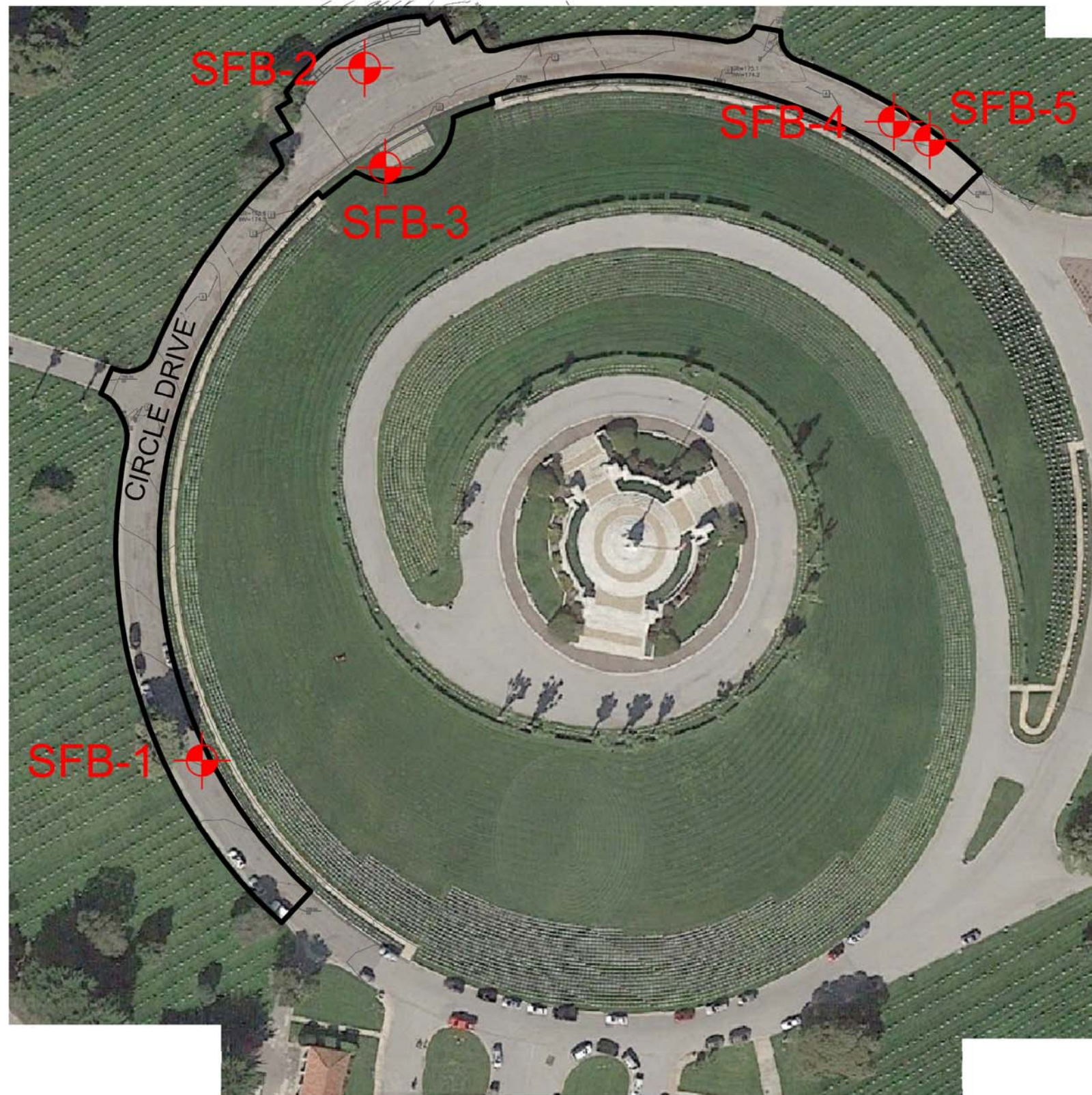
It should be understood that advancements in the practice of geotechnical engineering and engineering geology, or discovery of differing surface or subsurface conditions, may affect the validity of this report and are not uncommon. SFB strives to perform its services in a proper and professional manner with reasonable care and competence but we are not infallible. Geological engineering and geotechnical engineering are disciplines that are far less exact than other engineering disciplines; therefore we should be consulted if it is not completely understood what the limitations to using this report are.

In the event that there are any changes in the nature, design or location of the project, as described in this report, or if any future additions are planned, the conclusions and recommendations contained in this report shall not be considered valid unless we are contacted in writing, the project changes are reviewed by us, and the conclusions and recommendations presented in this report are modified or verified in writing. The opinions, conclusions, and recommendations contained in this report are based upon the description of the project as presented in the introduction section of this report.



