

UNITED STATES DEPARTMENT OF VETERANS AFFAIRS



PROJECT MANUAL  
FOR

**HOT SPRINGS VA  
SUMMERVILLE AND BOILER PLANT ROAD  
REPAIR**

Project Number 568-13-207

FOR CONSTRUCTION  
February 7, 2013

*Prepared by:*

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VA Project Engineer  
COR/COTR**

SPEC SET NO.

**Contracting Officer  
Ms. Joann Walker  
VA Black Hills Health Care System  
500 North Fifth Street  
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LIST OF DRAWINGS

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

<b>SHEET NO.</b>	<b>SHEET</b>	<b>SHEET TITLE</b>
1	X-1	COVER SHEET
2	X-2	GENERAL NOTES
3	C-1	DEMOLITION PLAN
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6	C-4	SITE CONSTRUCTION DETAILS
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8	C-6	SITE CONSTRUCTION DETAILS

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GENERAL REQUIREMENTS

1.1 GENERAL INTENTION

- A. Contractor shall provide all labor, materials, tools and equipment, necessary for Project 568-13-207, Summerville and boiler Plant Road Repair at the VA Black Hills Health Care System, Hot Springs, SD.
- B. NOT USED
- C. 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 restricted from unauthorized access.
- D. Prior to commencing work, general contractor shall provide proof that a 30-hour OSHA certified "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- E. Training:
  - 1. All employees of general contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
  - 2. Submit training records of all such employees for approval before the start of work.

1.2 SCOPE OF WORK

**Location:** VA Black Hills Health Care System, Hot Springs, SD

Provide all labor, materials, tools and equipment, necessary for complete replacement of roads, drain pans, and curb and gutter according to the plans and specifications for project 568-13-207.

**Description:** The contractor will replace asphalt roads, drain pans, and curb and gutter that are shown on the plans. All new roads will be constructed of asphalt with concrete, pans, and curb and gutter where applicable.

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- Demolition will consist of, but is not limited to: Removal and disposal of asphalt roads, removal and disposal of unusable base materials, removal and disposal also includes the cooling tower near building 18. This tower will be salvaged to the owner with the location to be coordinated with the VA project engineer. Protection of existing landscaping and utilities and erosion control.
- New construction will consist of, but is not limited to: Earthwork and grading, compacting for new road construction, installation of asphalt roads with concrete curb and gutter, traffic control and signage, grading and seeding lawn areas as needed, curb and gutter tie into existing storm drainage and catch basins. Erosion control and storm drain protection.

**Schedule Objectives:** The anticipated completion of this project is **90** calendar days after “Notice to Proceed (NTP).”

### **Bidding:**

- Base Bid: Provide all services as described above. The Base Bid includes all deduct alternates for the total project.
- Deduct Alternate #1: Provide all services as described above minus Deduct Alternate #1 shown on the plans which includes all demolition , construction, and installation of the drain pan past the deduct alternate line shown on the plans.

### 1.3 CONSTRUCTION SECURITY REQUIREMENTS

#### A. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. 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 give 3 days notice to the Contracting Officer 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.

3. No photography of VA premises is allowed without written permission of the Contracting Officer.
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 Contracting Officer.

#### 1.4 FIRE SAFETY

A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

1. American Society for Testing and Materials (ASTM):

E84-2008..... Surface Burning Characteristics of Building Materials

2. National Fire Protection Association (NFPA):

10-2006 ..... Standard for Portable Fire Extinguishers

30-2007 ..... Flammable and Combustible Liquids Code

51B-2003..... Standard for Fire Prevention During Welding, Cutting and  
Other Hot Work

70-2007 ..... National Electrical Code

241-2004 ..... Standard for Safeguarding Construction, Alteration, and  
Demolition Operations

3. 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 Project Engineer 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, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the Project Engineer that individuals have undergone contractor's safety briefing.

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- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- E. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- F. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.
- G. If required, submit documentation to the Project Engineer that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

### 1.5 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 Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Working space and space available for storing materials shall be as determined by the Project Engineer.
- C. Workmen are subject to rules of Medical Center applicable to their conduct.
- D. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by Project Engineer where required by limited working space.
  - 1. Do not store materials and equipment in other than assigned areas.
  - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.

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3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
  4. The VA reserves the right to require that construction activities that cause loud noise levels such as jack hammering, hammer drilling and power nailing be performed after hours or on weekends.
- E. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Project Engineer. All such actions shall be coordinated with the Utility Company involved.
- F. 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 Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients 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 Medical Center operations will continue during the construction period.
- G. Existing Utility Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, 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 Project Engineer.
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 Project Engineer. 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 Medical Center Director's prior knowledge and written approval.

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2. Contractor shall submit a request to interrupt any such services to Project Engineer, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
  3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
  4. 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 Project Engineer.
  5. In case of a contract construction emergency, service will be interrupted on approval of Project Engineer. Such approval will be confirmed in writing as soon as practical.
- H. Coordinate the work for this contract with other construction operations as requested by the COTR (Project Engineer). This includes the scheduling of traffic and the use of roadways, as delineated on the Plans.

### 1.6 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
  1. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.

### 1.7 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 Project Engineer. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Project Engineer 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 (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be

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patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.

- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by 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 indicated on drawings and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings 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).

### 1.8 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the Project Engineer's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the Project Engineer within 15 calendar days after each completed phase and after the acceptance of the project by the Project Engineer.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

### 1.9 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract.

### 1.10 HISTORIC PRESERVATION

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 VA Project Engineer verbally, and then with a written follow up.

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MEDICAL CENTER REQUIREMENTS

**1.0 GENERAL INTENTION:**

This document pertains to station safety, health, and environmental policies for construction projects performed at the VA Black Hills Health Care System. Safety and health concerns are taken seriously at this facility. Both our staff and yours are expected to strictly adhere to the regulations and requirements. This is exceedingly important, since we must be primarily concerned for the safety of our patients. In this regard, OSHA Standards may protect worker safety and health, but they have minimal benefit for protecting the safety and health of our patients, due primarily to their differing medical conditions. Review this information as orientation with your personnel performing work on site. In addition, construction can have significant impacts to the environment. It is the policy of this organization to minimize impacts in accordance with the facility's integrated Green Environmental Systems (GEMS).

**2.0 REQUIREMENTS:**

**A. Security:**

1. Secure all construction areas, especially mechanical and electrical rooms against entry of unauthorized individuals including patients.
2. Notify the Contracting Officer's Technical Representative (COTR) for permission to work after hours and weekends. Standard work hours for the medical center are Monday–Friday, 7:00 a.m. to 4:30 p.m.
3. The VA will issue ID tags to contractor personnel. All contractor personnel are required to wear the VA provided ID at all times while working on government property. The Contractor will submit ID requests for each employee (including subcontractor employees) using the request form on attachment A.

**B. Key Security:**

1. Only a limited number of keys will be issued to the contractor. Key requests shall be made using the request form on attachment B.
2. If the Contractor loses a key, a charge of \$30 will be billed for a replacement key.
3. Ensure all doors leading to and from construction are either monitored or locked to prevent access to the area from unauthorized persons.

**C. Contractor General Safety Program and Training Requirements:**

1. The Contractor shall appoint a "Competent Person" (CP) for the project. The CP will have primary responsibility for construction safety, OSHA compliance, and adherence to the Contractor's safety program. The Contractor shall provide for approval, as part of the submittal process, the name of the CP and documentation that the individual has had the necessary training, experience, and has the authority to carry out their responsibilities with respect to safety and health during construction activities. Evidence of training shall include completion of OSHA approved courses or other construction safety training consistent with the scope of the project.
2. The Contractor shall also provide for approval, as part of the submittal process, evidence of a company safety policy that includes, as a minimum, the following

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components: a) Safety is the first priority and will not be compromised, b) PPE is provided for employees, and the employees are trained in its use, c) Details of regularly scheduled safety training for jobs site employees in regards to OSHA requirements, construction related impacts, and Life Safety Code requirements. This may be accomplished through documented "tool box talks", or other similar methods.

3. The Contractors CP and primary workers will be required to view a VA provided video tape, "Playing It Safe", approximate viewing time 15 minutes. The video identifies concerns regarding patient's safety, privacy, and infection control; and introduces Contractor's workers to the unique safeguards required when working in a hospital environment.
4. Adhere to the following:
  - Follow all federal, state and local safety and health regulations.
  - Maintain safety in the construction site/area in accordance with the provisions of the contract that includes the Occupational Safety and Health Administration (OSHA) Regulations; National Electrical Codes; National Fire Protection Association (NFPA) 70, National Electric Code; and NFPA 101, Life Safety Code. Work in a safe manner and take all proper precautions while performing your work. Extra precautions shall be taken when working around persons occupying the building during construction.
  - Provide Personal Protective Equipment (PPE) for your employees.
  - Post appropriate signs in specific hazardous areas.
  - Keep tools, ladders, etc., away from patients to prevent injuries.

### D. Safety Inspections:

1. The VA professional Occupational Safety and Health staff at this facility will perform safety inspections of all contract operations. Written reports of unsafe practices or conditions will be reported to the COTR and Contracting Officer for immediate attention and resolution.
2. The Contractor's superintendent/CP is required to monitor work on a daily basis, including surveillance related to health and safety. The daily inspections are to be documented via the check list included on the back of the Daily Log form (attachment C). Completed Daily Logs should be provided to the COTR at the end of each shift, and no later than the next working day.

### E. Fire Alarms:

1. The fire alarm system connects all buildings at this facility, and is activated by various heat, duct, manual pull stations and smoke sensors. Manual pull stations are provided at each entrance. Survey the area in which you are working to locate the manual pull stations.
2. In the event of a fire alarm sounding, you are to remain in your area, unless medical center personnel (Safety, Nursing or Engineering) instruct otherwise, or unless a fire situation is in your area, in which case you should immediately evacuate.

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3. Any work involving the fire protection systems requires written permission to proceed from the COTR. *Do not tamper with or otherwise disturb any fire alarm system components without prior written permission. To do so without written permission will result in an adverse action.*

### F. Hazardous Materials:

1. Many of the operations you are scheduled to perform may involve the use of hazardous materials. Prior to locating hazardous materials on site, submit all Material Safety Data Sheets (MSDS) through the COTR for evaluation by the facility Safety Officer.

### G. Contact with Asbestos Containing Materials (ACM):

1. Due to the age of buildings, many contain asbestos containing materials (ACM). Primary ACM uses in the medical center include floor tile, mastic, piping, and HVAC insulation. The medical center has performed a comprehensive asbestos survey and has identified accessible ACM. Some areas contain damaged asbestos and should not be accessed without prior abatement.
2. The most common type of ACM insulation you may encounter includes thermal system insulation (TSI) and floor tile. ACM TSI is generally covered with a cloth wrap or lagging, and the asbestos substrate generally appear white in color. *Do not sand, drill, gouge or otherwise disturb this type of insulation.* Contractors disturbing or releasing asbestos containing materials will be liable for all damages and cleanup costs.
3. Where disturbance of asbestos is likely, it has been addressed in the contract for removal. If contact with the presence of asbestos is presented, stop all work in the immediate area and immediately contact the COTR or Safety Officer to make necessary arrangements for removal.
4. In some areas, asbestos insulation has been identified on elbows, between fiberglass piping insulation, as patching materials among the fiberglass insulation. Fiberglass insulation used in this facility is usually yellow or pink in color, wrapped either by cloth or paper lagging.
5. A complete assessment of asbestos materials and conditions are available for viewing by contacting the COTR. Prior to performing work above any ceiling or starting in a new area, consult with the COTR concerning existing conditions of ACM.
6. Some of the areas in the facility are identified as restricted areas due to condition of ACM. These are readily labeled. *Do not enter these areas* unless first contacting the COTR. Entry requirements to these areas are awareness of the hazards, proper protective clothing (coveralls and respirators) and personal monitoring in accordance with OSHA requirements.

### H. Environmental Protection:

1. It may help you to be aware of the seriousness that the environmental protection requirements of each contract are regarded. Adherence to these requirements is subject to continuing scrutiny from the community and backed by severe penalties, such as fines and incarceration. These environmental requirements will be strictly enforced. Contractors are required to abide by all Federal, State, and Local environmental regulations.

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2. *No* hazardous materials shall be disposed of on Government property. Haul all waste off-site or dispose in contractor owned and operated waste removal containers.
3. Forward a copy of all waste manifests for special or hazardous wastes to the COTR. Environmental requirements will be strictly enforced.

### I. Permit Required Confined Spaces:

1. Contractors performing work on this facility shall follow all requirements outlined in OSHA Standards for working in confined spaces. There are numerous permit required confined spaces on this facility. These spaces have been identified. Some spaces have been posted, but the majority have not due to their configuration. A complete listing of these areas is located in the Fire Department.
2. Confined spaces are areas that are large enough to be entered, have limited egress/exit potential and are not designed for permanent human occupancy. If you encounter any space that meets this definition, and if it is a suspected confined space, contact the COTR.
3. Contractors performing work in confined spaces are responsible for compliance with all applicable standards and regulations.

### J. Housekeeping:

1. Protect patients and VA personnel in occupied areas from the hazards of dust, noise, construction debris and material associated with a construction environment. Keep work area clear, clean and free of loose debris, construction materials and partially installed work that would create a safety hazard or interfere with VA personnel duties and traffic.
2. Clean area of all construction debris and dust upon completion of demolition and/or renovation.

### K. Hot Work Permits:

1. Any hot work operations including cutting, welding, thermal welding, brazing, soldering, grinding, thermal spraying, thawing pipes or any other similar activity, require a Hot Work Permit to be obtained by the Contractor from the Fire Department. The Contractor is responsible for conforming to all Medical Center regulations, policies and procedures concerning Hot Work Permits as outlined below:
  - a. Prior to the performance of hot work in patient-occupied buildings, request a Hot Work Permit from the Fire Department.
  - b. The Fire Department will inspect the area and ensure that the requirements of NFPA 241 and OSHA standards have been satisfied. The Hot Work Permit will be granted and must be posted in the immediate area of the work.
  - c. The Hot Work Permit will apply only to the location identified on the permit. If additional areas involve hot work, additional permits must be requested.
  - d. Upon completion of all hot work, notify the Fire Department to perform a re-inspection of the area.

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2. Do not use any of the extinguishers in the medical center for standby purpose while conducting hot work. Contractors are required to supply their own Class ABC extinguishers. Medical center extinguishers are only to be used in the event of a fire.
- L. Emergency Medical Services: Emergency medical services for stabilization purposes are available for contractors at this facility. For medical emergencies, dial 6911 when inside any building. Report the nature of the emergency and location. The operator will dispatch in-house personnel or coordinate an outside emergency assistance based on the nature of the emergency.
- M. Use of Government-Owned Material and Equipment: Use of Government-owned material and equipment is *prohibited*.
- N. Superintendent Communications: At all times during the performance of this contract, the Contractors Superintendent is to be available by cellular phone. At the beginning of the contract and prior to beginning any construction, supply the COTR with the telephone number for the Superintendent.
- O. Parking: Contractor employees shall be assigned a parking area during the preconstruction meeting.
- P. Traffic:
1. Traffic hazards are minimal at this facility. Drivers should be particularly concerned with pedestrian traffic.
  2. Seat belt use is mandatory on the station.
  3. Federal police officers maintain a 24-hour patrol of the area.
  4. Speed limits are to be observed, and are strictly enforced.
- Q. Contractor's Trailers: Contractor's trailers shall be located at the area assigned. All utility connections to the trailer shall be installed at the contractor expense. Trailer removal is required upon completion of the contract, unless approved by the COTR to leave in place.
- R. Smoking: No smoking is permitted in buildings or around hazardous areas. Any smoking inside a government building is subject to a fine without warning.
- S. Lock out/tag out: Contractors performing work on equipment and systems are responsible for compliance with the facilities lock out/tag out policies.
- T. Road Closures: For any work requiring closure of a road or parking lot, a request for closure shall be made in writing at least 5 days in advance for approval by the COTR and Fire Department.

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SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- 1.1 Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in Section 01 00 00, GENERAL CONDITIONS.
- 1.2 For the purposes of this contract, samples, 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 COTR, 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 will not serve as a basis for extending contract time for completion.
- 1.5 Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by COTR on behalf of the Contracting Officer.
- 1.6 Upon receipt of submittals, Architect-Engineer 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 Contracting Officer, 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 Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect- Engineer assumes no responsibility

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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. Contracting Officer 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 Hot Springs VA, 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 Hot Springs VA, 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.
  - C. 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.
  - D. Approved samples will be kept on file by the COTR at the site until completion of contract, at which time such 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. 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.
  - E. 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.

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1. For each drawing required, submit one legible photographic paper or vellum reproducible.
  2. Reproducible shall be full size and marked neatly as reproducible copy.
  3. Each drawing shall have marked thereon, proper descriptive title, including Hot Springs VA location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
  4. A space 120 mm by 125 mm (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 Architect-Engineer under one cover.
- 1.10 The Contractor shall also submit\* the complete submittal directly to the Contracting Officer's Technical Representative (COTR), also referred to as the VA Project Engineer:

VA Black Hills Health Care System  
Facility Management Office  
500 N. Fifth Street  
Hot Springs, South Dakota 57747  
ATTN: Matt Erpenbach, VA Project Engineer  
Phone: 605-745-7256

\*-Clean digital files may be submitted by Email in lieu of hard copies.

END OF SECTION

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SECTION 01 33 24

SUBMITTAL LOG

**1.0 General Intention:** This document pertains to the submittals pertaining to the submittals section. This section lists by item the submittals that need to be submitted and what types of submittals that are required. This is also used as a planning tool for timely submittals.

**2.0 Requirements:**

A. Items:

1. This submittal log will be filled out by the contractor by item for each submittal. This will list in sequence all parts and components of every section in which a submittal is required.
2. If each item of an assembly is to be certified by submittal together then each part of the assembly does not need to be listed separately.
3. This submittal log may be added to during the course of the project.

B.

Hot Springs VA Road Repair

SUBMITTAL REGISTER											CONTRACT NO:											
TITLE AND LOCATION: Hot Springs VA					CONTRACTOR:					PROJECT NUMBER: 568-13-207												
ITEM NO.	SPEC SECTION NO.	SPEC PARA. NO.	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL								CLASSIFICATION	REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		REMARKS
				DATASHEETS	DRAWINGS	INSTRUMENTS	STATEMENTS	REPORTS	RECORDS	PERMITS	INFORMATION ONLY			GOVT APPROVED	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	
1	010000	1.1	OSHA certification						X			X										
2	010011	2	ID tags copy							X		X										
3	010011	2	Competent Person Appointment				X					X										
4	010011	2	Company Safety Policy				X					X										
5	010011	2	Material Safety Data Sheets	X								X										
6	015700	1	Erosion control plan		X							X										
7																						
8																						
9																						

Hot Springs VA Road Repair

SUBMITTAL REGISTER													CONTRACT NO:									
TITLE AND LOCATION: Hot Springs VA						CONTRACTOR:						PROJECT NUMBER: 568-13-207										
ITEM NO.	SPEC SECTION NO.	SPEC PARA. NO.	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL							CLASSIFICATION		REVIEWER	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		REMARKS
				D A T A S H E E T S	D R A W I N G S	S H E E T S	S T A M P S	R E E M T S	C E R T I F I C A T E S	R E C O R D S	I N F O N O N L Y	G O V T A P P R O V E D		S U B M I T	A P P R O V A L N E E D E D B Y	M A T E R I A L N E E D E D B Y	C O D E	D A T E	S U B M I T T O G O V E R N M E N T	C O D E	D A T E	
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568-13-207

01 33 24 - 3  
SUBMITTAL LOG

02/07/2013

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SECTION 01 42 19

REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to – GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS

Office of Construction & Facilities Management

Facilities Quality Service (00CFM1A)

811 Vermont Avenue, NW - Room 462

Washington, DC 20420

Telephone Numbers: (202) 461-8217 or (202) 461-8292

Between 9:00 AM - 3:00 PM

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1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

AASHTO American Association of State Highway and Transportation Officials

<http://www.aashto.org>

ACI American Concrete Institute

<http://www.aci-int.net>

ACPA American Concrete Pipe Association

<http://www.concrete-pipe.org>

ACPPA American Concrete Pressure Pipe Association

<http://www.acppa.org>

AGC Associated General Contractors of America

<http://www.agc.org>

AISC American Institute of Steel Construction

<http://www.aisc.org>

AISI American Iron and Steel Institute

<http://www.steel.org>

AITC American Institute of Timber Construction

<http://www.aitc-glulam.org>

AMCA Air Movement and Control Association, Inc.