This report does not necessarily represent all of the information that has been communicated by us to Jacobs Engineering and their consultants during the course of this engagement and our rendering of professional services to Jacobs. Reliance on this report by parties other than those described above must be at their own risk unless we are first consulted as to the parties' intended use of this report and only after we obtain the written consent of Jacobs to divulge information that may have been communicated to Jacobs. We cannot accept consequences for use of segregated portions of this report.

Please refer to Appendix C for additional guidelines regarding use of this report.

FIGURE

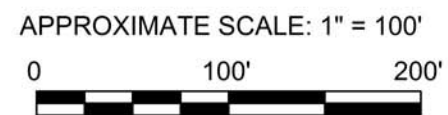


KEY

- SFB-5**  APPROXIMATE LOCATION OF SFB EXPLORATORY BORING (6/11/14)
-  APPROXIMATE PROJECT LIMIT



NOTE: Base map was taken from the project Grading and Drainage Plan Sheet L-300 prepared by Jacobs and dated 5/11/12.



DATE
June 2014
PROJECT NO.
361-18

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SITE PLAN

RENOVATE ROSTRUM & ROAD
 Golden Gate National Cemetery, San Bruno, California

FIGURE

1

APPENDIX A
Field Investigation

APPENDIX A

Field Investigation

Our field investigation for the proposed Renovate Rostrum and Road project at Golden Gate National Cemetery in San Bruno, California, consisted of surface reconnaissance and a subsurface exploration program. Geotechnical reconnaissance of the site and surrounding area was performed on June 5, 2014. Subsurface exploration was performed using a truck-mounted drill rig equipped with 4-inch diameter, continuous flight, solid stem augers. Five exploratory borings were drilled on June 11, 2014 to a maximum depth of about 6-1/2 feet. Our representative continuously logged the soils encountered in the borings in the field. The soils are described in general accordance with the Unified Soil Classification System (ASTM D2487). The logs of the borings as well as a key for the classification of the soil (Figure A-1) are included as part of this appendix.

Representative samples were obtained from our exploratory boring at selected depths appropriate to the investigation. Relatively undisturbed samples were obtained using a 3-inch O.D. split barrel sampler with liners, and disturbed samples were obtained using the 2-inch O.D. split spoon sampler. All samples were transmitted to our offices for evaluation and appropriate testing. Both sampler types are indicated in the "Sampler" column of the boring logs as designated in Figure A-1. The elevations discussed in this report and shown on the boring logs in this appendix were obtained from the base map shown on Figure 1; datum unknown.

Resistance blow counts were obtained in our boring with the samplers by dropping a 140-pound safety hammer through a 30-inch free fall. The sampler was driven 18 inches and the number of blows were recorded for each 6 inches of penetration. The blows per foot recorded on the boring logs represent the accumulated number of converted blows that were required to drive the last 12 inches, or the number of inches indicated where hard resistance was encountered. The blow counts recorded on the boring logs have been converted to equivalent SPT field blowcounts, but have not been corrected for overburden, silt content, or other factors.

The attached boring logs and related information show our interpretation of the subsurface conditions at the dates and locations indicated, and it is not warranted that they are representative of subsurface conditions at other locations and times.

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description	Major Divisions		grf	ltr	Description	
Coarse Grained Soils	Gravel		GW	Well-graded gravels or gravel sand mixtures, little or no fines	Soils	Silts And Clays LL < 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
			GP	Poorly-graded gravels or gravel sand mixture, little or no fines				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
	Gravelly Soils		GM	Silty gravels, gravel-sand-silt mixtures				OL	Organic silts and organic silt-clays of low plasticity	
			GC	Clayey gravels, gravel-sand-clay mixtures						
	Sand And Sandy Soils		SW	Well-graded sands or gravelly sands, little or no fines			Silts And Clays LL > 50		MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
			SP	Poorly-graded sands or gravelly sands, little or no fines	CH				Inorganic clays of high plasticity, fat clays	
				SM	Silty sands, sand-silt mixtures				OH	Organic clays of medium to high plasticity
				SC	Clayey sands, and-clay mixtures					
									Highly Organic Soils	

GRAIN SIZES

U.S. STANDARD SERIES SIEVE

CLEAR SQUARE SIEVE OPENINGS

	200	40	10	4	3/4"	3"	12"	
Silts and Clays	Sand			Gravel		Cobbles	Boulders	
	Fine	Medium	Coarse	Fine	Coarse			

RELATIVE DENSITY

Sands and Gravels	Blows/Foot*
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

CONSISTENCY

Silts and Clays	Blows/Foot*	Strength (tsf)**
Very Soft	0 - 2	0 - 1/4
Soft	2 - 4	1/4 - 1/2
Firm	4 - 8	1/2 - 1
Stiff	8 - 16	1 - 2
Very Stiff	16 - 32	2 - 4
Hard	Over 32	Over 4

*Number of Blows for a 140-pound hammer falling 30 inches, driving a 2-inch O.D. (1-3/8" I.D.) split spoon sampler.