<http://www.amca.org>

ANLA American Nursery & Landscape Association

<http://www.anla.org>

ANSI American National Standards Institute, Inc.

<http://www.ansi.org>

APA The Engineered Wood Association

<http://www.apawood.org>

ARI Air-Conditioning and Refrigeration Institute

<http://www.ari.org>

ASAE American Society of Agricultural Engineers

<http://www.asae.org>

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- ASCE American Society of Civil Engineers  
<http://www.asce.org>
- ASHRAE American Society of Heating, Refrigerating, and  
Air-Conditioning Engineers  
<http://www.ashrae.org>
- ASME American Society of Mechanical Engineers  
<http://www.asme.org>
- ASSE American Society of Sanitary Engineering  
<http://www.asse-plumbing.org>
- ASTM American Society for Testing and Materials  
<http://www.astm.org>
- AWI Architectural Woodwork Institute  
<http://www.awinet.org>
- AWS American Welding Society  
<http://www.aws.org>
- AWWA American Water Works Association  
<http://www.awwa.org>
- BHMA Builders Hardware Manufacturers Association  
<http://www.buildershardware.com>
- BIABrick Institute of America  
<http://www.bia.org>
- CAGI Compressed Air and Gas Institute  
<http://www.cagi.org>
- CGA Compressed Gas Association, Inc.  
<http://www.cganet.com>
- CI The Chlorine Institute, Inc.  
<http://www.chlorineinstitute.org>
- CISCA Ceilings and Interior Systems Construction Association  
<http://www.cisca.org>
- CISPI Cast Iron Soil Pipe Institute  
<http://www.cispi.org>
- CLFMI Chain Link Fence Manufacturers Institute  
<http://www.chainlinkinfo.org>

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- CPMB Concrete Plant Manufacturers Bureau  
<http://www.cpmc.org>
- CRA California Redwood Association  
<http://www.calredwood.org>
- CRSI Concrete Reinforcing Steel Institute  
<http://www.crsi.org>
- CTICooling Technology Institute  
<http://www.cti.org>
- DHI Door and Hardware Institute  
<http://www.dhi.org>
- EGSA Electrical Generating Systems Association  
<http://www.egsa.org>
- EEIEdison Electric Institute  
<http://www.eei.org>
- EPA Environmental Protection Agency  
<http://www.epa.gov>
- ETL ETL Testing Laboratories, Inc.  
<http://www.et1.com>
- FAA Federal Aviation Administration  
<http://www.faa.gov>
- FCC Federal Communications Commission  
<http://www.fcc.gov>
- FPS The Forest Products Society  
<http://www.forestprod.org>
- GANAGlass Association of North America  
<http://www.cssinfo.com/info/gana.html/>
- FM Factory Mutual Insurance  
<http://www.fmglobal.com>
- GA Gypsum Association  
<http://www.gypsum.org>
- GSA General Services Administration  
<http://www.gsa.gov>
- HI Hydraulic Institute  
<http://www.pumps.org>

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- HPVA Hardwood Plywood & Veneer Association  
<http://www.hpva.org>
- ICBO International Conference of Building Officials  
<http://www.icbo.org>
- ICEA Insulated Cable Engineers Association Inc.  
<http://www.icea.net>
- ICAC Institute of Clean Air Companies  
<http://www.icac.com>
- IEEE Institute of Electrical and Electronics Engineers  
<http://www.ieee.org>
- IMSA International Municipal Signal Association  
<http://www.imsasafety.org>
- IPCEA Insulated Power Cable Engineers Association
- NBMA Metal Buildings Manufacturers Association  
<http://www.mbma.com>
- MSS Manufacturers Standardization Society of the Valve and Fittings Industry Inc.  
<http://www.mss-hq.com>
- NAAMM National Association of Architectural Metal Manufacturers  
<http://www.naamm.org>
- NAPHCC Plumbing-Heating-Cooling Contractors Association  
<http://www.phccweb.org.org>
- NBS National Bureau of Standards  
See - NIST
- NBBPVI National Board of Boiler and Pressure Vessel Inspectors  
<http://www.nationboard.org>
- NEC National Electric Code  
See - NFPA National Fire Protection Association
- NEMA National Electrical Manufacturers Association  
<http://www.nema.org>
- NFPA National Fire Protection Association  
<http://www.nfpa.org>
- NHLA National Hardwood Lumber Association  
<http://www.natlhardwood.org>

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- NIH National Institute of Health  
<http://www.nih.gov>
- NIST National Institute of Standards and Technology  
<http://www.nist.gov>
- NLMA Northeastern Lumber Manufacturers Association, Inc.  
<http://www.nelma.org>
- NPA National Particleboard Association  
18928 Premiere Court  
Gaithersburg, MD 20879  
(301) 670-0604
- NSF National Sanitation Foundation  
<http://www.nsf.org>
- NWWDA Window and Door Manufacturers Association  
<http://www.nwwda.org>
- OSHA Occupational Safety and Health Administration  
Department of Labor  
<http://www.osha.gov>
- PCA Portland Cement Association  
<http://www.portcement.org>
- PCI Precast Prestressed Concrete Institute  
<http://www.pci.org>
- SSPC The Society for Protective Coatings  
<http://www.sspc.org>
- STI Steel Tank Institute  
<http://www.steeltank.com>
- SWI Steel Window Institute  
<http://www.steelwindows.com>
- TCA Tile Council of America, Inc.  
<http://www.tileusa.com>
- TEMA Tubular Exchange Manufacturers Association  
<http://www.tema.org>
- TPITruss Plate Institute, Inc.  
583 D'Onofrio Drive; Suite 200

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Madison, WI 53719

(608) 833-5900

UBC The Uniform Building Code

See ICBO

UL Underwriters' Laboratories Incorporated

<http://www.ul.com>

ULC Underwriters' Laboratories of Canada

<http://www.ulc.ca>

WCLIB West Coast Lumber Inspection Bureau

6980 SW Varns Road, P.O. Box 23145

Portland, OR 97223

(503) 639-0651

WRCLA Western Red Cedar Lumber Association

P.O. Box 120786

New Brighton, MN 55112

(612) 633-4334

WWPA Western Wood Products Association

<http://www.wwpa.org>

1.5 CLAUSES INCLUDED BY REFERENCE

The following Federal Acquisition (FAR) Clauses and Veterans Affairs Acquisition Regulations (VAAR) are contained in the DESIGN BUILD ROAD REPLACEMENT RFP (Solicitation No. VA26310RP0236) documents. They are hereby incorporated into the Design-Build Project Specifications by Reference, as listed in the GENERAL CONDITIONS.

END OF SECTION

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SECTION 01 45 29

TESTING LABORATORY SERVICES – RETAINED BY OWNER

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Selection and payment.
- B. Contractor submittals.
- C. Testing Agency/Laboratory responsibilities.
- D. Testing Agency/Laboratory reports.
- E. Limits on testing agency/laboratory authority.
- F. Contractor responsibilities.
- G. Schedule of tests.

1.2 RELATED SECTIONS

- A. 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:  
Manufacturer's certificates.
- B. 03 30 00 CAST-IN-PLACE CONCRETE
- C. 32 12 00 FLEXIBLE PAVEMENT

1.3 REFERENCES

- A. ASTM C 1077 - Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
- B. ASTM D 3740 - Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- C. ASTM D 4561 - Quality Control Systems for an Inspection and Testing Agency for Bituminous Paving Materials.
- D. ASTM E 329 - Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.

1.4 SELECTION AND PAYMENT

- A. Employment and payment for services of an independent testing agency or laboratory to perform specified testing retained by Department of Veterans Affairs (Owner).

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- B. Employment of testing agency or laboratory by the Owner in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.5 QUALITY ASSURANCE

- A. Comply with requirements of ASTM C 1077, ASTM D 3740, ASTM D 4561, and ASTM E 329.
- B. Laboratory: Authorized to operate in State in which Project is located.
- C. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
- D. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.6 CONTRACTOR SUBMITTALS

- A. Prior to start of Work, submit schedule of anticipated testing intervals, for use by the COTR and Testing Agency.

1.7 TESTING AGENCY/LABORATORY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Contracting Officer's Technical Representative and Contractor in performance of services.
- C. Perform specified sampling and testing of Products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Contracting Officer's Technical Representative and Contractor of observed irregularities or non-conformance of Work or Products.
- F. Perform additional tests required by Contracting Officer's Technical Representative.
- G. Attend preconstruction meetings and progress meetings, if requested.

1.8 TESTING AGENCY/LABORATORY REPORTS

- A. After each test, promptly submit two copies of report to Contracting Officer's Technical Representative, Engineer, and to Contractor.
- B. Include:
  - 1. Date issued.
  - 2. Project title and number.

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3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications section.
6. Location in the Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

- C. When requested by Contracting Officer's Technical Representative, provide interpretation of test results.

1.9 LIMITS ON TESTING AGENCY/LABORATORY AUTHORITY

- A. Testing agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Testing agency or laboratory may not approve or accept any portion of the Work.
- C. Testing agency or laboratory may not assume any duties of Contractor.
- D. Testing agency or laboratory has no authority to stop the Work.

1.10 CONTRACTOR RESPONSIBILITIES

- A. Deliver to testing agency/laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
- C. Provide incidental labor and facilities:
  1. To provide access to Work to be tested.
  2. To obtain and handle samples at the site or at source of products to be tested.
  3. To facilitate tests.
  4. To provide storage and curing of test samples.
- D. Notify A/E and laboratory 24 hours prior to expected time for operations requiring testing services.
- E. Employ services of an independent qualified testing laboratory and pay for additional samples and tests required by Contractor beyond specified requirements.

1.11 SCHEDULE OF TESTS

- A. Individual Specification Sections: Tests required and standards for testing. Summary of Test tests shown in Part 3

## PART 2 - PRODUCTS

2.1 Not Used.

## PART 3 - EXECUTION

### 3.1 EARTHWORK (Phase 1):

- A. General: Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the COTR regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Contracting Officer's Technical Representative the extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
- B. Testing Compaction of scarified, conditioned, and re-worked subgrade:
  - 1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D1557. Perform additional tests of on-site borrow, as directed by the COTR, when soil type and consistency change.
  - 2. Make field density tests in accordance with the primary testing method following ASTM D2922 wherever possible. Field density tests utilizing ASTM D1556 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 COTR before the tests are conducted.
  - 3. Pavement Subgrade: One test for each 200 Lineal Feet of roadway but in no case less than ten (10) tests.
- C. Testing Materials: Test suitability of on-site borrow as directed by Contracting Officer's Technical Representative.

### 3.2 ASPHALT CONCRETE PAVING (Phase 2):

- A. Aggregate Base Course:
  - 1. Determine maximum density and optimum moisture content for Aggregate base material in accordance with ASTM D1557.
  - 2. Density tests: One test for each 50 Lineal Feet of roadway/curb corridor. Make a minimum of three field density tests on each day's final compaction on each Aggregate course in accordance with ASTM D 3017 and ASTM D 2922.
- B. Testing of 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 T 27), wear (AASHTO T 96), and soundness (AASHTO T 104).

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2. Sample and test aggregates in stock piles and hot-bins daily to insure compliance with specification requirements for moisture content (ASSHTO T 180).
3. Temperature: Check temperatures of each load of asphalt concrete at mixing plant and at site of paving operation.
4. Density: Make a minimum of three field density tests in accordance with ASTM D 1188 of asphalt base and surface course for each day's paving operation. (92% minimum density per Rice test required).
5. Binder: Make a minimum of three field samples of asphalt base and surface course for each day's paving operation to insure compliance with specification requirements for binder (AASHTO T 308).
6. Air Voids: Make a minimum of three field samples of asphalt base and surface course for each day's paving operation to insure compliance with specification requirements for air voids (AASHTO T 209).

### 3.3 CAST-IN-PLACE CONCRETE TESTING (Phase 2):

- A. Compressive Strength: One set of four cylinders from the first 25-cy placed and one set for each 50-cy placed thereafter; being placed each day. Test one cylinder at 7-days, two at 28-days, and retain one "hold" cylinder for future use. Make additional cylinders as needed for determination of early compressive strength.
- B. Slump: Test slump of each load of concrete, after mix adjustment, or as requested by the COTR.
- C. Air Content: One test per 25-cy placed and after a mix adjustment is made.
- D. Testing representative shall remain on site throughout the concrete placement.

END OF SECTION

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SECTION 01 57 00

ENVIRONMENTAL MANAGEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Special requirements for environmental management during construction operations.
- B. NOT USED
- C. Working in and around protected species and associated environment
- D. Slope Protection and Erosion Control practices
- E. Monitoring requirements.
- F. Definitions.
- G. Environmental protection.

1.2 RELATED DOCUMENTS

- A. NOT USED

1.3 DEFINITIONS

- A. Environmental Pollution and Damage: Presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade utility of environment for aesthetic, cultural, or historical purposes.

PART 2 - PRODUCTS

- 2.1 Not used.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL PROTECTION

- A. Protection of natural resources: Comply with applicable regulations and these specifications. Preserve the natural resources within the Project boundaries and outside the limits of permanent Work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by Owner.
  - 1. Confine demolition and construction activities to work area limits indicated on the Drawings.

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2. Disposal operations for demolished and waste materials that are not identified to be salvaged, recycled or reused:
  - a. Remove debris, rubbish, and other waste materials resulting from demolition and construction operations, from site.
  - b. No burning permitted.
  - c. Transport materials with appropriate vehicles and dispose off site to areas that are approved for disposal by governing authorities having jurisdiction.
  - d. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways. Remove spillage and sweep, wash, or otherwise clean project site, streets, or highways.
3. Water resources:
  - a. Comply with requirements of the National Pollutant Discharge Elimination System (NPDES) and the State Pollutant Discharge Elimination System (SPDES).
  - b. Oily substances: Prevent oily or other hazardous substances from entering the ground, drainage areas, or local bodies of water. Store and service construction equipment at areas designated for collection of oil wastes.
  - c. Mosquito abatement: Prevent ponding of stagnant water conducive to mosquito breeding habitat. Provide positive drainage throughout construction
  - d. Prevent run-off from site during demolition and construction operations.
  - e. Stream Crossings: Equipment will not be permitted to ford live streams
4. Land resources: Prior to construction, identify land resources to be preserved within the Work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and landforms without permission from Owner.
  - a. Earthwork: As specified in Division 31 and as follows:
    - 1) Erodible Soils for Earthwork: Plan and conduct earthwork to minimize the duration of exposure of unprotected Soils for Earthwork, except where the constructed feature obscures borrow areas, quarries, and waste material areas. Clear areas in reasonably sized increments only as needed to use the areas developed. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
    - 2) Erosion and sedimentation control devices: Construct or install temporary and permanent erosion and sedimentation control features as required and delineated in the SWPPP, and in accordance with Best Management Practices (BMP) of SD DOT.
    - 3) Prevent and eliminate tracking of Soils for Earthwork and loose materials off site through cleaning of vehicle tires and other vehicle surfaces prior to exiting the site. Clean public roads of any material tracked from the site.

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5. Air Resources: Develop and comply with IAQ Management Plan, Dust Control Plan, and as follows:
  - a. Coordinate and comply with local Air Pollution Control District requirements.
  - b. Prevent creation of dust, air pollution, and odors.
  - c. Sequence construction to avoid disturbance to site to the greatest extent possible.
  - d. 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.
  - e. Store volatile liquids, including fuels and solvents, in closed containers.
  - f. Properly maintain equipment to reduce gaseous pollutant emissions.
6. Fish and Wildlife Resources: Manage and control construction activities to minimize interference with, disturbance of, and damage to fish and wildlife.
  - a. Do not disturb fish and wildlife.
  - b. Do not alter water flows or otherwise significantly disturb the native habitat related to the project and critical to the survival of fish and wildlife, except as indicated or specified.
  - c. Contractor to obtain clearance from Biologist if working within 500 feet of any nesting raptors.

### 3.2 ARCHEOLOGICAL/HISTORIC RESOURCES

- 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 Contracting Officer's Technical Representative verbally, and then with a written follow up.

### 3.3 FIELD QUALITY CONTROL

- A. Comply with requirements of agencies having jurisdiction and as specified.

### 3.4 RECLAMATION AND RE-SEEDING

- A. All disturbed areas resulting from the Road Replacement Project which are not occupied by permanent construction shall be re-claimed to pre-construction conditions. Re-establish turf of a quality and mix to match existing vegetation at the given location.

END OF SECTION

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SECTION 01 74 19  
CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and 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 (eg, concrete, masonry and asphalt).

1.2 RELATED WORK

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

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building 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.

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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 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.
- D. 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, 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.
- E. 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.
- F. 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.
- G. 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. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

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- F. 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.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. 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.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. 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.
- K. 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.
- L. 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.
- M. 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.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.

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- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. 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 COTR Engineer 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. Proposed storage locations and waste disposal sites
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Provide a 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, at project completion.

### 1.6 APPLICABLE PUBLICATIONS

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.

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

### 1.7 RECORDS

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.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, 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, 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, invoices. Include the net total costs for each disposal.

END OF SECTION

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SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

1.2 RELATED WORK:

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

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 – 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 1.9 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.

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- 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 4500 mm (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 Medical Center; any damaged items shall be repaired or replaced as approved by the COTR.
- G. The work shall comply with the requirements of Section 01 57 00,  
ENVIRONMENTAL MANAGEMENT AND 01 74 19 CONSTRUCTION WASTE  
MANAGEMENT.

PART 2 - PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 DEMOLITION:

- A. Completely demolish and remove roadway pavement, curb and gutter, including all appurtenances related or connected thereto.
- B. Make full-depth saw cuts through pavement, curb & gutter, drain pans, and sidewalks at limits of new construction. Employ double saw cuts or other methods to protect structures to remain. Saw cut through reinforcing pins to protect concrete surfaces to remain. Take special care to protect historic sandstone columns and buildings from damage.
- C. Make examination of structures to remain to determine whether they are pinned to structures to be removed.
- D. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by them daily or suitably stockpiled in designated staging areas, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas directed by the COTR.
- E. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local

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permits, rules and/or regulations. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Any materials that are discovered to be hazardous shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.

- F. 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 Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

### 3.2 CLEAN-UP:

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to the COTR. Clean-up shall include off the Medical Center 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 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.

1.2 RELATED WORK

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

1.3 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.
6. 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).
  - a. ACI 301 - "Specifications for Structural Concrete for Buildings".
  - b. ACI 315 - "Details and Detailing of Concrete Reinforcing".
2. American Society for Testing and Materials (ASTM).
  - a. ASTM A82 - "Cold Drawn Wire for Concrete Reinforcement".

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- b. ASTM A615 - "Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".
      - c. ASTM A706 – "Low Alloy Steel Deformed Bars for Concrete Reinforcement".
    3. Concrete Reinforcing Steel Institute (CRSI) - "Manual of Standard Practice".
  - C. Submittals: (Submit under provisions of Section 01 33 23)
    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.
    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. Certificates of Compliance with specified standards:
      - a. Reinforcing bars.
    4. Samples: Only as requested by A/E.
- 1.4 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.

## 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.
- B. Stirrups and Ties: ASTM A615, Grade 60 for No.4 and larger bars, ASTM A615, Grade 40 for No. 3 and smaller 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. 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.

## 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 structural engineer'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. Notify COTR a minimum of 24-hours prior to planned concrete placement so reinforcement and forms can be inspected and approved.
- B. 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.
  - 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 and curb & gutter shall be placed as detailed. 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.

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- 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 COTR.
  - 3. Do not heat, bend, or cut bars without concurrence of COTR.
  - 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 COTR approval before using.
  - 4. Do not splice bars except at locations shown without concurrence of COTR.
  
- E. Welding:
  - 1. Welding is not permitted unless specifically detailed on Drawings or approved by COTR.
  
- 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. 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. Furnish, place and finish cast in place concrete and related work as indicated on the Drawings 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.

1.2 RELATED WORK (See also Table of Contents)

- A. Concrete Paving: Section 32 13 13.
- B. Reinforcing Steel: Section 03 21 00.

1.3 QUALITY ASSURANCE

- A. Standards and References: (Latest Edition unless otherwise noted)
  - 1. AMERICAN CONCRETE INSTITUTE (ACI)
    - a. ACI 117 Standard Tolerances for Concrete Construction and Materials
    - b. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
    - c. ACI 211.2 Standard Practice for Selecting Proportions for Structural Lightweight Concrete
    - d. ACI 301 Structural Concrete for Buildings
    - e. ACI 305R Hot Weather Concreting
    - f. ACI 318 Building Code Requirements for Reinforced Concrete
  - 2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
    - a. ASTM C 31 Making and Curing Concrete Test Specimens in the Field
    - b. ASTM C 33 Concrete Aggregates
    - c. ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens
    - d. ASTM C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
    - e. ASTM C 94 Ready-Mixed Concrete
    - f. ASTM C 143 Slump of Hydraulic Cement Concrete
    - g. ASTM C 150 Portland Cement
    - h. ASTM C 172 Sampling Freshly Mixed Concrete by the Volumetric Method
    - i. ASTM C 192 Making and Curing Concrete Test Specimens in the Laboratory
    - j. ASTM C 260 Air-Entraining Admixtures for Concrete

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- k. ASTM C 330 Lightweight Aggregates for Structural Concrete
- l. ASTM C 494 Chemical Admixtures for Concrete
- m. ASTM C 618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- n. ASTM C157 Length Change of Hardened Hydraulic-Cement Mortar and Concrete

B. Submittals: (Submit under provisions of Section 01 33 23)

- 1. Concrete mix designs. See "Mix Design" below. Include results of test data used to establish proportions.
- 2. Certificates of Compliance from Manufacturer
  - a. Cement
  - b. Aggregates
  - c. Admixtures.
- 3. Grout samples for sacked surface textures and colors upon Contracting Officer's technical representative's request only.
- 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 Contracting Officer's technical representative for his inspection upon request.
  - c. Upon completion of this portion of the work, deliver the record and the delivery slips to the Contracting Officer's technical representative.
  - d. See Section 03 21 00 for reinforcing steel submittals.

C. Tests and Inspections:

- 1. The following tests shall be made by a recognized testing laboratory selected by the Owner and approved by the building official. All tests shall be in accordance with the previously mentioned standards. A complete record of all tests and inspections shall be kept and submitted to the COTR.
  - a. Compressive Strength: Make and cure in accordance with ASTM C-31. Test in accordance with ASTM C-39.
    - 1) A record shall be made of time and of locations of concrete from which samples were taken.
    - 2) Four identical cylinders shall be taken from the first 25-cy placed and for each 50-cy placed thereafter, being placed each day. One cylinder shall be tested at age 7 days and two at age 28 days unless otherwise specified. Preserve remaining cylinder for future use.
  - b. Air Content
    - 1) Test air content a minimum of one test for every 25-cy placed and following a mix adjustment.
  - c. Concrete consistency (slump) shall be tested for the first mixer truck and then every-other mixer truck, in accordance with ASTM C143.

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2. Provide full time inspection during the taking of test specimens and during the placing of all concrete required to develop a compressive strength greater than 4000 psi at 28 days.
3. See Section 03 21 00 for reinforcing steel tests and inspections.

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. Aggregate shall be crushed granite or Perkins type.
  2. Concrete Aggregates for Lightweight Concrete: ASTM C330 to produce concrete weighing no more than 110 pcf at 28 days. Aggregate shall be vacuum saturated expanded shale as produced through the rotary kiln method.
- C. Water: Clean and free from injurious amounts of oil, acids, alkali, organic matter and other deleterious substances; suitable for domestic consumption.
- D. Admixtures shall be subject to prior approval by the Contracting Officer's technical representative. 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 A-618 Class F.
- E. Sand: Clean, dry, well graded.
- F. Expansion Joint Filler:
  1. Joint fill shall be a pre-formed closed-cell, resilient filler, 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. Bonding Agent: Sonneborn "Sonobond"; the Euclid Chemical Company "Euco-Weld"; Larsen Products Corp., "Weld-Crete" or approved equivalent.

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- H. Concrete Cure: Water based curing compound conforming to ASTM C-309, Type 1, Class A and B, and AASHTO Specification M-148; Type 1, Class A and B requirements, and State of California Air Resources Board VOC Regulations. Product shall be equivalent to Euclid Chemical Company "Kurez DR VOX", Burke "No. 1127" or "Aqua-Resin Cure", W.R. Meadows "1100 Clear", or approved equal.

2.2 CONCRETE

- A. Concrete Mixes (Use Type C Concrete for all Cast-in-Place Concrete on this project):
1. 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
    - d. 6.5 sacks per yard minimum.
    - e. Maximum Water to Cement Ratio: 0.50
    - f. Admixture: Water reducing.
    - g. Weight: 145 lbs. per cubic foot
    - h. Use for concrete walls, exterior paving, sidewalks, curb, gutters, and drain pans, except 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: 4 inch maximum (See Section 32 13 13 Flexible Pavement for allowable slumps for machine-placed concrete).
  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 approval of COTR.
- C. Tinted Concrete: Provide "Flagstone Brown" or "Rawhide" at a rate of 2% loading #338 per cubic yard of concrete. Coordinate with Redi-mix and supplier (Stan Houston Equipment) to provide samples prior to placement. The intent is to generally match the sandstone color of the Hospital Buildings.
- D. Mix Design:
1. Initial mix design shall be prepared for Type C, concrete by recognized testing laboratory (approved by the Contracting Officer's technical representative) in accordance with ASTM or AASHTO Standards. 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.

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2. Contractor shall notify the Testing Laboratory and Contracting Officer's technical representative 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 6% ± 1.5% air entrainment typical for exterior concrete exposed to freeze-thaw cycles.
5. Owner's testing laboratory shall review all mix design before submittal.

E. 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 Contracting Officer's technical representative. Approval of site mixing does not relieve Contractor of any other requirements of Specifications.
3. Mixing Time: After mix water has been added, concrete shall be mixed not less than 1-1/2 minutes or 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 3%.
  - 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 Structural Engineer 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

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only be used if approved by Architect. 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.
  3. Reinforcing steel shall have been placed, tied and supported.
  4. Embedded work of all trades shall be in place in the forms and adequately tied and braced including weepholes, screens and sleeves.
  5. 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.
  6. 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.
  7. 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.
  8. 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.
  9. No concrete shall be placed until the Contracting Officer's technical representative 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 Contracting Officer's technical representative 48 hours in advance of concrete pour.

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- B. 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.
- C. Depositing: Deposit concrete into forms in horizontal layers not exceeding 24 inches in thickness around building, 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; to be 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 Contracting Officer's technical representative.
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 Structural Engineer. 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 Contracting Officer's technical representative, 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.

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3. Cold Weather Concreting: Follow recommended ACI 306 procedures when air temperature falls below 40 degrees F., as approved by the Contracting Officer's technical representative. 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 Contracting Officer's technical representative.
- D. Construction Joints: Install only 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.
- E. Concrete Slabs on Grade:
1. Exterior concrete slabs on grade shall be poured as required under this Section. Base shall be accurately leveled and compacted prior to placing of concrete.
  2. Typically, exterior non vehicular slabs on grade shall be poured over a minimum of four (4 inch) inches, unless otherwise indicated, of compacted crushed rock.
- F. Control Jointing - Slabs on Grade:
1. Joints shall be in locations indicated on Drawings, or as directed by Architect.
  2. Control jointing in exterior paving slabs shall be poured in a checkerboard pattern: pour and allow alternate slabs to set; fill out balance of checkerboard pattern with second pour. Construct joint edges tooled to provide a uniform joint at least 3/8 inch in depth.
  3. Slab reinforcing need not be terminated at control joints.
  4. Construction and expansion joints shall be counted as control joints.
- G. Expansion Joints - Slabs on Grade:
1. Unless otherwise indicated, use 3/8 inch thick expansion joint filler. See Section 2.1 F
  2. Joints in exterior slabs on grade shall be installed at each side of structures, at curb transitions opposite apron joints, at ends of curb returns, at back of curb when adjacent to sidewalk, 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. Provide dowels at 18" O.C.
- H. 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.

### 3.2 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 or 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. Membrane curing compounds of chlorinated rubber or resin type conforming to ASTM C309 may be used only if specifically approved by Architect. 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 California Air Resources Board VOC Regulations.
    - d. Waterproof paper conforming to ASTM C 171, or opaque polyethylene film, may be used. Concrete shall be covered immediately following final finishing operation. Anchor paper or film securely and seal all edges in such a manner as to prevent moisture escaping from concrete.
  3. Curing Process - Formed Surfaces: Forms heated by sun shall be kept moist during curing period. If forms are to be removed during curing period, curing as described for flatwork shall be commenced immediately.
- B. Protection: Contractor shall be responsible for protection of finished concrete against injury by rain, cold, vibration, animal tracks, marking by visitors, vandalism, etc.

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- 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.

### 3.3 FINISHES

#### A. Formed Surfaces:

1. Rough Form Finish: Surfaces shall be reasonably true to line and plane with no specified requirements for selected facing materials. Tie holes and defects shall be patched and fins exceeding 1/4 inch in height shall be rubbed down with wooden blocks. Fins and other rough spots at surfaces to receive membrane waterproofing shall be completely removed and the surfaces rubbed smooth. Otherwise, surfaces shall be left with the texture imparted by forms.
2. Smooth Plywood Form Finish: Finish shall be true to line and plane. Tie holes and defects shall have been patched and ground with surface fins removed. Arrangement of plywood sheets shall be orderly, symmetrical, as large as practical and free of torn grain or worn edges. Surface concrete shall be treated with 1 part muriatic acid, in three parts water solution, followed immediately by a thorough rinsing with clear water. Surfaces which are glazed, have efflorescence, or traces of form oil, curing compounds or parting compounds shall be cleaned or treated to match other formed surfaces, except as otherwise indicated or specified.
  - a. Smooth Plywood Form Finish shall be used for the following areas:
    - 1) All surfaces from 6" below grade and above unless otherwise specified.
    - 2) At Contractor's option, may also be used in lieu of rough form finish.

#### B. 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 floor 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 one of following, as required.
  - a. Light 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. Use Light Broom finish at all locations for exterior flatwork except as otherwise indicated or specified.

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- b. Medium Broom Finish: To be approximately double the broom pressure and resulting indentation of a light broom finish. Provide Medium Broom finish on all ramps, handi-cap-accessible ramps, and tinted concrete.
3. Tooled Stair Nosings: provide tooled detectable warning strips 1-inch back from nose of each step, as indicated on the plans.
4. 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.

### 3.4 PATCHING

- A. Formed Surfaces:
  1. Promptly upon removal of contact forms and after concrete surfaces have been inspected, form ties shall be removed and all necessary patching and pointing shall be expertly done.
  2. Honeycombed areas shall be removed down to sound concrete, coated with a bonding grout or approved compound and patched using a low shrinkage high bond mortar. Patched areas shall be cured by being kept damp for at least 5 days.
  3. Tie holes shall be cleaned, dampened and filled solid with patching mortar or cement plugs of an approved variety.
  4. Exposed vertical surfaces (step risers and walls) shall be given a light textured "sack-rub" finish.
- B. Slabs on Grade: After entire slab is finished, shrinkage cracks that may appear shall be patched as follows:
  1. Where slab is not exposed or where appearance is not important, cracks larger than 1/32 inch wide shall be filled with cement grout and struck off level with surface.
  2. Where slab is exposed and appearance is important, unsightly cracks shall be repaired in a manner satisfactory in appearance to Architect. If this cannot be accomplished, concrete shall be considered defective.

### 3.5 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

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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 Contracting Officer's Technical Representative.
  - b. Cost of core sampling and testing will be paid for by the Contractor.
- 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. 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 Architect, 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 Owner.
- E. No repair work shall begin until procedure has been reviewed by the VA Project Engineer and A/E.

### 3.6 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

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SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Subsoil materials and topsoil materials.

1.2 RELATED SECTIONS

- A. Section 01 57 00 – Environmental Management: Slope protection and erosion control.
- B. Section 31 05 16 – Aggregate for Earthwork.
- C. Section 31 23 23 – Fill.

1.3 RELATED DOCUMENTS

- A. None

1.4 REFERENCES

- A. ASTM D 1557 - Moisture-Density Relations of Soils for Earthwork and Soil-Aggregate Mixtures Using 10 pound (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- B. ASTM D 2487 - Classification of Soils for Earthwork for Engineering Purposes.
- C. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- D. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

PART 2 - PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Native Soil Fill
  1. Native excavated from behind curbs and re-used material.
  2. Free of lumps larger than 3 inches, rocks larger than 4 inches, and debris.
  3. May not be used as engineered fill or a fill for support of structures.

2.2 TOPSOIL MATERIALS

- A. Topsoil:
  1. Friable loam – stripped full depth from existing roadway prism.

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2. Reasonably free of roots, sticks, rocks larger than ½-inch, subsoil, debris, large weeds, and foreign matter.
3. Acidity range (pH) of 5.5 to 7.5.
4. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.

### 2.3 SOURCE QUALITY CONTROL

- A. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D 1557.
- B. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D 1557, and ASTM D 2974.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

## PART 3 - EXECUTION

### 3.1 SOIL REMOVAL

- A. Mark and protect utilities to remain.
- B. Excavate topsoil from area outside curb line only of sufficient width to allow for construction. Strip topsoil to whatever depth it may occur in designated areas.
- C. Excavate native soil behind curb and sidewalks only of sufficient width to allow for construction.
- D. Remove lumped soil, boulders, and rock.
- E. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

### 3.2 STOCKPILING

- A. Stockpile materials on site at locations designated by Contracting Officer's Technical Representative or as indicated.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Prevent intermixing of soil types or contamination.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Material shall be stockpiled on impervious material and covered over with same material, until disposal.

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- F. Place erosion control measures as required by the Storm Water Pollution Prevention Plan.

3.3 SUBGRADE PREPARATION

- A. Road and curb subgrade: Remove base course. Scarify subgrade to 8-inch minimum depth, moisture condition as needed, and re-compact to minimum 95% density. This shall constitute subgrade preparation as required prior to placement of base course for streets and curbs.
- B. Sidewalk subgrade: Proof-roll existing sidewalk subgrade soil in presence of VA Project Engineer or A/E. This shall constitute subgrade preparation as required prior to placement of base course for sidewalks.

3.4 STOCKPILE CLEAN-UP

- A. Remove stockpile and all equipment, materials, and debris. Grade site surface across the slope to prevent free standing surface water and erosion. Recalim and re-seed the disturbed areas to match pre-construction conditions.

END OF SECTION

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SECTION 31 05 16

AGGREGATE FOR EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aggregate materials for Aggregate base, drainage fill, flowable gravel, and sand for earthwork, excavation and fill, backfill purposes.

1.2 RELATED SECTIONS

- A. Section 31 05 13 – Soils for Earthwork.
- B. Section 31 23 23 - Fill.
- C. Section 32 11 23 - Aggregate Base Course.
- D. Section 01 57 00 - Environmental Management: Slope protection and erosion control.

1.3 RELATED DOCUMENTS

- A. None.

1.4 REFERENCES

- A. ASTM C 136 - Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D 1557 - Moisture-Density Relations of Soils for Earthwork and Soil-Aggregate Mixtures Using 10 pound (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- C. ASTM D 2487 - Classification of Soils for Earthwork for Engineering Purposes.
- D. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. ASTM D 4253 - Maximum Index Density and Unit Weight of Soils for Earthwork Using a Vibratory Table.

1.5 SUBMITTALS

- A. Samples: Submit, in air-tight containers, 10-pound sample of each type of Aggregate with certificate of compliance to SDDOT or ASTM standard listed.
  - 1. In addition to the above, submit samples of both gradations for Aggregate base.

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- B. Materials Source: Submit name of imported materials suppliers and physical location of material.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Aggregate Base: Conforming to State of South Dakota Standard Specification Section 882.1 for Aggregate Base Course:
1. Aggregate for Aggregate base shall be free from organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base. Aggregate may include material processed from reclaimed Portland cement concrete, lean concrete base, cement- treated base, AC pavement millings, or a combination of any of these materials. The amount of reclaimed material shall not exceed 30 percent of the total volume of the Aggregate used.
  2. Aggregate shall conform to the grading and quality requirements shown in the following tables.

AGGREGATE BASE COURSE GRADING REQUIREMENTS		
	Percentage Passing	
	Aggregate Base Course	Limestone Ledge Rock
Sieve Sizes	Operating Range	Operating Range
2" (50 mm)		
1" (25.0 mm)	100	100
3/4" (19.0 mm)	80-100	80-100
1/2" (12.5 mm)	68-91	68-90
No. 4 (4.75 mm)	46-70	42-70
No. 8 (2.36 mm)	34-58	29-53
No. 40 (425 µm)	13-35	10-28
No. 200 (75 µm)	3.0-12.0	3.0-12.0
Liquid Limit Max	25	25
Plasticity Index	0-6	0-3
L.A. Abra. Loss, max.	40	40
Foot Notes	1,2	
Processing Required	Crushed	Crushed

Footnotes

1. The fraction passing the No. 200 (75 µm) sieve shall not be greater than 2/3 of the fraction passing the No. 40 (425 µm) sieve. In no case shall the upper limit specified for the No.200 (75 µm) sieve be exceeded.
2. Requirements include quarried ledge rock.

2.2 FINE AGGREGATE MATERIALS

- A. Sand: Natural river or bank sand conforming to AASHTO M-6 or ASTM C-33; 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

2.3 ENGINEERED FILL

- A. 1-inch minus clean material: Type 1 – Bedding Material, per RC Standard Specifications, 100% passing 1-inch sieve and 8% maximum passing a #8 sieve.

2.4 SOURCE QUALITY CONTROL

- A. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 STOCKPILING

- A. Stockpile in sufficient quantities to meet Project schedule and requirements.
- B. Separate differing materials with dividers or stockpile apart to prevent mixing.
- C. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.
- D. Materials shall be stockpiled on impervious material and covered over with same material, until disposed of.

3.2 STOCKPILE CLEANUP

- A. Leave unused materials in a neat, compact stockpile.
- B. If a borrow area is indicated, leave area in a clean and neat condition. Grade surrounding site surface to prevent free-standing surface water.

END OF SECTION

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SECTION 31 05 16

AGGREGATE FOR EARTHWORK

PART 4 - GENERAL

4.1 SECTION INCLUDES

- A. Aggregate materials for Aggregate base, drainage fill, flowable gravel, and sand for earthwork, excavation and fill, backfill purposes.

4.2 RELATED SECTIONS

- A. Section 31 05 13 – Soils for Earthwork.
- B. Section 31 23 23 - Fill.
- C. Section 32 11 23 - Aggregate Base Course.
- D. Section 01 57 00 - Environmental Management: Slope protection and erosion control.

4.3 RELATED DOCUMENTS

- A. None.

4.4 REFERENCES

- A. ASTM C 136 - Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D 1557 - Moisture-Density Relations of Soils for Earthwork and Soil-Aggregate Mixtures Using 10 pound (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- C. ASTM D 2487 - Classification of Soils for Earthwork for Engineering Purposes.
- D. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- F. ASTM D 4253 - Maximum Index Density and Unit Weight of Soils for Earthwork Using a Vibratory Table.

4.5 SUBMITTALS

- A. Samples: Submit, in air-tight containers, 10-pound sample of each type of Aggregate with certificate of compliance to SDDOT or ASTM standard listed.
  - 1. In addition to the above, submit samples of both gradations for Aggregate base.

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- B. Materials Source: Submit name of imported materials suppliers and physical location of material.