**Unconfined compressive strength.

SYMBOLS & NOTES

	Standard Penetration sampler (2" OD Split Barrel)		Shelby Tube
	Modified California sampler (3" OD Split Barrel)		Pitcher Barrel
	California Sampler (2.5" OD Split Barrel)		HQ Core
	Ground Water level initially encountered		
	Ground Water level at end of drilling		

Increasing Visual Moisture Content

↑ Saturated
Wet
Moist
Damp
Dry

Constituent Percentage

PI = Plasticity Index
LL = Liquid Limit
R = R-Value

trace <5%
some 5-15%
with 16-30%
-y 31-49%

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KEY TO EXPLORATORY BORING LOGS

**RENOVATE ROSTRUM & ROAD
Golden Gate National Cemetary, San Bruno, CA**

PROJECT NO.

DATE

FIGURE NO.

361-18

June 2014

A-1

DRILL RIG	Mobile B-24 CFA	SURFACE ELEVATION	188 feet	LOGGED BY	TC
DEPTH TO GROUND WATER	Not Encountered	BORING DIAMETER	4-inch	DATE DRILLED	06/11/14

DESCRIPTION AND CLASSIFICATION			DEPTH (FEET) ELEVATION	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE							
Asphalt Concrete (AC) 4" Thick.			0						At 2": Liquid Limit = 20 Plasticity Index = 1 Medium Sand = 4% Fine Sand = 66% Silt = 15% Clay = 15%
Gravels 10" Thick (Baserock).									
Seepage at 1'.									
SAND (SM), yellowish brown, fine- to medium-grained, with silt and clay, damp.	dense		185		39	13	122		
					41				
Moist.	very dense		5		50/11"				
Bottom of Boring = 5.4 feet									
Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.									
			180						
			10						
			175						
			15						
			170						
			20						
			165						
			25						
			160						
			30						
			155						

EXPLORATORY BORING LOG 361-18.GPJ STEVENS FERRONE BAILEY.GDT 6/25/14

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EXPLORATORY BORING LOG

RENOVATE ROSTRUM & ROAD
Golden Gate National Cemetary, San Bruno, CA

PROJECT NO.

361-18

DATE

June 2014

BORING NO.

SFB-1

DRILL RIG	Mobile B-24 CFA	SURFACE ELEVATION	177.5 feet	LOGGED BY	TC
DEPTH TO GROUND WATER	Not Encountered	BORING DIAMETER	4-inch	DATE DRILLED	06/11/14

DESCRIPTION AND CLASSIFICATION			DEPTH (FEET) ELEVATION	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE							
Asphalt Concrete (AC) 2" Thick.			0						
Gravels/Sands 4" Thick (Baserock).									
FILL: SAND (SM), mottled yellow brown, fine- to medium-grained, silty, some clay, dry to damp. With clay at 3'.	dense		175		47/11"	14	117		
					30				
FILL: CLAY (CL), mottled yellow brown, sandy(fine- to medium-grained), with silt, dry to damp.	very stiff		5		29				
Bottom of Boring = 5.5 feet Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.			170						
			10						
			165						
			15						
			160						
			20						
			155						
			25						
			150						
			30						
			145						

EXPLORATORY BORING LOG 361-18.GPJ STEVENS FERRONE BAILEY.GDT 6/25/14

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EXPLORATORY BORING LOG

RENOVATE ROSTRUM & ROAD
Golden Gate National Cemetary, San Bruno, CA

PROJECT NO.

361-18



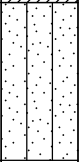



DATE

June 2014

BORING NO.

SFB-2

DRILL RIG	Mobile B-24 CFA	SURFACE ELEVATION	178.5 feet	LOGGED BY	TC
DEPTH TO GROUND WATER	Not Encountered	BORING DIAMETER	4-inch	DATE DRILLED	06/11/14

DESCRIPTION AND CLASSIFICATION			DEPTH (FEET) ELEVATION	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE							
FILL: CLAY (CL), grayish brown, silty, with sand(fine- to medium-grained), damp to moist.	stiff		0		17	16	107		
SAND (SM), yellowish brown, fine- to medium-grained, silty, trace clay, damp to moist.	medium dense		175		18				
With clay, damp.			5		14				
Bottom of Boring = 6.5 feet Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.			170						
			10						
			165						
			15						
			160						
			20						
			155						
			25						
			150						
			30						
			145						

EXPLORATORY BORING LOG 361-18.GPJ STEVENS FERRONE BAILEY.GDT 6/25/14



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EXPLORATORY BORING LOG

RENOVATE ROSTRUM & ROAD
Golden Gate National Cemetary, San Bruno, CA

PROJECT NO.