PART 5 - PRODUCTS

5.1 COARSE AGGREGATE MATERIALS

- A. Aggregate Base: Conforming to State of South Dakota Standard Specification Section 882.1 for Aggregate Base Course:
1. Aggregate for Aggregate base shall be free from organic matter and other deleterious substances, and shall be of such nature that it can be compacted readily under watering and rolling to form a firm, stable base. Aggregate may include material processed from reclaimed Portland cement concrete, lean concrete base, cement- treated base, AC pavement millings, or a combination of any of these materials. The amount of reclaimed material shall not exceed 30 percent of the total volume of the Aggregate used.
  2. Aggregate shall conform to the grading and quality requirements shown in the following tables.

AGGREGATE BASE COURSE GRADING REQUIREMENTS		
	Percentage Passing	
	Aggregate Base Course	Limestone Ledge Rock
Sieve Sizes	Operating Range	Operating Range
2" (50 mm)		
1" (25.0 mm)	100	100
3/4" (19.0 mm)	80-100	80-100
1/2" (12.5 mm)	68-91	68-90
No. 4 (4.75 mm)	46-70	42-70
No. 8 (2.36 mm)	34-58	29-53
No. 40 (425 µm)	13-35	10-28
No. 200 (75 µm)	3.0-12.0	3.0-12.0
Liquid Limit Max	25	25
Plasticity Index	0-6	0-3
L.A. Abra. Loss, max.	40	40
Foot Notes	1,2	
Processing Required	Crushed	Crushed

Footnotes

1. The fraction passing the No. 200 (75 µm) sieve shall not be greater than 2/3 of the fraction passing the No. 40 (425 µm) sieve. In no case shall the upper limit specified for the No.200 (75 µm) sieve be exceeded.
2. Requirements include quarried ledge rock.

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5.2 FINE AGGREGATE MATERIALS

- A. Sand: Natural river or bank sand conforming to AASHTO M-6 or ASTM C-33; 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

5.3 ENGINEERED FILL

- A. 1-inch minus clean material: Type 1 – Bedding Material, per RC Standard Specifications, 100% passing 1-inch sieve and 8% maximum passing a #8 sieve.

5.4 SOURCE QUALITY CONTROL

- A. Provide materials of each type from same source throughout the Work.

PART 6 - EXECUTION

6.1 STOCKPILING

- A. Stockpile in sufficient quantities to meet Project schedule and requirements.
- B. Separate differing materials with dividers or stockpile apart to prevent mixing.
- C. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.
- D. Materials shall be stockpiled on impervious material and covered over with same material, until disposed of.

6.2 STOCKPILE CLEANUP

- A. Leave unused materials in a neat, compact stockpile.
- B. If a borrow area is indicated, leave area in a clean and neat condition. Grade surrounding site surface to prevent free-standing surface water.

END OF SECTION

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SECTION 31 20 11

EARTHWORK (SHORT FORM)

**PART 1 - GENERAL**

**1.1:DESCRIPTION:**

This section specifies the requirements for furnishing all equipment, materials, labor and techniques for earthwork including excavation, fill, and backfill and site restoration utilizing fertilizer, seed and/or sod.

**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 75 mm (3 inches); organic materials, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable.
  - 2. Existing Subgrade (except footings): Same materials as above paragraph, that are not capable of direct support of slabs, pavement, and similar items, with the possible exception of improvement by compaction, proofrolling, or similar methods of improvement.
  - 3. Existing Subgrade (footings only): Same as Paragraph 1, but no fill or backfill. If materials differ from reference borings and design requirements, excavate to acceptable strata subject to Resident Engineer's approval.
- B. Earthwork: Earthwork operations required within the new construction area. It also includes earthwork required for auxiliary structures and buildings and sewer and other trenchwork throughout the job site.
- C. Degree of Compaction: Degree of compaction is expressed as a percentage of maximum density obtained by the test procedure presented in ASTM D698
- D. The term fill means fill or backfill as appropriate.

**1.3 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Safety Requirements Section: 1 00 00, GENERAL REQUIREMENTS and Section 01 00 11 MEDICAL CENTER REQUIREMENTS.
- C. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

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### **1.4 CLASSIFICATION OF EXCAVATION:**

- A. Unclassified Excavation: Removal and disposal of pavements and other man-made obstructions visible on the surface; utilities, and other items including underground structures indicated to be demolished and removed; together with any type of materials regardless of character of material and obstructions encountered.
- B. NOT USED.
- C. Rock Excavation:
  - 1. Solid ledge rock (igneous, metamorphic, and sedimentary rock).
  - 2. Bedded or conglomerate deposits so cemented as to present characteristics of solid rock which cannot be excavated without blasting; or the use of a modern power excavator (shovel, backhoe, or similar power excavators) of no less than 0.75 m<sup>3</sup> (1 cubic yard) capacity, properly used, having adequate power and in good running condition.
  - 3. Boulders or other detached stones each having a volume of 0.4 m<sup>3</sup> (1/2 cubic yard) or more.

### **1.5 NOT USED**

### **1.6 MEASUREMENT AND PAYMENT FOR ROCK EXCAVATION:**

- A. NOT USED
- B. Payment: No separate payment shall be made for rock excavation quantities shown.

### **1.7 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Rock Excavation Report:
  - 1. Certification of rock quantities excavated.
  - 2. Excavation method.
  - 3. Labor.
  - 4. Equipment.
  - 5. Land Surveyor's or Civil Engineer's name and official registration stamp.
  - 6. Plot plan showing elevations.
- C. Contractor shall submit procedure and location for disposal of unused satisfactory material. Proposed source of borrow material. Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

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SPEC WRITER NOTE: Use only when there is a VA Retained Testing Laboratory.

- D. Furnish to Resident Engineer, soil samples, suitable for laboratory tests, of proposed off site or on site fill material.
- E. Qualifications of the commercial testing laboratory or Contractor's Testing facility shall be submitted.

**1.8 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Nursery and Landscape Association (ANLA):  
2004..... American Standard for Nursery Stock
- C. American Association of State Highway and Transportation Officials (AASHTO):  
T99-10..... Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop  
T180-10..... Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg [10 lb] Rammer and a 457 mm (18 inch) Drop
- D. American Society for Testing and Materials (ASTM):  
C33-03 ..... Concrete Aggregate  
D698-e1 ..... Laboratory Compaction Characteristics of Soil Using Standard Effort  
D1140-00 ..... Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve  
D1556-00 ..... Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method  
D1557-09 ..... Laboratory Compaction Characteristics of Soil Using Modified Effort  
D2167-94 (2001) ..... Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method  
D2487-06 ..... Standard Classification of Soil for Engineering Purposes (Unified Soil Classification System)  
D6938-10 ..... Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

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E. Standard Specifications of South Dakota Department of Transportation, latest revision.

**PART 2 - PRODUCTS**

**2.1 MATERIALS:**

A. Fills: Materials approved from on site and off site sources having a minimum dry density of 1760 kg/m<sup>3</sup> (110 pcf), a maximum Plasticity Index of 6, and a maximum Liquid Limit of 30.

B. Granular Fill:

1. Aggregate Base Course (Gravel Cushion) – Under asphalt, sidewalk and curb and/or gutter, shall be crushed limestone that meets all of the requirements of Limestone Ledge Rock Base Course as specified in the South Dakota Department of Transportation’s Standard Specifications for Road and Bridge Design.
2. Type 1 Bedding Material – Bedding for water lines 3-inch and larger shall be crushed limestone rock having two (2) fractured faces and meet the following gradation requirements by dry weight:

Passing 1-inch sieve .....	100%
Passing 3/4-inch sieve .....	90 – 100%
Passing 3/8-inch sieve .....	20 – 55%
Passing #4 sieve .....	0 – 10%
Passing #8 sieve .....	0 – 8%

C. Fertilizer: (5-10-5) delivered to site in unopened containers that clearly display the manufacturer's label, indicating the analysis of the contents.

D. Seed: Grass mixture comparable to existing turf delivered to site in unopened containers that clearly display the manufacturer's label, indicating the analysis of the contents. Seed may conform to the following schedule:

- Ephraim Crested Wheatgrass 94 lbs. PLS/Acre
- Perennial Ryegrass 58 lbs. PLS/Acre
- Aloha Creeping Red Fescue 12 lbs. PLS/Acre
- Annual Ryegrass 22 lbs. PLS/Acre
- Alsike 14 lbs. PLS/Acre
- TOTAL 200 lbs. PLS/Acre

E. Sod: Comparable species with existing turf. Use State Certified or State Approved sod when available. Deliver sod to site immediately after cutting and in a moist condition.

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Thickness of cut must be 19 mm to 32 mm (3/4 inch to 1 1/4 inches) excluding top growth. There shall be no broken pads and torn or uneven ends

- F. Requirements For Offsite Soils: Offsite soils brought in for use as backfill shall be tested for TPH, BTEX and full TCLP including ignitability, corrosivity and reactivity. Backfill shall contain less than 100 parts per million (ppm) of total hydrocarbons (TPH) and less than 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and shall not fail the TCLP test. TPH concentrations shall be determined by using EPA 600/4-79/020 Method 418.1. BTEX concentrations shall be determined by using EPA SW-846.3-3a Method 5030/8020. TCLP shall be performed in accordance with EPA SW-846.3-3a Method 1311. Provide Borrow Site Testing for TPH, BTEX and TCLP from a composite sample of material from the borrow site, with at least one test from each borrow site. Material shall not be brought on site until tests have been approved by the Resident Engineer.
- G. Buried Warning and Identification Tape: Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant polyethylene plastic or warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specific below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, Unaffected by moisture or soil. Warning tape color codes:
- |         |                                    |
|---------|------------------------------------|
| Red:    | Electric                           |
| Yellow: | Gas, Oil, Dangerous Materials      |
| Orange: | Telephone and Other Communications |
| Blue:   | Water Systems                      |
| Green:  | Sewer Systems                      |
| White:  | Steam Systems                      |
| Gray:   | Compressed Air                     |
- H. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.076 mm (0.003 inch). Tape shall have a minimum strength of 10.3 MPa (1500 psi) lengthwise, and 8.6 MPa (1250 psi) crosswise, with a maximum 350 percent elongation.

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- I. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.102 mm (0.004 inch). Tape shall have a minimum strength of 10.3 MPa (1500 psi) lengthwise and 8.6 MPa (1250 psi) crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 0.9 m (3 feet) deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.
- J. Detection Wire For Non-Metallic Piping: Detection wire shall be Insulated single strand, solid copper with a minimum of 12 AWG.

### **PART 3 - EXECUTION**

#### **3.1 SITE PREPARATION:**

- A. Clearing: Clearing within the limits of earthwork operations as described or designated by the Resident Engineer. Work includes removal of trees, shrubs, fences, foundations, incidental structures, paving, debris, trash and any other obstructions. Remove materials from the Medical Center.
- B. Grubbing: Remove stumps and roots 75 mm (3 inches) and larger diameter. Undisturbed sound stumps, roots up to 75 mm (3 inches) diameter, and nonperishable solid objects which will be a minimum of 900 mm (3 feet) below subgrade or finished embankment may be left.
- C. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from the areas within 4500 mm (15 feet) of new construction and 2250 mm (7'-6") of utility lines if such removal is approved in advance by the Resident Engineer. Remove materials from the Medical Center. Trees and shrubs, shown to be transplanted, shall be dug with a ball of earth and burlapped in accordance with the latest issue of the, "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 semi-annually 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 the conclusion of the contract. Box, and otherwise protect from damage, existing trees and shrubs which are not shown to be removed in the construction area. Repair immediately damage to

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existing trees and shrubs by trimming, cleaning and painting damaged areas, including the roots, in accordance with standard industry horticultural practice for the geographic area and plant species. Building materials shall not be stored closer to trees and shrubs that are to remain, than the farthest extension of their limbs.

- D. Stripping Topsoil: Unless otherwise indicated on the drawings, the limits of earthwork operations shall extend anywhere the existing grade is filled or cut or where construction operations have compacted or otherwise disturbed the existing grade or turf. Strip topsoil as defined herein, or as indicated in the geotechnical report, from within the limits of earthwork operations as specified above unless specifically indicated or specified elsewhere in the specifications or shown on the drawings. Topsoil shall be fertile, friable, natural topsoil of loamy character and characteristic of the locality. Topsoil shall be capable of growing healthy horticultural crops of grasses. Stockpile topsoil and protect as directed by the Resident Engineer. Eliminate foreign material, such as weeds, roots, stones, subsoil, frozen clods, and similar foreign materials, larger than 0.014 m<sup>3</sup> (1/2 cubic foot) in volume, from soil as it is stockpiled. Retain topsoil on the station. Remove foreign materials larger than 50 mm (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 the soil is wet so that the tilth of the soil will be destroyed.
1. NOT USED
  2. 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 300 mm (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 the Medical Center.
- E. 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 onsite.

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### 3.2 EXCAVATION:

- A. Shoring, Sheet piling and Bracing: Shore, brace, or slope to its angle of repose banks of excavations to protect workmen, banks, adjacent paving, structures, and utilities, in compliance with OSHA requirements.
1. Extend shoring and bracing to the bottom of the excavation. Shore excavations that are carried below the elevations of adjacent existing foundations.
  2. If the bearing of any foundation is disturbed by excavating, improper shoring or removal of shoring, placing of backfill, and similar operations, provide a concrete fill support in compliance with Specification Section 31 23 23.33, FLOWABLE FILL, under disturbed foundations, as directed by Resident Engineer, at no additional cost to the Government. Do not remove shoring until permanent work in excavation has been inspected and approved by Resident Engineer.
- B. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required, to keep excavations free of water and subgrades dry, firm, and undisturbed until approval of permanent work has been received from Resident Engineer. Approval by the Resident Engineer is also required before placement of the permanent work on all subgrades. When subgrade for foundations has been disturbed by water, remove the disturbed material to firm undisturbed material after the water is brought under control. Replace disturbed subgrade in trenches by mechanically tamped sand or gravel. When removed disturbed material is located where it is not possible to install and properly compact disturbed subgrade material with mechanically compacted sand or gravel, the Resident Engineer should be contacted to consider the use of flowable fill. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 0.9 m (3 feet) of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. Operate dewatering system continuously until construction work below existing water levels is complete. Submit performance records weekly. Measure and record performance of dewatering system at same time each day by use of observation wells or piezometers installed in conjunction with the dewatering system

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C. Blasting shall not be permitted.

D. Building Earthwork:

1. Excavation shall be accomplished as required by drawings and specifications.
2. Excavate foundation excavations to solid undisturbed subgrade.
3. Remove loose or soft material to solid bottom.
4. Fill excess cut under footings or foundations with 25 MPa (3000 psi) concrete, poured separately from the footings.
5. Do not tamp earth for backfilling in footing bottoms, except as specified.

E. Trench Earthwork:

1. Utility trenches (except sanitary and storm sewer):

- a. Excavate to a width as necessary for sheeting and bracing and proper performance of the work.
- b. Grade bottom of trenches with bell-holes, scooped-out to provide a uniform bearing.
- c. Support piping on suitable undisturbed earth unless a mechanical support is shown. Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 150 mm (6 inches) loose thickness.
- d. The length of open trench in advance of pipe laying shall not be greater than is authorized by the Resident Engineer.
- e. Provide buried utility lines with utility identification tape. Bury tape 300 mm (12 inches) below finished grade; under pavements and slabs, bury tape 150 mm (6 inches) below top of subgrade
- f. Bury detection wire directly above non-metallic piping at a distance not to exceed 300 mm (12 inches) above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate inside the manholes at each end of the pipe, with a minimum of 0.9 m (3 feet) of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over its entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe.

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**SPEC WRITER NOTE: Select Bedding Type(s) that are applicable to the project.**

g. Bedding shall be of the type and thickness shown. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 698 maximum density. Plastic piping shall have bedding to spring line of pipe. Provide materials as follows:

- 1) Class I: Angular, 6 to 40 mm (0.25 to 1.5 inches), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
- 2) Class II: Coarse sands and gravels with maximum particle size of 40 mm (1.5 inches), including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D 2487.

### 2. Water, Sanitary and storm sewer trenches:

- a. a. All water, sanitary sewer and storm sewer pipe, appurtenances, and service lines; except copper water services shall be bedded with Type 1 Bedding material from 3 inches below the pipe invert to 3 inches above the pipe crown over the full width of the trench. Type 1 Bedding Material shall meet the requirements of Part 2 of this Section.
  - 1) Type 1 Bedding shall be compacted and placed as a separate lift from the trench bottom, or top of Foundation material, to the pipe invert and shall be placed and compacted prior to the pipe or appurtenance being placed in the trench.
  - 2) Type 1 Bedding shall be hand tamped and placed as a separate lift from the pipe invert to the pipe.

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- b. Place and compact as specified the remainder of backfill using acceptable excavated materials. Do not use unsuitable materials.
  - c. Use Type 1 Bedding or other granular fill as approved by the Project Engineer for bedding where rock or rocky materials are excavated.
  - d. Use granular fill for bedding where rock or rocky materials are excavated.
  - e. Provide buried utility lines with utility identification tape. Bury tape 300 mm (12 inches) below finished grade; under pavements and slabs, bury tape 150 mm (6 inches) below top of subgrade
  - f. Bury detection wire directly above non-metallic piping at a distance not to exceed 300 mm (12 inches) above the top of pipe. The wire shall extend continuously and unbroken, from manhole to manhole. The ends of the wire shall terminate inside the manholes at each end of the pipe, with a minimum of 0.9 m (3 feet) of wire, coiled, remaining accessible in each manhole. The wire shall remain insulated over its entire length. The wire shall enter manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, the wire shall terminate in the valve pit at the pump station end of the pipe.
  - g. Bedding shall be of the type and thickness shown. Initial backfill material shall be placed and compacted with approved tampers to a height of at least one foot above the utility pipe or conduit. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Backfill to top of pipe shall be compacted to 95 percent of ASTM D698 maximum density. Plastic piping shall have bedding to spring line of pipe.
- F. Site Earthwork:** Excavation shall be accomplished as required by drawings and specifications. Remove subgrade materials that are determined by the Resident Engineer 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 Resident Engineer, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable

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or not. When unsuitable material is encountered and removed, the contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL CONDITIONS as applicable. Adjustments to be based on meters (yardage) in cut section only.

- G. Finished elevation of subgrade shall be as follows:
  - 1. Pavement Areas - bottom of the pavement or base course as applicable.
  - 2. Planting and Lawn Areas - 100 mm (4 inches) below the finished grade, unless otherwise specified or indicated on the drawings.

### **3.3 FILLING AND BACKFILLING:**

- A. General: Do not fill or backfill until all debris, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from the excavation. Proof-roll exposed subgrades with a fully loaded dump truck. Use excavated materials or borrows for fill and backfill, as applicable. Do not use unsuitable excavated materials. Do not backfill until foundation walls have been completed above grade and adequately braced, waterproofing or dampproofing applied, and pipes coming in contact with backfill have been installed, and inspected and approved by Resident Engineer.
- B. Proof-rolling Existing Subgrade: - Proof rolling shall be done on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade with six passes of a dump truck loaded with 6 cubic meters (4 cubic yards) of soil or a 13.6 meter tons (15 ton), pneumatic-tired roller. Operate the roller or truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 4 to 5.5 km/hour (2 1/2 to 3 1/2 mph). When proof rolling, one-half of the passes made with the roller shall be in a direction perpendicular to the other passes. Notify the Resident Engineer a minimum of 3 days prior to proof rolling. Proof rolling shall be performed in the presence of the Resident Engineer. Rutting or pumping of material shall be undercut as directed by the Resident Engineer and replaced with fill and backfill or select material.
- C. Placing: Place material in horizontal layers not exceeding 200 mm (8 inches) in loose depth and then compacted. Do not place material on surfaces that are muddy, frozen, or contain frost.
- D. Compaction: Use approved equipment (hand or mechanical) well suited to the type of material being compacted. Do not operate mechanized vibratory compaction equipment

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within 3000 mm (10 feet) of new or existing building walls without the prior approval of the Resident Engineer. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Compact each layer to not less than 95 percent of the maximum density determined in accordance with the following test method ASTM D698 . Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure.

E. NOT USED

F. NOT USED

### **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 unfinished areas fill low spots and level off with coarse sand or fine gravel.
- C. Slope backfill outside the building away from the building walls for a minimum distance of 3048 mm (10 feet) at a minimum five percent (5%) slope.
- D. The finished grade shall be 150 mm (6 inches) below bottom line of windows or other building wall openings unless greater depth is shown.
- E. Place crushed stone or gravel fill under concrete slabs on grade tamped and leveled. The thickness of the fill shall be 150 mm (6 inches), unless otherwise indicated.
- F. Finish subgrade in a condition acceptable to the Resident Engineer at least one day in advance of the paving operations. Maintain finished subgrade in a smooth and compacted condition until the succeeding operation has been accomplished. Scarify, compact, and grade the subgrade prior to further construction when approved compacted subgrade is disturbed by contractor's subsequent operations or adverse weather.
- G. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 6 mm (0.25 inches) of indicated grades.

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### 3.5 LAWN AREAS:

- A. General: Harrow and till to a depth of 100 mm (4 inches), new or existing lawn areas to remain, which are disturbed during construction. Establish existing or design grades by dragging or similar operations. Do not carry out lawn areas earthwork out when the soil is wet so that the tilth of the soil will be destroyed. Plant bed must be approved by Resident Engineer before seeding or sodding operation begins.
- B. Finished Grading: Begin finish grading after rough grading has had sufficient time for settlement. Scarify subgrade surface in lawn areas to a depth of 100 mm (4 inches). Apply topsoil so that after normal compaction, dragging and raking operations (to bring surface to indicated finish grades) there will be a minimum of 100 mm (4 inches) of topsoil over all lawn areas; make smooth, even surface and true grades, which will not allow water to stand at any point. Shape top and bottom of banks to form reverse curves in section; make junctions with undisturbed areas to conform to existing topography. Solid lines within grading limits indicate finished contours. Existing contours, indicated by broken lines are believed approximately correct but are not guaranteed.
- C. Fertilizing: Incorporate fertilizer into the soil to a depth of 100 mm (4 inches) at a rate of 12 kg/100 m<sup>2</sup> (25 pounds per 1000 square feet).
- D. Seeding: Seed at a rate of 200 pounds per acre and accomplished only during periods when uniform distribution may be assured. Lightly rake seed into bed immediately after seeding. Roll seeded area immediately with a roller not to exceed 225 kg/m (150 pounds per foot) of roller width.
- E. Sodding: Topsoil shall be firmed by rolling and during periods of high temperature the topsoil shall be watered lightly immediately prior to laying sod. Sod strips shall be tightly butted at the ends and staggered in a running bond fashion. Placement on slopes shall be from the bottom to top of slope with sod strips running across slope. Secure sodded slopes by pegging or other approved methods. Roll sodded area with a roller not to exceed 225 kg/m (150 pounds per foot) of the roller width to improve contact of sod with the soil.
- F. Watering: The Resident Engineer is responsible for having adequate water available at the site. As sodding is completed in any one section, the entire sodded area shall be thoroughly irrigated by the contractor, to a sufficient depth, that the underside of the new sod pad and soil, immediately below sod, is thoroughly wet. Resident Engineer will be responsible for sod after installation and acceptance.

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### **3.6 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL:**

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Medical Center property.
  - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Medical Center property.
- B. Place excess excavated materials suitable for fill and/or backfill on site where directed.
- C. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- D. Segregate all excavated contaminated soil designated by the Resident Engineer from all other excavated soils, and stockpile on site on two 0.15 mm (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:**

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 debris, rubbish, and excess material from the Medical Center property.

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SECTION 31 23 19

DEWATERING

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies performance of dewatering required to lower and control ground water table levels and hydrostatic pressures to permit excavation, backfill, and construction to be performed in the dry. Control of surface water shall be considered as part of the work under this specification.

**1.2 SUMMARY:**

- A. The work to be completed by the Contractor includes, but is not necessarily limited to the following:
  - 1. Implementation of the Erosion and Sedimentation Control Plan.
  - 2. Dewater excavations, including seepage and precipitation.
- B. The Contractor shall be responsible for providing all materials, equipment, labor, and services necessary for care of water and erosion control. Excavation work shall not begin before the Erosion and Sedimentation Control Plan is in place.

**1.3 REQUIREMENT:**

- A. Dewatering system shall be of sufficient size and capacity necessary to lower and maintain ground water table to an elevation at least 300 mm (1 foot) below lowest foundation subgrade or bottom of pipe trench and to allow material to be excavated, piles to be driven, and concrete placed, in a reasonably dry condition. Materials to be removed shall be sufficiently dry to permit excavation to grades shown and to stabilize excavation slopes where sheeting is not required. Operate dewatering system continuously until backfill work has been completed.
- B. Reduce hydrostatic head below any excavation to the extent that water level in the construction area is a minimum of 300 mm (1 foot) below prevailing excavation surface.
- C. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.
- D. Maintain stability of sides and bottom of excavation.
- E. Construction operations are performed in the dry.
- F. Control of surface and subsurface water is part of dewatering requirements. Maintain adequate control so that:
  - 1. The stability of excavated and constructed slopes are not adversely affected by saturated soil, including water entering prepared subbase and subgrades where

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underlying materials are not free draining or are subject to swelling or freeze-thaw action.

2. Erosion is controlled.
  3. Flooding of excavations or damage to structures does not occur.
  4. Surface water drains away from excavations.
  5. Excavations are protected from becoming wet from surface water, or insure excavations are dry before additional work is undertaken.
- G. Permitting Requirements: The contractor shall comply with and obtain the required State and County permits where the work is performed.

### **1.4 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Safety Requirements: Section 00 72 00, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.
- C. Submittal requirements as specified in Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- D. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.11, PHYSICAL DATA.
- F. Excavation, backfilling, site grade and utilities: Section 31 20 00, EARTH MOVING.

### **1.5 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Drawings and Design Data:
  1. Submit drawings and data showing the method to be employed in dewatering excavated areas 30 days before commencement of excavation.
  2. Material shall include: location, depth and size of wellpoints, headers, sumps, ditches, size and location of discharge lines, capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey the water from site to adequate disposal.
  3. Include a written report outlining control procedures to be adopted if dewatering problem arises.
  4. Capacities of pumps, prime movers, and standby equipment.

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5. Design calculations proving adequacy of system and selected equipment. The dewatering system shall be designed using accepted and professional methods of design and engineering consistent with the best modern practice. The dewatering system shall include the deep wells, wellpoints, and other equipment, appurtenances, and related earthwork necessary to perform the function.
  6. Detailed description of dewatering procedure and maintenance method.
  7. Materials submitted shall be in a format acceptable for inclusion in required permit applications to any and all regulatory agencies for which permits for discharge water from the dewatering system are required due to the discharge reaching regulated bodies of water.
- C. Inspection Reports.
- D. All required permits.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION:**

- A. Install a dewatering system to lower and control ground surface water in order to permit excavation, construction of structure, and placement of backfill materials to be performed under dry conditions. Make the dewatering system adequate to pre-drain the water-bearing strata above and below the bottom of structure foundations, utilities and other excavations.
- B. In addition, reduce hydrostatic pressure head in water-bearing strata below structure foundations, utility lines, and other excavations, to extent that water levels in construction area are a minimum of 300 mm (1 foot) below prevailing excavation surface at all times.

#### **3.2 OPERATION:**

- A. Prior to any excavation below the ground water table, place system into operation to lower water table as required and operate it continuously 24 hours a day, 7 days a week until utilities and structures have been satisfactorily constructed, which includes the placement of backfill materials and dewatering is no longer required.
- B. Place an adequate weight of backfill material to prevent buoyancy prior to discontinuing operation of the system.

#### **3.3 WATER DISPOSAL:**

- A. Dispose of water removed from the excavations in such a manner as:
  1. Will not endanger portions of work under construction or completed.

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2. Will cause no inconvenience to Government or to others working near site.
  3. Will comply with the stipulations of required permits for disposal of water.
  4. Will Control Runoff: The Contractor shall be responsible for control of runoff in all work areas including but not limited to: excavations, access roads, parking areas, laydown, and staging areas. The Contractor shall provide, operate, and maintain all ditches, basins, sumps, culverts, site grading, and pumping facilities to divert, collect, and remove all water from the work areas. All water shall be removed from the immediate work areas and shall be disposed of in accordance with applicable permits.
- B. Excavation Dewatering:
1. The Contractor shall be responsible for providing all facilities required to divert, collect, control, and remove water from all construction work areas and excavations.
  2. Drainage features shall have sufficient capacity to avoid flooding of work areas.
  3. Drainage features shall be so arranged and altered as required to avoid degradation of the final excavated surface(s).
  4. The Contractor shall utilize all necessary erosion and sediment control measures as described herein to avoid construction related degradation of the natural water quality.
- C. Dewatering equipment shall be provided to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work during construction. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

### **3.4 STANDBY EQUIPMENT:**

Provide complete standby equipment, installed and available for immediate operation, as may be required to adequately maintain de-watering on a continuous basis and in the event that all or any part of the system may become inadequate or fail.

### **3.5 CORRECTIVE ACTION:**

If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system (loosening of the foundation strata, or instability of slopes, or damage to foundations or structures), perform work necessary for reinstatement of foundation soil and damaged structure or damages to work in place resulting from such inadequacy or failure by Contractor, at no additional cost to Government.

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### **3.6 DAMAGES:**

Immediately repair damages to adjacent facilities caused by dewatering operations.

### **3.7 REMOVAL:**

Insure compliance with all conditions of regulating permits and provide such information to the Resident Engineer. Obtain written approval from Resident Engineer before discontinuing operation of dewatering system.

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### SECTION 31 23 23 FILL

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Site roadway and structure backfilling to subgrade elevations; site filling and backfilling; fill under slabs-on-grade, paving; fill under paving; fill for over-excavation; consolidation and compaction as scheduled; and placement of filter fabric.
- B. Fill required for the project is expected to be minimal. Fill roadway prism to subgrade elevation with salvaged base course and/or recycled asphalt.
- C. Over-excavation/dig-outs: fill shall be foundation stabilization material approved by the COTR taken from roadway demolition.

##### 1.2 RELATED SECTIONS

- A. Section 31 05 13 – Soils for Earthwork.
- B. Section 31 05 16 - Aggregate.

##### 1.3 REFERENCES

- A. ASTM D 1557 - Moisture-Density Relations of Soils for Earthwork and Soil-Aggregate Mixtures Using 10 pound (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- B. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate Mixtures.
- D. ASTM D 4253 - Maximum Index Density and Unit Weight of Soils for Earthwork Using a Vibratory Table.

#### PART 2 - PRODUCTS

##### 2.1 FILL MATERIALS

- A. Aggregate Base Course: As specified in Section 31 05 16
- B. Engineered Fill: As specified in Section 31 05 16

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### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify utility risers are located, marked, and protected.

#### 3.2 PREPARATION

- A. Moisture condition, mix, and compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Aggregate base fill and compact to density equal to or greater than requirements for subsequent fill material.
- C. Scarify and proof roll subgrade surface to a depth of 8-inches to identify soft spots; fill and compact to the density equal to or greater than requirements for subsequent fill material.

#### 3.3 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials. Borrow material, consisting of existing subgrade soils mixed with base course, shall be graded within the road corridor to match Plan subgrade elevations (bottom of base course).
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Replace excavated material behind curb and sidewalks. Protect and adjust sprinkler heads. Compact with methods to achieve 90% density, to reduce settlement.
- D. Replace salvaged topsoil to minimum 4-inch thickness behind structures. Extend existing sprinkler heads as needed to match final grade.
- E. Employ a placement method that does not disturb or damage other work.
- F. Maintain optimum moisture content of backfill materials to attain required compaction density.
- G. Make gradual grade changes. Blend slope into level areas.
- H. Leave fill material stockpile areas free of excess fill materials.
- I. Shape and grade all areas for positive drainage.

#### 3.4 TOLERANCES

- A. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

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- B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

### 3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D 1557, ASTM D 2922, and ASTM D 3017.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests Testing Laboratory Services Retained by Contractor for estimated number of tests.
- D. Proof roll compacted fill surfaces under gravel paving.

### 3.6 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic prior to final acceptance.

### 3.7 RECLAMATION AND RE-SEEDING

- A. Following placement of topsoil and prior to project acceptance, rake out, soil-bed prepare, fertilize seed and mulch disturbed areas along roadways. A standard plant mix, fertilizer ratio, and mulch type will be provided by the COTR to match facility landscaping standards. Adjust sprinkler heads as needed.
- B. Allow VA staff to test, adjust, and operate irrigation system. Repair broken laterals and heads.
- C. Provide initial watering, protection and maintenance of newly seeded areas through project completion. VA staff will continue maintenance until minimum of 70% ground cover is achieved.

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### TECHNICAL NOTES

- A. These Technical Notes are intended as a guide in preparing this specification section and the detail drawings. Delete these notes before typing the Contract Specifications. Modify this specification section and appropriate details and finishes included on the drawings for site work concrete, such as, other methods of construction (when aesthetics is of prime importance), or special game areas (shuffleboard, horseshoe, game tables, etc.). If any of the following items are used, include the referenced publication and paragraphs in the appropriate portion of the contract specification.
1. When the project is located in an area where winter damage from deicing chemicals and freeze-thaw cycles pose a serious problem, the Spec Writer shall check the need for a special protective coating of linseed oil mixture. The coating protects only against the action of urea, sodium chloride, and calcium chloride used for deicing purposes. Protection against these chemicals is not required for concrete that will be in place for a cumulative time of six weeks at a continuous minimum temperature of 5 °C (40 °F), excluding the curing time. Otherwise, give concrete protective coating.  
Referenced paragraphs:  
APPLICABLE PUBLICATION: AASHTO M233. Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete.  
MATERIALS: Concrete Protection Material-Linseed Oil mixture shall conform to AASHTO M233.  
CURING AND PROTECTION: Protective Coating - apply protective coating of linseed oil mixture to exposed-to-view concrete surfaces, drainage structures, and features that project through, into, or against the items constructed under this section to protect the concrete against the action of deicing materials.
    - a. Application: Complete backfilling and curing operation prior to applying protective coating. Concrete shall be surface dry and thoroughly clean before each application. Give the concrete surface at least two applications. Coverage shall not be more than 11 m<sup>2</sup>/L (50 square yards per gallon) for first application, and not more than 16 m<sup>2</sup>/L (70 square yards per gallon) for the second application, except when the number of applications and coverage for each application for commercially prepared mixture shall be in accordance with the manufacturer's instructions. Protect coated surfaces from vehicular and pedestrian traffic until dry.

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b. Precautions: Do not heat protective coating, and do not expose the protective coating to open flame, sparks, or fire adjacent to open containers or applicators. Do not apply material at temperatures lower than 10 °C (50 °F).

SUBMITTALS: Certificates-Concrete Protective Coating.

2. In some case it may be practical and economical to build concrete vehicular pavement with an integral curb section. The integral curb being constructed simultaneously with the pavement slab in a one-step operation avoids a longitudinal joint between the curb and gutter, and pavement. The curb is easily formed with a template and straightedge. The only joints generally required in the integral curbs are continuations of the transverse joints in the pavement slab. Another option for concrete curb or curb and gutter not required to be constructed integral with or tied to a concrete pavement, is the use of a self-propelled machine (slipforming machine) to place the concrete. This type of construction is most advantageous when the drawing details indicate a "mountable" (rolled) type curb and gutter. However, use of these machines on small jobs is generally not cost justifiable. Include the following paragraph and additional requirements for the integral curb template, extrusion equipment, and self-propelled machine in the appropriate portions of the Contract Specification, when an integral curb is indicated on the drawings or the use of a curb-forming machine is justified.

CURB-FORMING MACHINES: Curb-forming machines for constructing // integral curbs // curbs // and gutter // will be approved based on trail use on the job. If the equipment produces unsatisfactory results, discontinue use of the equipment at any time during construction and accomplish the work by hand method construction as specified. Remove unsatisfactory work and reconstruct the full length between regularly scheduled joints. Dispose of removed portions off the Station.

3. When aesthetics is of prime importance and certain areas are shown to have a special finish and texture, such as an exposed aggregate surface or to have colored concrete, the Spec Writer shall consider the use of the following data:
- a. Contact the Portland Cement Association district office in the area of the project for advice in specifying and detailing the finish and texture desired.
  - b. Exposed Aggregate Concrete: For use by the physically handicapped, the texture of an exposed aggregate surface shall be smooth and the aggregate size shall not produce a rough finish.

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There are a number of ways to obtain exposed aggregate finishes, so base the method selected on local materials and construction practices. The following is a suggested paragraph:

EXPOSED AGGREGATE CONCRETE: When concrete is shown to have an exposed aggregate surface, the finish shall be as follows: Apply mix and mark off surface as indicated with surface joints at least 10 mm (3/8 inch) deep. Level off finish to a true surface and compact with a wood float, working as little as possible so that coarse material will remain at the top. Before finish has set, treat top surface with cement retarding material. When body of concrete finish has set, remove retarded surface film by wire brushes and fine water spray to remove the mortar from the top of the colored aggregate. Continue washing and brushing until flush water runs clear and there is no noticeable cement film left on the aggregate. Specify color of aggregate in Section 09 06 00, SCHEDULE FOR FINISHES. Prior to starting work, submit a sample of exposed aggregate concrete panel to the Resident Engineer for approval.

Edit the above paragraph to describe the "seeding method" of preparing a concrete base 10 to 13 mm (3/8 to 1/2-inch) lower than the finish grade to accommodate the aggregate to be scattered over the concrete base surface and embedded therein by use of a hand float, straight edge, or darby. After the aggregate is embedded, the usual procedures are followed to expose the aggregate.

- B. Colored Concrete - Two method of producing colored concrete finishes are: By integral color or by the dry-shake method. For durability, uniformity of color and lower cost, the Department of Veterans Affairs preference is the integral color method. The amount of pigment used to achieve integral colored concrete should be the minimum amount necessary to produce the desired color, but never more than 10 percent by weight of the cement. The use of white Portland cement produces cleaner, brighter colors and is the preference to normal gray Portland cement, except for black or dark gray colors. The following is a suggested paragraph:

COLORED CONCRETE: Pedestrian pavement designed to be colored shall have the coloring introduced into the concrete mix at the batch plant. Introduce sufficient quantities of // carbon black // mineral oxide pigment // to produce the color specified in Section 09 06 00, SCHEDULE FOR FINISHES. Prior to starting work, submit a sample

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of the colored concrete with type of coloring additive and the amount of additive per m3 (cubic yard) of concrete mix to the Resident Engineer for approval.

Some coloring materials affect air entrainment while others do not, the Spec Writer will make certain that the color and mixtures used do not produce a concrete having less than the desired air content specified in Section 03 30 00, CAST-IN-PLACE CONCRETE. Edit the above paragraph and drawing details as required to cover mixing, placing, preparation, equipment, finish, and any special construction.

- C. Include under the SUBMITTALS portion of Contract Specifications the following paragraphs(s) as applicable:

Samples:

1. Exposed aggregate concrete panel, 0.4 m2 by 50 mm (4 square feet by 2 inches) thick, 2 required, each color and finish.
2. Color concrete panel, as specified in Section 09 06 00, SCHEDULE FOR FINISHES, with mix data.
3. Snow Melting Systems - Specify snow melting systems as required by the HVAC design manual in a separate section and that section title referenced in this section. The site plan drawings shall indicate the areas to be provided with the snow melting systems.

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### SECTION 31 23 23.33 FLOWABLE FILL

#### **PART 1 - GENERAL**

##### **1.1 INTRODUCTION:**

- A. Flowable fill refers to a cementitious slurry consisting of a mixture of fine aggregate or filler, water, and cementitious material(s), which is used as a fill or backfill in lieu of compacted earth. This mixture is capable of filling all voids in irregular excavations and hard to reach places (such as under undercuts of existing slabs), is self-leveling, and hardens in a matter of a few hours without the need for compaction in layers. Flowable fill is sometimes referred to as controlled density fill (CDF), controlled low strength material (CLSM), lean concrete slurry, and unshrinkable fill.
- B. Flowable fill materials will be used as only as a structural fill replacement on VA projects. Unless otherwise noted, flowable fill installed as a substitution for structural earth fill, shall not be designed to be removed by the use of hand tools. The materials and mix design for the flowable fill should be designed to produce a comparable compressive strength to the surrounding soil after hardening, making excavation at a later time possible as determined by the Resident Engineer.