DATE

BORING NO.

361-18

June 2014

SFB-3

DRILL RIG	Mobile B-24 CFA	SURFACE ELEVATION	174.5 feet	LOGGED BY	TC
DEPTH TO GROUND WATER	Not Encountered	BORING DIAMETER	4-inch	DATE DRILLED	06/11/14

DESCRIPTION AND CLASSIFICATION			DEPTH (FEET) ELEVATION	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE							
Asphalt Concrete (AC) 4" Thick.			0						
Gravels 9" Thick (Baserock).									
FILL: SAND (SC), mottled yellow brown, fine- to medium-grained, clayey, with silt, dry to damp.	medium dense				30/3"	13	119		
SAND (SM), mottled yellow light gray, fine- to medium-grained, silty, dry.	very dense				50/3"				
Bottom of Boring = 4.5 feet Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.			170		36/6"				
			5						
			10						
			15						
			20						
			25						
			30						
			140						

EXPLORATORY BORING LOG 361-18.GPJ STEVENS FERRONE BAILEY.GDT 6/25/14

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EXPLORATORY BORING LOG

RENOVATE ROSTRUM & ROAD
Golden Gate National Cemetary, San Bruno, CA

PROJECT NO.

361-18

DATE

June 2014

BORING NO.

SFB-4

DRILL RIG	Mobile B-24 CFA	SURFACE ELEVATION	174 feet	LOGGED BY	TC
DEPTH TO GROUND WATER	Not Encountered	BORING DIAMETER	4-inch	DATE DRILLED	06/11/14

DESCRIPTION AND CLASSIFICATION			DEPTH (FEET) ELEVATION	SAMPLER	SPT N-VALUE	WATER CONTENT (%)	DRY DENSITY (PCF)	UNC. COMP. (KSF)	OTHER TESTS
DESCRIPTION AND REMARKS	CONSIST	SOIL TYPE							
Asphalt Concrete (AC) 4" Thick.			0						
Gravels 6" Thick (Baserock).									
Bottom of Boring = 1 feet									
Notes: Stratification is approximate, variations must be expected. Blowcounts converted to SPT N-values. See Report for additional details.									
			170						
			5						
			165						
			10						
			160						
			15						
			155						
			20						
			150						
			25						
			145						
			30						
			140						

EXPLORATORY BORING LOG 361-18.GPJ STEVENS FERRONE BAILEY.GDT 6/25/14



1600 Willow Pass Court
Concord, CA 94523
Tel: 925-688-1001

EXPLORATORY BORING LOG

RENOVATE ROSTRUM & ROAD
Golden Gate National Cemetary, San Bruno, CA

PROJECT NO.

DATE

BORING NO.

361-18

June 2014

SFB-5

APPENDIX B
Laboratory Investigation

APPENDIX B

Laboratory Investigation

Our laboratory testing program for the Renovate Rostrum and Road project at Golden Gate National Cemetery in San Bruno, California was directed toward a quantitative and qualitative evaluation of the physical and mechanical properties of the soils underlying the site.

The natural water content was determined on four samples of the subsurface soils. The water contents are recorded on the boring logs at the appropriate sample depths.

Dry density determination was performed on four samples of the subsurface soils to evaluate their physical properties. The results of the tests are shown on the boring logs at the appropriate sample depths.

Atterberg Limit determinations were performed on one sample of the subsurface soils to determine the range of water content over which these materials exhibit plasticity. These values are used to classify the soil in accordance with the Unified Soil Classification System and to indicate the soil's compressibility and expansion potentials. The results of the test are presented on the boring log at the appropriate sample depth.

Gradation and hydrometer tests were performed on one sample of the subsurface soils. These tests were performed to assist in the classification of the soils and to determine their grain size distribution. The results of the tests are presented on the boring log at the appropriate sample depth.

A resistance R-Value test was performed on a combined sample of the existing pavement subgrade soils at the site to provide data for pavement design. The test was performed in accordance with California Test Method 301-F and indicated an R-Value of 59 at an exudation pressure of 300 pounds per square inch.

APPENDIX C
ASFE Guidelines

Important Information about Your Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance

Membership in ASFE/The Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE THE GEOPROFESSIONAL BUSINESS ASSOCIATION

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