##### **1.2 DESCRIPTION:**

Furnish and place flowable fill in a fluid condition, that sets within the required time and, after curing, obtains the desired strength properties as evidenced by the laboratory testing of the specific mix design, at locations shown on the plans or as directed by the Resident Engineer, verbally or in writing. This section specifies flowable fill for use as structural fill to remain easily excavatable using a backhoe as would be utilized for adjoining earth.

##### **1.3 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Earthwork, excavation and backfill and compaction requirements: Section 31 20 00, EARTH MOVING.

##### **1.4 DEFINITIONS:**

- A. Flowable fill - Ready-mix Controlled Low Strength Material used as an alternative to compacted soil, and is also known as controlled density fill, and several other names, some of which are trademark names of material suppliers. Flowable fill (Controlled Low Strength Material) differs from portland cement concrete as it contains a low

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cementitious content to reduce strength development for possible future removal. Unless specifically approved otherwise, by the Resident Engineer, flowable fill shall be designed as a permanent material, not designed for future removal. Design strength for this permanent type flowable fill shall be a compressive strength of 2.1 MPa (300 psi) minimum at 28 days. Chemical admixtures may also be used in flowable fill to modify performance properties of strength, flow, set and permeability.

- B. Excavatable Flowable fill – flowable fill designed with a compressive strength that will allow excavation as either machine tool excavatable at compressive strength of 1.5 MPa (200 psi) maximum at 1 year, or hand tool excavatable at compressive strength of 0.7 MPa (100 psi) maximum at 1 year.

### 1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Flowable fill Mix Design: Provide flowable fill mix design containing cement and water. At the contractor's option, it may also contain fly ash, aggregate, or chemical admixtures in any proportions such that the final product meets the strength and flow consistency, and shrinkage requirements included in this specifications. The mix design should state the sources and proportions of each of the flowable fill constituents. The coefficient of permeability of flowable fill shall be that of uniform fine sand,  $4.0 \times 10^{-1}$  cm/sec (0.16 in/sec) or as indicated to provide a backfill material with permeability equal to or greater than that of the surrounding soil.

#### 1. Test and Performance - Submit the following data:

- a. Flowable fill shall have a minimum strength of 2.1 MPa (300 psi) according to ASTM C 39 at 28 days after placement.
- b. Flowable fill shall have minimal subsidence and bleed water shrinkage. Evaporation of bleed water shall not result in shrinkage of more than 10.4 mm per m (1/8 inch per ft.) of flowable fill depth (for mixes containing high fly ash content). Measurement of a Final Bleeding shall be as measured in Section 10 of ASTM C 940 "Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory.
- c. Flowable fill shall have a unit weight of 1900 - 2300 kg/m<sup>3</sup> (115 - 145 lb/feet<sup>3</sup>) measured at the point of placement after a 60 minute ready-mix truck ride.

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- C. Provide documentation that the admixture supplier has experience of at least one year, with the products being provided and any equipment required to obtain desired performance of the product.
- D. Manufacturer's Certificates: Provide Resident Engineer with a certification that the materials incorporated in the flowable fill, following achievement of the required strength, do not represent a threat to groundwater quality.

**1.6 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - D4832-10 ..... Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
  - C618-12 ..... Standard Specifications for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete. (Use Fly Ash conforming to the chemical and physical requirements for mineral admixture, Class F listed, including Table 2 (except for Footnote A). Waive the loss on ignition requirement.)
  - C403/C403M-08 ..... Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
  - C150/C150M-11 ..... Standard Specification for Portland Cement
  - C33/C33M-11a ..... Standard Specification for Concrete Aggregates
  - C94/C94M-12 ..... Standard Specification for Ready-Mixed Concrete
  - C494/C494M-11 ..... Standard Specification for Chemical Admixtures for Concrete
  - C685/C685M-11 ..... Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
  - C940-10a ..... Standard Specification for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced – Aggregate Concrete in the Laboratory
  - D5971 ..... Sampling Freshly Mixed Controlled Low Strength Material
  - D6103 ..... Flow Consistency of Controlled Low Strength Material
  - D6023 ..... Unit Weight, Yield, Cement Content and Air Content (Gravimetric) of Controlled Low Strength Material

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- C. American Concrete Institute (ACI):  
SP-150-94 ..... Controlled Low-Strength Materials

**1.7 QUALITY ASSURANCE:**

- A. Manufacturer: Flowable fill shall be manufactured by a ready-mix concrete producer with a minimum of 1 year experience in the production of similar products.
- B. Materials: For each type of material required for the work of this Section, provide primary materials that are the products of one manufacturer. If not otherwise specified here, materials shall comply with recommendations of ACI 229, "Controlled Low Strength Materials."
- C. Pre-Approval Procedures: The use of flowable fill during any part of the project shall be restricted to those incidences where, due to field conditions, the Contractor has made the Resident Engineer aware of the conditions for which he recommends the use of the flowable, and the Resident Engineer has confirmed those conditions and approved the use of the flowable fill, in advance. During the submittal process, the contractor shall prepare and submit various flowable fill mix designs corresponding to required conditions or if the contractor desires to use flowable fill due to economics. Approval for the strength of the flowable fill shall be obtained from the Resident Engineer when the contractor desires, or is required, to use flowable fill at specific location(s) within the project. Prior to commencement of field operations the contractor shall establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
- D. Sampling and Acceptance: Flowable fill shall be samples and testing in the field in conformance with either ASTM C 94 or C 685. Samples for tests shall be taken for every 115 cubic meters (150 cubic yards) of material, or fraction thereof, for each day's placement. Tests shall include temperature reading and four compressive strength cylinders. Compressive strength sampling and testing shall conform to ASTM D 4832 with one specimen tested at 7 days, two at 28 days, and one held for each batch of four specimens. Sampling and testing shall be performed by a qualified, independent commercial testing laboratory. Test results should be submitted within 48 hours of completion of testing.

**1.8 DELIVERY, STORAGE, AND HANDLING:**

Deliver and handle all products and equipment required, in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.

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### **1.9 PROJECT CONDITIONS:**

Perform installation of flowable fill only when approved by the Resident Engineer, and when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials and products used.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS:**

- A. Provide flowable fill containing, at a minimum, cementitious materials and water. Cementitious materials shall be portland cement, pozzolanic materials, or other self-cementing materials, or combinations thereof, at the contractor's option, and following approval by the Resident Engineer. The flowable fill mix design may also contain, fine aggregate or filler, and/or chemical admixtures in any proportions such that the final product meets the strength, flow consistency and shrinkage requirements included in this specification, as approved by the Resident Engineer.
- B. Portland Cement: ASTM C150, Type 1 or Type 2. Meeting South Dakota DOT standards.
- C. Mixing Water: Fresh, clean, and potable. Meeting South Dakota DOT standards for use as mix-water for cast-in-place concrete.
- D. Air-Entraining Admixture: ASTM C260.
- E. Chemical Admixtures: ASTM C494.
- F. Aggregate: ASTM C33.

#### **2.2 FLOWABLE FILL MIXTURE:**

- A. Mix design shall produce a consistency that will result in a flowable product at the time of placement which does not require manual means to move it into place.
- B. Flowable fill shall have a minimum strength of 2.1 MPa (300 psi) according to ASTM C39 at 28 days after placement.
- C. Flowable fill shall have minimal subsidence and bleed water shrinkage. Evaporation of bleed water shall not result in shrinkage of more than 10.4 mm per m (1/8 inch per foot) of flowable fill depth (for mixes containing high fly ash content). Measurement of a Final Bleeding shall be as measured in Section 10 of ASTM C 940 "Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory.
- D. Flowable fill shall have a unit weight of 1900 – 2300 kg/m<sup>3</sup> (115 – 145 lbs/feet<sup>3</sup>) measured at the point of placement after a 60 minute ready-mix truck ride. In the

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absence of strength data the cementitious content shall be a maximum of 90 kg/m<sup>3</sup> (150 lbs/cy).

- E. Flowable fill shall have an in-place yield of a maximum of 110% of design yield for removable types at 1 year.
- F. Provide equipment as recommended by the Manufacturer and comply with manufacturer's recommendations for the addition of additives, whether at the production plant or prior to placement at the site.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION:**

Examine conditions of substrates and other conditions under which work is to be performed and notify Resident Engineer, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

#### **3.2 APPLICATION OF FLOWABLE FILL:**

Secure tanks, pipes and other members to be encased in flowable fill. Insure that there are no exposed metallic pipes, conduits, or other items that will be in contact with the flowable fill after placement. If so, replace with non-metallic materials or apply manufacturers recommended coating to protect metallic objects before placing the flowable fill. Replacement or protection of metallic objects is subject to the approval of the Resident Engineer.

#### **3.3 PROTECTION AND CURING:**

Protect exposed surfaces of flowable fill from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by Resident Engineer.

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SECTION 32 05 23  
CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section shall cover site work concrete constructed upon the prepared subgrade and in conformance with the lines, grades, thickness, and cross sections shown.

Construction shall include the following:

- B. Curb, gutter, and combination curb and gutter.  
C. Pedestrian Pavement: Walks and grade slabs.  
D. Vehicular Pavement: Grade slabs and driveways.  
E. NOT USED

**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.  
D. Metal Components of Steps (Nosing and Railing): Section 05 50 00, METAL FABRICATIONS.

**1.3 DESIGN REQUIREMENTS**

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

**1.4 WEATHER LIMITATIONS**

Placement of concrete shall be as specified under Article 3.8, COLD WEATHER and Article 3.7, HOT WEATHER of Section 03 30 00, CAST-IN-PLACE CONCRETE.

**1.5 SELECT SUBBASE MATERIAL JOB-MIX**

The Contractor shall retain and reimburse a testing laboratory to design a select subbase material mixture and submit a job-mix formula to the Resident Engineer, in writing, for approval. The formula shall include the source of materials, gradation, plasticity index, liquid limit, and laboratory compaction curves indicating maximum density at optimum moisture.

**1.6 SUBMITTALS**

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

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- 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: *Select subbase material.*
  - 1. Job-mix formula.
  - 2. Source, gradation, liquid limit, plasticity index, percentage of wear, and other tests as specified and in referenced publications.

### 1.7 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):
  - M031MM031-07-UL..... Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement (ASTM A615/A615M-09)
  - M055MM055-09-UL..... Steel Welded Wire Reinforcement, Plain, for Concrete (ASTM A185)
  - M147-65-UL ..... Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses (R 2004)
  - M148-05-UL ..... Liquid Membrane-Forming Compounds for Curing Concrete (ASTM C309)
  - M171-05-UL ..... Sheet Materials for Curing Concrete (ASTM C171)
  - M182-05-UL ..... Burlap Cloth Made from Jute or Kenaf and Cotton Mats
  - M213-01-UL ..... Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Type) (ASTM D1751)
  - M233-86-UL ..... Boiled Linseed Oil Mixer for Treatment of Portland Cement Concrete
  - T099-09-UL ..... Moisture-Density Relations of Soils Using a 2.5 kg. (5.5 lb) Rammer and a 305 mm (12 in.) Drop
  - T180-09-UL ..... Moisture-Density Relations of Soils Using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop

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C. American Society for Testing and Materials (ASTM):

C94/C94M-09..... Ready-Mixed Concrete

C143/C143M-09..... Slump of Hydraulic Cement Concrete

SPEC WRITER NOTE: Update materials to agree with requirements (type, grades, class, test method, tables, etc.) specified in the referenced APPLICABLE PUBLICATIONS.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

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

<u>TYPE</u>	<u>MAXIMUM SLUMP*</u>
Curb & Gutter	75 mm (3")
Pedestrian Pavement	75 mm (3")
Vehicular Pavement	50 mm (2") (Machine Finished) 100 mm (4") (Hand Finished)
Equipment Pad	75 to 100 mm (3" to 4")
* 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. Welded wire-fabric shall conform to AASHTO M55.
- C. Dowels shall be plain steel bars conforming to AASHTO M31. Tie bars shall be deformed steel bars conforming to AASHTO M31.

**2.3 SELECT SUBBASE (WHERE REQUIRED)**

- A. Subbase material shall consist of select granular material composed of sand, sand-gravel, crushed stone, crushed or granulated slag, with or without soil binder, or combinations of these materials conforming to AASHTO M147, Grading E or F.
- B. Materials meeting other gradations than that noted will be acceptable whenever the gradations are within a tolerance of three to five percent, plus or minus, of the single gradation established by the job-mix formula.

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- C. Subbase material shall produce a compacted, dense-graded course, meeting the density requirement specified herein.

### **2.4 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 3 mm (1/8 inch) in any 3000 mm (ten foot) long section, in either a horizontal or vertical direction.
- C. Wood forms should be at least 50 mm (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.

### **2.5 CONCRETE CURING MATERIALS**

- A. Concrete curing materials shall conform to one of the following:
  - 1. Burlap conforming to AASHTO M182 having a weight of 233 grams (seven ounces) or more per square meter (yard) when dry.
  - 2. Impervious Sheeting conforming to AASHTO M171.
  - 3. Liquid Membrane Curing Compound conforming to AASHTO M148 (ASTM C309), Type 1 and shall be free of paraffin or petroleum.

### **2.6 EXPANSION JOINT FILLERS**

Material shall conform to AASHTO M213.

## **PART 3 - EXECUTION**

### **3.1 SUBGRADE PENETRATION**

- 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.

SPEC WRITER NOTE: Use Paragraph 3.2 only if SELECT SUBBASE is specified. If Subbase is selected delete the phrase (where required).

### **3.2 SELECT SUBBASE (WHERE REQUIRED)**

- A. Mixing: Proportion the select subbase by weight or by volume in quantities so that the final approved job-mixed formula gradation, liquid limit, and plasticity index requirements will be met after subbase course has been placed and compacted. Add water in

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approved quantities, measured by weight or volume, in such a manner to produce a uniform blend.

### B. Placing:

1. Place the mixed material on the prepared subgrade in a uniform layer to the required contour and grades, and to a loose depth not to exceed 200 mm (8 inches), and that when compacted, will produce a layer of the designated thickness.
2. When the designated compacted thickness exceeds 150 mm (6 inches), place the material in layers of equal thickness. Remove unsatisfactory areas and replace with satisfactory mixture, or mix the material in the area.
3. In no case will the addition of thin layers of material be added to the top layer in order to meet grade.
4. If the elevation of the top layer is 13 mm (1/2 inch) or more below the grade, excavate the top layer and replace with new material to a depth of at least 75 mm (3 inches) in compacted thickness.

### C. Compaction:

1. Perform compaction with approved equipment (hand or mechanical) well suited to the material being compacted.
2. Moisten or aerate the material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.
3. Compact each layer to at least 95 percent or 100 percent of maximum density as determined by AASHTO T180 or AASHTO T99 respectively.

### D. Smoothness Test and Thickness Control:

Test the completed subbase for grade and cross section with a straight edge.

1. The surface of each layer shall not show any deviations in excess of 10 mm (3/8 inch).
2. The completed thickness shall be within 13 mm (1/2 inch) of the thickness as shown.

### E. Protection:

1. Maintain the finished subbase in a smooth and compacted condition until the concrete has been placed.
2. When Contractor's subsequent operations or adverse weather disturbs the approved compacted subbase, excavate, and reconstruct it with new material meeting the requirements herein specified, at no additional cost to the VA.

## 3.3 SETTING FORMS

### A. Base Support:

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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 3 mm (1/8 inch) when checked with a straightedge and shall not deviate from true line by more than 6 mm (1/4 inch) at any point.
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.

SPEC WRITER NOTE: See TECHNICAL NOTES at end of this section for slipforming machine option.

- C. The Contractor's Registered Professional Land Surveyor, specified in Section 00 72 00, GENERAL CONDITIONS, 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 has become unstable, reset and recheck the form before placing concrete.

### 3.4 EQUIPMENT

- A. The Resident Engineer 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.

### 3.5 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.

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- B. Before the concrete is placed, the Resident Engineer 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.

### **3.6 PLACING CONCRETE - GENERAL**

- A. Obtain approval of the Resident Engineer before placing concrete.
- B. Remove debris and other foreign material from between the forms before placing concrete. Obtain approval of the Resident Engineer 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.

### **3.7 PLACING CONCRETE FOR CURB AND GUTTER, PEDESTRIAN PAVEMENT, AND EQUIPMENT 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.

### **3.8 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 without approval by the Resident Engineer.

### **3.9 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.

### **3.10 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 6mm (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 3 mm (1/8 inch) for gutter and 6 mm (1/4 inch) for top and face of curb, when tested with a 3000 mm (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.

### **3.11 CONCRETE FINISHING PEDESTRIAN PAVEMENT**

- A. Walks, Grade Slabs:

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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 2 mm (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 5 mm (3/16 inch) when tested with a 3000 mm (10 foot) straightedge.
  6. The thickness of the pavement shall not vary more than 6 mm (1/4 inch).
  7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.
- B. Steps: The method of finishing the steps and the sidewalls is similar to above except as herein noted.
1. Remove the riser forms one at a time, starting with the top riser.
  2. After removing the riser form, rub the face of the riser with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Use an outside edger to round the corner of the tread; use an inside edger to finish the corner at the bottom of the riser.
  3. Give the risers and sidewall a final brush finish. The treads shall have a final finish with a stiff brush to provide a non-slip surface.
  4. The texture of the completed steps shall present a neat and uniform appearance and shall not deviate from a straightedge test more than 5 mm (3/16 inch).

### **3.12 CONCRETE FINISHING FOR VEHICULAR PAVEMENT**

- A. Accomplish longitudinal floating with a longitudinal float not less than 3000 mm (10 feet) long and 150 mm (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, 1500 mm (5 feet)

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in length, and straightedges, 3000 mm (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 3000 mm (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 6 mm (1/4 inch) in both longitudinal and transverse directions when tested with a 3000 mm (10 foot) straightedge.
- E. The thickness of the pavement shall not vary more than 6 mm (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 450 mm (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 3 mm (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.
- G. The finish surfaces of new and existing abutting pavements shall coincide at their juncture.

### **3.13 CONCRETE FINISHING EQUIPMENT PADS**

- A. After the surface has been struck off and screeded to the proper elevation, give it a smooth dense float finish, free from depressions or irregularities.
- B. Carefully finish all slab edges with an edger having a radius as shown in the Drawings.
- C. After removing the forms, rub the faces of the pad with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The finish surface of the pad shall not vary more than 3 mm (1/8 inch) when tested with a 3000 mm (10 foot) straightedge.
- D. Correct irregularities exceeding the above.

### **3.14 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.

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### **3.15 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. NOT USED
- C. NOT USED
- D. Finish edges of all joints with an edging tool having the radius as shown.
- E. Score pedestrian pavement with a standard grooving tool or jointer.

### **3.16 EXPANSION JOINTS**

- A. Use a preformed expansion joint filler material of the thickness as shown 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 shown.
  - 3. Installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

### **3.17 CONSTRUCTION JOINTS**

- A. Locate longitudinal and transverse construction joints between slabs of vehicular pavement as shown.
- 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.

### **3.18 FORM REMOVAL**

- A. Forms shall remain in place at least 12 hours after the concrete has been placed.  
Remove forms without injuring the concrete.

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- B. Do not use bars or heavy tools against the concrete in removing the forms. Promptly repair any concrete found defective after form removal.

### **3.20 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 Resident Engineer.
- B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 150 mm (6 inches).
- C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at least 0.1 mm (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 300 mm (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 5 m<sup>2</sup>/L (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.

### **3.21 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.

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4. Clean the entire concrete of all debris and construction equipment as soon as curing and sealing of joints has been completed.

### **3.22 PROTECTION**

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 Resident Engineer, 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 Resident Engineer.

### **3.23 FINAL CLEAN-UP**

Remove all debris, rubbish and excess material from the Station.

--- E N D ---

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### TECHNICAL NOTES

- A. These Technical Notes are intended as a guide in preparing this specification section and the detail drawings. Delete these notes before typing the Contract Specifications. Modify this specification section and appropriate details and finishes included on the drawings for site work concrete, such as, other methods of construction (when aesthetics is of prime importance), or special game areas (shuffleboard, horseshoe, game tables, etc.). If any of the following items are used, include the referenced publication and paragraphs in the appropriate portion of the contract specification.
1. When the project is located in an area where winter damage from deicing chemicals and freeze-thaw cycles pose a serious problem, the Spec Writer shall check the need for a special protective coating of linseed oil mixture. The coating protects only against the action of urea, sodium chloride, and calcium chloride used for deicing purposes. Protection against these chemicals is not required for concrete that will be in place for a cumulative time of six weeks at a continuous minimum temperature of 5 °C (40 °F), excluding the curing time. Otherwise, give concrete protective coating.  
Referenced paragraphs:  
APPLICABLE PUBLICATION: AASHTO M233. Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete.  
MATERIALS: Concrete Protection Material-Linseed Oil mixture shall conform to AASHTO M233.  
CURING AND PROTECTION: Protective Coating - apply protective coating of linseed oil mixture to exposed-to-view concrete surfaces, drainage structures, and features that project through, into, or against the items constructed under this section to protect the concrete against the action of deicing materials.
    - a. Application: Complete backfilling and curing operation prior to applying protective coating. Concrete shall be surface dry and thoroughly clean before each application. Give the concrete surface at least two applications. Coverage shall not be more than 11 m<sup>2</sup>/L (50 square yards per gallon) for first application, and not more than 16 m<sup>2</sup>/L (70 square yards per gallon) for the second application, except when the number of applications and coverage for each application for commercially prepared mixture shall be in accordance with the manufacturer's instructions. Protect coated surfaces from vehicular and pedestrian traffic until dry.

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b. Precautions: Do not heat protective coating, and do not expose the protective coating to open flame, sparks, or fire adjacent to open containers or applicators. Do not apply material at temperatures lower than 10 °C (50 °F).

SUBMITTALS: Certificates-Concrete Protective Coating.

2. In some case it may be practical and economical to build concrete vehicular pavement with an integral curb section. The integral curb being constructed simultaneously with the pavement slab in a one-step operation avoids a longitudinal joint between the curb and gutter, and pavement. The curb is easily formed with a template and straightedge. The only joints generally required in the integral curbs are continuations of the transverse joints in the pavement slab. Another option for concrete curb or curb and gutter not required to be constructed integral with or tied to a concrete pavement, is the use of a self-propelled machine (slipforming machine) to place the concrete. This type of construction is most advantageous when the drawing details indicate a "mountable" (rolled) type curb and gutter. However, use of these machines on small jobs is generally not cost justifiable. Include the following paragraph and additional requirements for the integral curb template, extrusion equipment, and self-propelled machine in the appropriate portions of the Contract Specification, when an integral curb is indicated on the drawings or the use of a curb-forming machine is justified.

CURB-FORMING MACHINES: Curb-forming machines for constructing integral curbs curbs and gutter will be approved based on trail use on the job. If the equipment produces unsatisfactory results, discontinue use of the equipment at any time during construction and accomplish the work by hand method construction as specified. Remove unsatisfactory work and reconstruct the full length between regularly scheduled joints. Dispose of removed portions off the Station.

3. When aesthetics is of prime importance and certain areas are shown to have a special finish and texture, such as an exposed aggregate surface or to have colored concrete, the Spec Writer shall consider the use of the following data:
- a. Contact the Portland Cement Association district office in the area of the project for advice in specifying and detailing the finish and texture desired.
  - b. Exposed Aggregate Concrete: For use by the physically handicapped, the texture of an exposed aggregate surface shall be smooth and the aggregate size shall not produce a rough finish.

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There are a number of ways to obtain exposed aggregate finishes, so base the method selected on local materials and construction practices. The following is a suggested paragraph:

**EXPOSED AGGREGATE CONCRETE:** When concrete is shown to have an exposed aggregate surface, the finish shall be as follows: Apply mix and mark off surface as indicated with surface joints at least 10 mm (3/8 inch) deep. Level off finish to a true surface and compact with a wood float, working as little as possible so that coarse material will remain at the top. Before finish has set, treat top surface with cement retarding material. When body of concrete finish has set, remove retarded surface film by wire brushes and fine water spray to remove the mortar from the top of the colored aggregate. Continue washing and brushing until flush water runs clear and there is no noticeable cement film left on the aggregate. Specify color of aggregate in Section 09 06 00, SCHEDULE FOR FINISHES. Prior to starting work, submit a sample of exposed aggregate concrete panel to the Resident Engineer for approval.

Edit the above paragraph to describe the "seeding method" of preparing a concrete base 10 to 13 mm (3/8 to 1/2-inch) lower than the finish grade to accommodate the aggregate to be scattered over the concrete base surface and embedded therein by use of a hand float, straight edge, or darby. After the aggregate is embedded, the usual procedures are followed to expose the aggregate.

- B. Colored Concrete - Two method of producing colored concrete finishes are: By integral color or by the dry-shake method. For durability, uniformity of color and lower cost, the Department of Veterans Affairs preference is the integral color method. The amount of pigment used to achieve integral colored concrete should be the minimum amount necessary to produce the desired color, but never more than 10 percent by weight of the cement. The use of white Portland cement produces cleaner, brighter colors and is the preference to normal gray Portland cement, except for black or dark gray colors. The following is a suggested paragraph:

**COLORED CONCRETE:** Pedestrian pavement designed to be colored shall have the coloring introduced into the concrete mix at the batch plant. Introduce sufficient quantities of carbon black or mineral oxide pigment to produce the color specified in Section 09 06 00, SCHEDULE FOR FINISHES. Prior to starting work, submit a sample

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of the colored concrete with type of coloring additive and the amount of additive per m3 (cubic yard) of concrete mix to the Resident Engineer for approval.

Some coloring materials affect air entrainment while others do not, the Spec Writer will make certain that the color and mixtures used do not produce a concrete having less than the desired air content specified in Section 03 30 00, CAST-IN-PLACE CONCRETE. Edit the above paragraph and drawing details as required to cover mixing, placing, preparation, equipment, finish, and any special construction.

- C. Include under the SUBMITTALS portion of Contract Specifications the following paragraphs(s) as applicable:

Samples:

1. Exposed aggregate concrete panel, 0.4 m2 by 50 mm (4 square feet by 2 inches) thick, 2 required, each color and finish.
2. Color concrete panel, as specified in Section 09 06 00, SCHEDULE FOR FINISHES, with mix data.
3. Snow Melting Systems - Specify snow melting systems as required by the HVAC design manual in a separate section and that section title referenced in this section. The site plan drawings shall indicate the areas to be provided with the snow melting systems.

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SECTION 32 11 23  
AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Aggregate base course for concrete structures and flexible paving.

1.2 RELATED SECTIONS

- A. Section 01 45 29 – Testing Laboratory Services – Retained by Owner
- B. Section 31 05 16 – Aggregate for Earthwork.
- C. Section 31 23 23 – Fill: Compacted fill under base course.
- D. Section 32 12 00 – Flexible Pavement: Asphalt binder and wearing/finish courses.

1.3 REFERENCES

- A. ASTM D 1557 - Moisture-Density Relations of Soils for Earthwork and Soil-Aggregate Mixtures Using 10 pound (4.54 Kg) Rammer and an 18 inch (457 mm) Drop.
- B. ASTM D 2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. ASTM D 3017 - Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate Base for Paving: Aggregate Base Course as specified in Section 31 05 16. Use millings from AC Pavement (maximum 30% by volume) and existing reclaimed base course (maximum 30% by volume), supplemented by imported crushed aggregate base course for new construction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify substrate has been scarified, recompacted, tested, gradients and elevations are correct, and substrate is dry.

### 3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

### 3.3 AGGREGATE PLACEMENT

- A. Spread Aggregate over prepared substrate to a total compacted thickness of the thicknesses indicated on the Drawings.
- B. Place Aggregate in maximum 8-inch layers and roller compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add water to assist compaction. If excess water is apparent, remove Aggregate and aerate to reduce moisture content.
- E. Use hand-operated mechanical tamping equipment in areas inaccessible to compaction equipment.

### 3.4 TOLERANCES

- A. Scheduled Compacted Thickness: Within ¼-inch.
- B. Variation from Design Elevation: Within ½-inch.

### 3.5 FIELD QUALITY CONTROL

- A. Compaction testing will be performed in accordance with ASTM D 1557, ASTM D 2922 and ASTM D 3017 (California Test 216 or 231).
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- C. Frequency of Tests: One test for every 50 linear feet of roadway, curb, and sidewalk corridor, and one test for every 2500 square feet in a grid for open hard stands, gravel roadways, and parking areas. See Section 01 45 29 Testing Laboratory Services – for estimated number of tests.

### 3.6 SCHEDULES

- A. Under Asphalt Pavement: Compact placed Aggregate materials to achieve 95 percent of maximum density.
- B. Under Concrete Pavement and Curbs: Compact placed Aggregate materials where indicated to achieve 95 percent of maximum density.

END OF SECTION

SECTION 32 12 00  
FLEXIBLE PAVEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Asphaltic concrete paving: Asphalt concrete binder and wearing courses and Aggregate base course.

1.2 RELATED SECTIONS

- A. Section 01 45 29 – Testing Laboratory Services – Retained by Owner.
- B. Section 32 11 23 - Aggregate Base Course.
- C. Section 31 23 23 - Fill: Compacted subbase for paving.

1.3 REFERENCES

- A. ASTM D 946 - Penetration-Graded Asphalt Cement for Use in Pavement Construction.
- B. ASTM D 3381 - Viscosity Graded Asphalt Cement for Use in Pavement Construction.
- C. ASTM D 2950 – In-Place Densities by Nuclear Method
- D. TAI MS-2 - Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
- E. TAI MS-3 - Asphalt Plant Manual.
- F. TAI MS-8 - Asphalt Paving Manual.
- G. TAI MS-19 - Basic Asphalt Emulsion Manual.
- H. Standard Specifications for Roads and Bridges, 2004 Ed.

1.4 SUBMITTALS

- A. Product Data and Test Reports: Submit product information for all materials, mix design and certifications as required by SD DOT.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with State of South Dakota Department of Transportation's standard.

- B. Mixing Plant: Conform to State of South Dakota Department of Transportation's standard.
- C. Obtain materials from same source throughout.
- D. Asphalt minimum density = 92% with Rice Test.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.
- B. Place bitumen mixture when temperature is not more than 15 degrees F below bitumen suppliers bill of lading and not more than maximum specified temperature.

1.7 TESTING REQUIREMENTS

- A. As delineated in Section 01 45 29: Testing Laboratory Services.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphalt Cement (Binder): In accordance with State of South Dakota Department of Transportation standard specification for PG 64-22 and comply with AASHTO Performance Grades Binder Specifications M320:
  - 1. The asphalt binder shall, if necessary, be blended at the terminal with permissible additives styrene-butadiene styrene (SBS) or styrene-butadiene rubber (SBR) necessary to meet the specifications. The type of modifier supplied shall be listed on the certificate of compliance. Air blown asphalts, acid modifiers, and other modifiers will not be allowed.
- B. 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 South Dakota Department of Transportation Standard Specification:
  - 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-µm {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
Class D Type1	19-mm {3/4 inch} maximum, coarse

3. In the table below, the symbol "X" is the gradation which the Contractor proposes to furnish for the specific sieve. The proposed gradation shall meet the gradation shown in the table under "Limits of Proposed Gradation." Changes from one mix design to another shall not be made during the progress of the work unless permitted by the Contracting Officer's Technical Representative. However, changes in proportions to conform to the approved mix design shall not be considered changes in mix design.

19-mm {3/4 inch} Maximum, Coarse

Sieve Sizes	Limits of Proposed Gradation	X
25-mm {1"}}	—	
19-mm {3/4"}}	—	
9.5-mm {3/8"}}	—	
4.75-mm {No. 4}	45-75	
2.36-mm {No. 8}	30-55	
425-µm {No. 40}	10-30	
75-µm {No. 200}	3.0-7.0	

4. Re-cycled AC Pavement millings shall not be used in Binder Course Mix.
  5. Binder Content: Plus 50 / 60 penetration grade liquid asphalt at 5 percent to 6 ½ percent of the combined dry aggregates.
- C. Aggregate for Wearing Course Mix: In accordance with Type B for ½" maximum Aggregate (medium) for the finish or wearing course in accordance with State of South Dakota Department of Transportation standard specification:

Type	Grading
Class d Type 2	12.5-mm {1/2 inch} maximum, Medium

1. In the table below, the symbol "X" is the gradation which the Contractor proposes to furnish for the specific sieve. The proposed gradation shall meet the gradation shown in the table under "Limits of Proposed Gradation." Changes from one mix design to another shall not be made during the progress of the work unless permitted by the Contracting Officer's Technical Representative. However, changes in proportions to conform to the approved mix design shall not be considered changes in mix design.

12.5-mm {1/2 inch} Maximum, Medium

Sieve Sizes	Limits of Proposed Gradation	X
19-mm {3/4"}}	—	
12.5-mm {1/2"}}	—	
9.5-mm {3/8"}}	—	
4.75-mm {No. 4}	60-80	
2.36-mm {No. 8}	40-60	
425-µm {No. 40}	15-35	
75-µm {No. 200}	4-8	

2. Re-cycled AC Pavement millings shall not be used in Wearing Course Mix.
- D. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- E. Primer: ASSHTO MC 82. In accordance with State of South Dakota standard specification.
- F. Tack Coat: ASSHTO SS1H. In accordance with State of South Dakota Department of Transportation standard specification:
  1. The asphaltic emulsion shall be homogeneous. Within 30 days after delivery and provided separation has not been caused by freezing, the asphaltic emulsion shall be homogeneous after thorough mixing. The polymer used in the manufacture of polymer modified asphaltic emulsion shall be, at the option of the Contractor, either neoprene, ethylene vinyl acetate or a blend of butadiene and styrene.
- G. Use dry material to avoid foaming. Mix uniformly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify compacted granular base is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

### 3.2 AGGREGATE BASE

- A. See Section 32 11 23 for the construction of the aggregate base.

### 3.3 PREPARATION - PRIMER

- A. Immediately prior to applying prime coat or paint binder (tack coat), or immediately prior to placing the asphalt concrete or asphalt concrete base when a prime coat or paint binder (tack coat) is not required, the subgrade to receive asphalt concrete or asphalt concrete base shall conform to the compaction requirement and elevation tolerances specified for the material involved and shall be free of loose or extraneous material. If the asphalt concrete or asphalt concrete base is to be placed on an existing base or pavement which was not constructed as part of the contract, the Contractor shall clean the surface by sweeping, flushing or other means to remove all loose particles of paving, all dirt and all other extraneous material immediately before applying the prime coat or paint binder (tack coat).
- B. Apply primer - A prime coat of liquid asphalt shall be applied to the areas to be surfaced when there is a contract item for the work or when the work is required by the special provisions.
- C. Prime coat shall be applied at the approximate total rate of 0.25-gallon per square yard of surface covered.
- D. A paint binder (tack coat) of asphaltic emulsion shall be furnished and shall be applied to all vertical surfaces of existing pavement, 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.
- E. Paint binder (tack coat) shall be applied in one application at a rate of from 0.02- to 0.10-gallon per square yard of surface covered.
- F. Prime coat or paint binder (tack coat) shall be applied only so far in advance of placing the surfacing as may be permitted by the Engineer. When asphaltic emulsion is used as a paint binder (tack coat), asphalt concrete shall not be placed until the asphaltic emulsion has cured.
- G. Immediately in advance of placing asphalt concrete or asphalt concrete base, additional prime coat or paint binder (tack coat) shall be applied as directed by the Contracting Officer's Technical Representative to areas where the prime coat or paint binder (tack coat) has been damaged, and loose or extraneous material shall be removed, and no additional compensation will be allowed therefor.
- H. Use clean sand to blot excess primer.

### 3.4 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

- 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.
- B. Place asphalt binder course within 24 hours of applying primer or tack coat.
  - C. Place binder course over prime coated Aggregate base to the thicknesses indicated. Where shown on the drawings.
  - D. Place wearing course within 24 hours of placing and compacting binder course. If binder course is placed more than 24 hours before placing wearing course, it may become dirty; clean surface and apply tack coat before placing wearing course.
  - E. Place wearing course over binder course where shown on the drawings.
  - F. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment. Shape areas to provide positive drainage.
  - G. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

### 3.5 TOLERANCES

- A. Flatness: Maximum variation of ¼-inch measured with 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within ¼-inch.
- C. Variation from True Elevation: Within ½-inch.

### 3.6 QAULTY ASSURANCE

- A. Positive drainage – In the presence of the Contracting Officer's Technical representative apply water to paved area to demonstrate positive drainage of finished surface.
- B. Correct deficiencies as required.

### 3.7 PROTECTION OF FINISHED WORK

- A. Immediately after placement, protect pavement from mechanical injury for 24 hours or until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 13 13  
CONCRETE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Concrete curb and gutter.
- B. Walkways and pads.

1.2 RELATED SECTIONS

- A. Section 32 11 23 - Aggregate Base Course.
- B. Section 31 23 23 - Fill: Compacted subbase for paving.
- C. Section 03 30 00 – Cast-in-Place Concrete.

1.3 REFERENCES

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 304 - Measuring, Mixing, Transporting and Placing Concrete.
- C. ASTM C 33 - Concrete Aggregates.
- D. ASTM C 94 - Ready Mix Concrete.
- E. ASTM C 150 - Portland Cement.
- F. ASTM C 920 – Elastomeric Joint Sealants
- G. ASTM C 309 - Liquid Membrane-Forming Compounds for Curing Concrete.
- H. ASTM C979 - Pigments for Integrally Colored Concrete.
- I. ASTM D 1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.4 SUBMITTALS

- A. Product Data: Submit data on curing compounds.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 301 and requirements of Section 03 30 00
- B. Obtain cementitious materials from same source throughout.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Wood or Steel form material, profiled to suit conditions.
  - 1. Use metal or wood forms that are straight and suitable for the work involved in cross-section, depth, and strength to resist springing during depositing and consolidating the concrete.
  - 2. Do not use forms if they vary from a straight line more than 3 mm (1/8 inch) in any 3000 mm (ten foot) long section in either a horizontal or vertical direction.
  - 3. Wood forms should be at least 50 mm (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 radius forming.

2.2 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615; 40 ksi yield grade; deformed billet steel bars; unfinished finish.
- B. Welded Steel Wire Fabric: Plain type, ASTM A 185; furnish in flat sheets.
- C. Dowels: ASTM A 615; 40 ksi yield grade, plain steel. Paper covered one end.

2.3 CONCRETE MATERIALS

- A. Concrete Materials: Concrete shall be Type C, 4000 psi as 28 Days as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, with the following exceptions:

<u>TYPE</u>	<u>MAXIMUM SLUMP*</u>
Pedestrian Pavement	4"
Vehicular Pavement	2" (Machine Finished) 4" (Hand Finished)
Utility/Equipment Pad	3" to 4"

\* For concrete to be vibrated: Slump as determined by ASTM C143. Tolerances as established by ASTM C94.

2.4 JOINT SEALANTS

- A. Expansion joints shall be sealed with polyurethane elastomeric joint sealant – Sonolastic NP-1 or approved equivalent. Color shall be submitted for approval, and shall generally match or be a shade lighter than the concrete substrate.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

### 3.2 AGGREGATE BASE

- A. See Section 32 11 23 for the installation of aggregate base for this section.

### 3.3 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Contracting Officer's Technical Representative minimum 24 hours prior to commencement of concreting operations.

### 3.4 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

### 3.5 REINFORCEMENT

- A. Place reinforcement as indicated.
- B. Interrupt reinforcement at expansion joints; use dowels for joint transfer devices.
- C. Provide doweled joints 12 inch on center at interruptions of concrete reinforcement with one end of dowel set in capped sleeve to allow longitudinal movement.

### 3.6 BATCHING AND MIXING OF CONCRETE

- A. See Section 03 30 00 – Cast in Place Concrete

### 3.7 PLACING CONCRETE - GENERAL

- A. Place concrete in accordance with ACI 301 and as specified in Section 03 30 00.
- B. Obtain approval of the Contracting Officer's Technical Representative before placing concrete.

- C. Remove debris and other foreign material from between the forms before placing concrete. Obtain approval of the COTR before placing concrete.
- D. Before the concrete is placed, uniformly moisten the subgrade, base or subbase appropriate, avoiding puddles of water.
- E. 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.
- F. 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.
- G. 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.
- H. Workmen or construction equipment coated with foreign material shall not be permitted to walk or operate in the concrete during placement and finishing operations.

### 3.8 PLACING CONCRETE FOR CURB AND GUTTER

- 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 metal float.

### 3.9 JOINTS

- A. Place expansion joints at 20-foot intervals max. against previously constructed curb and gutters or as shown.
- B. Place joint filler between paving components and building or other fixed appurtenances.
- C. Box out and isolate column footings with expansion joints.
- D. Provide keyed joints as indicated.

- E. Edges at concrete joints shall be edger finished to approximately 3/8-inch radius

### 3.10 FINISHING

- 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. No swirl or wave finishes are permitted.
  - 4. Remove excess concrete from perimeter of forms.
    - a. When appropriate, cut away any concrete that has seeped beyond limits of forms.
- B. Area Paving and Curbs: Light broom
- C. Direction of Curb Texturing: Parallel to curb length.
- D. Place curing compound on exposed concrete surfaces immediately after finishing. Mask adjacent surfaces subject to staining or marking.

### 3.11 JOINT SEALING

- A. Separate pavement from vertical surfaces with ½ inch thick joint filler.
- B. Place joint filler in pavement pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

### 3.12 TOLERANCES

- A. Maximum Variation of Surface Flatness: ½ -inch in 10 feet.
- B. Maximum Variation From True Position: ½-inch.

### 3.13 FIELD QUALITY CONTROL

- A. Three concrete test cylinders will be taken for every 75 or less cubic yards of each class of concrete placed each day.
- B. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- C. One slump test will be taken for each set of test cylinders taken.
- D. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

### 3.14 PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

- B. Do not permit pedestrian vehicular traffic over pavement for 7 days minimum after finishing.
- C. Protect surfaces from construction activities and traffic until final acceptance of project.

END OF SECTION

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SECTION 33 10 00  
WATER UTILITIES

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

Underground water distribution system complete, ready for operation, including all appurtenant structures, and connections to both new building service lines and to existing water supply.

**1.2 RELATED WORK:**

- A. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Excavation, trench widths, pipe bedding, backfill, shoring, sheeting, bracing: Section 31 20 00, EARTH MOVING.
- C. Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Protection of materials and equipment: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- E. Fire protection system connection and supervisory switch for post indicator valve: Section 21 12 00, FIRE-SUPPRESSION STANDPIPES.
- F. Fire protection system connection, Section 21 10 00, WATER-BASED FIRE-SUPPRESSION SYSTEMS.

**1.3 DEFINITIONS:**

- A. Water Distribution: Pipelines and appurtenances which are part of the distribution system. The distribution system comprises the network of piping located throughout building areas and other areas of water use, including hydrants, valves, and other appurtenances used to supply water for domestic and fire-fighting/fire protection purposes.
- B. Water Service Line: Pipe line connecting building piping to water distribution lines.

**1.4 QUALITY ASSURANCE:**

- A. Products Criteria:
  - 1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be product of one manufacturer.
  - 2. Nameplate: Nameplate bearing manufacturer's name or identifiable trademark securely affixed in a conspicuous place on equipment or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

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- B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems.
- C. Comply with all rules and regulations of Federal, State, and Local Health Department and Department of Environmental Quality having jurisdiction over the design, construction, and operation of potable water systems.
- D. All material surfaces in contact with potable water shall comply with NSF 61.

### **1.5 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers' Literature and Data (Submit all items as one package):  
(Ductile Iron Pipe and Polyvinyl Chloride (PVC) shall be in accordance with AWWA C600 and C605 respectively; and shall be provided to Resident Engineer for approval.)
  - 1. Piping.
  - 2. Gaskets.
  - 3. Valves.
  - 4. Fire hydrants.
  - 5. Street washer.
  - 6. Meter.
  - 7. Vaults, frames and covers.
  - 8. Steps.
  - 9. Post indicator.
  - 10. Valve boxes.
  - 11. Corporation and curb stops.
  - 12. Curb stop boxes.
  - 13. Joint restraint.
  - 14. Disinfection products.
  - 15. Link/sleeve seals.
- C. Testing Certifications:
  - 1. Certification of Backflow Devices.
  - 2. Hydrostatic Testing.
  - 3. Certification of Disinfection, including free chlorine residuals, and bacteriological examinations.

### **1.6 APPLICABLE PUBLICATIONS:**

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- 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 National Standards Institute (ANSI/ASME):
- B16.1-98..... Cast Iron Pipe Flanges and Flanged Fittings
  - B16.18..... Cast Bronze Solder Joint Pressure Fittings
  - B16.26-88..... Cast Copper Alloy Fittings for Flared Copper Tubes
  - B40.100-98..... Pressure Gauges and Gauge Attachments
- C. American Society for Testing and Materials (ASTM):
- A123-97..... Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - A148M-03..... Standard Specifications for Steel Castings
  - A242-00..... Standard Specifications for High Strength Low Alloy Structural Steel AASHTO No. M161
  - A307-02..... Standard Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
  - A536-04..... Standard Specifications for Ductile Iron Castings
  - B61-02..... Steam or Valve Bronze Castings
  - B62-02..... Composition Bronze or Ounce Metal Castings
  - B88-02..... Seamless Copper Water Tube
  - B828..... Standard Practice: Soldering and Brazing Copper Tube and fittings
  - C32-04 ..... Sewer and Manhole Brick (Made from Clay or Shale)
  - C139-03 ..... Concrete Masonry Units for Construction of Catch Basins and Manholes
  - D1784-03 ..... Standard Specifications for Rigid PVC Compounds and CPVC Compounds
  - D1869-00 ..... Standard Specifications for Rubber Rings for Asbestos Cement Pipe
  - D2464-99 ..... Standard Specifications for Threaded PVC Pipe Fittings, Schedule 80
  - D2467-02 ..... Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
  - D3139-98 ..... Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

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- F477-02e1 ..... Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- C32-04 ..... Standard Specifications for Sewer Manhole Brick
- D. American Water Works Association (AWWA):
  - B300-04..... Hypochlorites
  - B301-04..... Liquid Chlorine
  - C104-04 ..... Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
  - C105-99 ..... Polyethylene Encasement for Gray and Ductile C.I. Piping for Water and Other Liquids
  - C110-03 ..... Ductile-Iron and Gray-Iron Fittings, 80 mm (3 Inches) Through 1200 mm (48 Inches) for Water and Other Liquids
  - C111-01 ..... Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
  - C115-99 ..... Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges
  - C150-02 ..... American National Standard for Thickness Design of Ductile Iron Pipe
  - C151-96 ..... Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
  - C153-00 ..... Ductile-Iron Compact Fittings, 80 mm (3 inches) Through 300 mm (12 Inches) for Water and Other Liquids
  - C500-02 ..... Gate Valves for Water and Sewerage Systems
  - C502a-95 ..... Dry-Barrel Fire Hydrants
  - C503-97 ..... Wet-Barrel Fire Hydrants
  - C508-01 ..... Swing Check Valves for Waterworks Service, 2 Inches (50 mm) Through 24 Inches (600mm) NPS
  - C509-01 ..... Resilient Seated Gate Valve for Water and Sewage System
  - C510-97 ..... Double Check Valve Back-Flow Prevention Assembly
  - C511-97 ..... Reduced Pressure Principle Back-Flow Prevention Assembly
  - C550-01 ..... Protective Epoxy Interior Coatings for Valves and Hydrants
  - C600-01 ..... Installation for Ductile-Iron Water Mains and Their Appurtenances

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- C605-94 ..... Underground Installation of Polyvinyl Chloride (PVC)  
Pressure Pipe and Fittings for Water
- C651-92 ..... Disinfecting Water Mains
- C800-01 ..... Underground Service Line Valves and Fittings
- C900-97 ..... Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches Thru 12  
Inches, for Water
- C905-97 ..... Polyvinyl Chloride (PVC) Pressure Pipe 14 Inches Thru 36  
Inches
- E. National Fire Protection Association (NFPA):
  - 24-95 ..... Installation of Private Fire Service Mains and Their  
Appurtenances
  - 291-01 ..... Fire Flow Testing and Marking of Hydrants
  - 1141-98 ..... Fire Protection in Planned Building Groups
- F. NSF International:
  - 14-03 ..... Plastics Piping Components and Related Materials
  - 61-02 ..... Drinking Water System Components-Health Effects  
(Sections 1-9)
- G. American Welding Society (AWS):
  - A5.8-04 ..... Brazing Filler Metal
- H. Foundation for Cross-Connection Control and Hydraulic Research-2005
- I. Copper Development Association's Copper Tube Handbook-2005

## **PART 2 - PRODUCTS**

### **2.1 DUCTILE IRON PIPE AND FITTINGS:**

- A. Ductile iron pipe, direct buried:
  - 1. Provide ductile iron pipe conforming to the requirements of AWWA C151, Pressure Class 350 for Pipe 100 mm through 300 mm (4 inches through 12 inches) in diameter and 250, [ ] minimum for pipe larger than 300 mm (12 inches) in diameter, with standard thickness cement mortar lining interior, and interior asphaltic seal coat and exterior asphaltic coating, in accordance with AWWA and ANSI Standards.
  - 2. Below Grade: Supply pipe in lengths not in excess of a nominal 6 m (20 feet) with rubber ring type push-on joints, mechanical joint or approved restrained joint. Provide flange joint pipe where shown on the drawings. Provide mechanical and restrained joint pipe with sufficient quantities of accessories as required for each joint.

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3. When a polyethylene encasement over pipe, fittings, and valves is a requirement as indicated on the drawings, the material, installation and workmanship shall conform to applicable sections of AWWA C105. Make provisions to keep the polyethylene from direct exposure to sunlight prior to installation. Backfill following installation without delay to avoid exposure to sunlight.
- B. Ductile Iron Pipe Above Grade or in Below Ground Concrete Pits:
1. Flanged ductile iron pipe, AWWA C115, with factory applied screwed long hub flanges except as otherwise specified hereinafter. Face and drill flanges after being screwed on the pipe, with flanges true to 90 degrees with the pipe axis and flush with end of pipe, ANSI B16.1, 850 kPa (125 psi) or 1725 kPa (250 psi) standard, for the purpose intended.
  2. Wall Sleeve Castings: Size and types shown on the drawings and be hot dipped galvanized. Seal strips, where required shall be Link Seal as manufactured by Thunderline Corp., Wayne, Michigan or equal.
  3. Pipe Thickness Class: Minimum of Class 53 as defined in AWWA C150 for all sizes of flanged pipe.
  4. Rubber Ring Gaskets: Full face type, AWWA C111, 2 mm (1/16 inch) rubber ring gaskets and of approved composition suitable for the required service.
  5. Pipe and fittings exposed to view in the finished work are to be painted in accordance with Section 09 91 00, PAINTING. Pipe shall not receive the standard tar or asphalt coat on the outside surfaces but shall be shop primed on the outside with one coat of Kop-Coat No. 621 Rust Inhibitive Primer or equal. Paint color shall match the wall color.
  6. Bolts and Nuts on Flanged Fittings: Grade B, ASTM A307. Low alloy, high strength steel in accordance with AWWA C111. Assemble stainless steel bolts and nuts using anti-seize compound to prevent galling.
- C. All Pipe Fittings: Ductile iron with a minimum pressure rating of 2400 kPa (350 psi). Fittings shall meet the requirements of ANSI and AWWA specifications as applicable. Rubber gasket joints shall conform to AWWA C111 for mechanical and push-on type joints. Ball joints shall conform to AWWA C151 with a separately cast ductile iron bell conforming to ASTM A148. Flanged fittings shall conform to AWWA C115 and be furnished flat faced and drilled to 850 kPa (125 psi) or 1725 kPa (250 psi) template in accordance with ANSI B16.1 with full faced gaskets.

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- D. Provide cement mortar lining and bituminous seal coat on the inside of the pipe and fittings in accordance with AWWA C104. Provide standard asphaltic coating on the exterior.
- E. Provide a factory hydrostatic test of not less than 3.5 MPa (500 psi) for all pipe in accordance with AWWA C151.
- F. Provide non-detectable adhesive backed identification tape on top and sides of all buried ductile iron pipe, extended from joint to joint along the length of the pipe and have black lettering identifying the pipe service at no more than 300 mm (12 inch) intervals. According to service, the tape background color shall be as follows: force main/sanitary-green; potable water-blue; reclaimed water-lavender.

### **2.2 POLYVINYL CHLORIDE PIPE AND FITTINGS:**

- A. Class-Rated Polyvinyl Chloride (PVC) Pipe:
  - 1. PVC pipe and accessories 100 mm to 356 mm (4 inches–14 inches) in diameter, AWWA C900 “Polyvinyl Chloride (PVC) Pressure Pipe”, Class 200, DR 14, cast iron outside diameters, unless otherwise shown or specified.
  - 2. PVC pipe and accessories 400 mm (16 inches) or larger, AWWA C905, “Polyvinyl Chloride Water Transmission Pipe”, Class 235, DR 18, cast iron outside diameters unless otherwise shown or specified. Pipe and accessories shall bear the NSF mark indicating pipe size, manufacturer’s name, AWWA and/or ASTM Specification number, working pressure and production code. Pipe and couplings shall be made in accordance with ASTM D1784.
  - 3. PVC Pipe and Accessories Smaller than 100 mm (4 inches): Schedule 80, meeting the requirements of ASTM D-1785, Type 1, Grade 1. All exposed piping shall be CPVC meeting requirements of ASTM F441.
- B. Joints:
  - 1. Pipe 75 mm (3 inches) and Greater in Diameter: Push-on type with factory installed solid cross section elastomeric ring meeting the requirements of ASTM F-477.
  - 2. Pipe Less Than 75 mm (3 inches) in Diameter: Threaded (ASTM D-2464) or solvent welded (ASTM 2467). Use Teflon tape or liquid Teflon thread lubricant approved for use on plastic on all threaded joints.
- C. Fittings:
  - 1. Class-Rated Pipe 75 mm (3 inches) in Diameter and Greater: Ductile iron with mechanical joints conforming to the requirements of AWWA C153.

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2. For Schedule 80 Pipe less than 75 mm (3 inches) in Diameter: Threaded or solvent weld. Threaded PVC fittings shall conform to ASTM D2464. CPVC fittings shall conform to ASTM F437 for threaded fittings and ASTM F439 for solvent weld fittings.

### **2.3 COPPER PIPE AND TUBING:**

Copper Piping: ASTM B88, Type K, or Type L with flared fittings in accordance with AWWA C800, with sweat cast brass fittings per ANSI B16.18. Use brazing alloy, AWS A5.8, Classification BCuP.

### **2.4 VALVES:**

- A. Asbestos packing is not allowed.
- B. Gate:
  1. 75 mm (3 inches) and Larger: Resilient seated, ductile iron body, bronze mounted, inclined seats, non-rising stem type turning counter-clockwise to open, 1375 kPa (200 pound) WOG. AWWA C509. The resilient seat shall be fastened to the gate with stainless steel fasteners or vulcanizing methods. The interior and exterior shall be coated with thermo-setting or fusion epoxy coating in accordance with AWWA C550.
  2. Operator:
    - a. Underground: Except for use with post indicators, furnish valves with 50 mm (2 inch) nut for socket wrench operation. Post indicator shall comply with the requirements of NFPA 24 and shall be fully compatible with the valve provided.
    - b. Above Ground and in Pits: Hand wheels.
  3. Joints: Ends of valves shall accommodate, or be adapted to, pipe installed.
- C. Check: Swing.
  1. Smaller than 100 mm (4 inches): Bronze body and bonnet, ASTM B61 or B62, 1375 kPa (200 pound) WOG.
  2. 100 mm (4 inches) and Larger: Iron body, bronze trim, swing type, vertical or horizontal installation, flange connection, 1375 kPa (200 pound) WOG. Check valves for fire lines shall conform to AWWA C508 and shall be epoxy coated and lined per AWWA C550.
- D. Corporation stops and saddles shall conform to AWWA C800.
- E. Curb Stop: Smaller than 75 mm (3 inches). Waterworks standard for Type "K" copper, single piece cast bronze body with tee top operated plug sealed with O-ring gaskets, 1375 kPa (200 pound) WOG per AWWA C800.

### **2.5 CURB STOP BOX:**

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Cast iron extension box with screw or slide type adjustment and flared base. Box shall be adapted, without full extension, to depth of cover required over pipe at stop location. Cast the word "WATER" in cover and set cover flush with finished grade. Curb stop shut-off rod shall extend 600 mm (2 feet) above top of deepest stop box.

### **2.6 VALVE BOX:**

Cast iron extension box with screw or slide-type adjustment and flared base. Minimum thickness of metal shall be 5 mm (3/16 inch). Box shall be adapted, without full extension, to depth of cover required over pipe at valve location. Cast the word "WATER" in cover. Provide [ ] "T" handle socket wrenches of 16 mm (5/8 inch) round stock long enough to extend 600 mm (2 feet) above top of deepest valve box.

### **2.7 POST INDICATOR VALVE:**

- A. Valve: Valve shall conform to the specifications listed in Section 2.4 for gate valves. The Post Indicator shall conform to NFPA 24, and shall be fully compatible with the valve and all the supervisory switches.

### **2.8 FIRE HYDRANTS:**

- A. Size of main valve opening of each hydrant shall be 125 mm (5 inches), minimum. Hose thread, size of fire apparatus connection, and shape, size and direction of rotation of operating head of hydrant shall be identical with present local fire department and/or water department standards those in use at station.
- B. Hydrant shall be type AWWA C502, heavy construction, of proper length to connect pipe without extra fittings, and shall be the traffic type with safety flange on barrel and safety couplings on the valve stem with the following features:
  - 1. Interior removable without digging up hydrant; can be packed under pressure; 150 mm (6 inch) bell connection; one steamer nozzle and two hose nozzles with nozzle caps securely chained to barrel; suitable drainage device; single rubber or leather-faced valve in base; nozzles, stuffing boxes, wedge nuts, seat rings, clamp plates, etc. Threaded joints or spindles shall be bronze. Upper and lower barrels shall be of equal diameters. Upper barrel shall be of sufficient length to permit setting hydrant with barrel flange not more than 50 mm (2 inches) above finished grade. All fire hydrants shall have 150 mm (6 inch) bottom connection.
  - 2. Provide fire hydrants with a finish paint identical to the existing fire hydrants.
- C. Provide 2 wrenches with handles not less than 350 mm (14 inches) long.

### **2.9 PIPE SLEEVES:**

Ductile iron or zinc coated steel.

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### **2.10 BACKFLOW PREVENTER:**

- A. Potable Water and Irrigation Water Service: Reduced Pressure Principle Type AWWA C511, except pressure drop at rated flow shall not exceed 100 kPa (15 psi). Gate valves installed on the assembly shall be resilient seated valve conforming to AWWA C509.
- B. Fire Service: Double detector check valve. AWWA C510 and NFPA 14.
- C. In cold climate areas, backflow assemblies and devices shall be protected from freezing by a method acceptable to local jurisdiction.
- D. Backflow preventers shall be approved by the Foundation for Cross-Connection Control and Hydraulic Research per current edition of the Manual of Cross-Connection Control.
- E. Backflow preventer shall not be located in any area containing fumes that are toxic, poisonous or corrosive.
- F. Direct connections between potable water piping and sewer connected wastes shall not exist under any condition with or without backflow protection.
- G. Backflow preventer shall be accessed and have clearance for the required testing, maintenance and repair. Access and clearance shall require a minimum of one (1) foot (305 mm) between the lowest portion of the assembly and grade, floor or platform. Installations elevated more than five (5) feet (1524 mm) above the floor or grade shall be provided with a permanent platform capable of supporting a tester or maintenance person.

SPEC WRITER NOTE: Retain applicable following Water Meter paragraph:

### **2.11 NOT USED**

### **2.12 NOT USED**

### **2.13 NOT USED**

### **2.14 VAULTS (BACKFLOW PREVENTER OR METER):**

- A. Top and base shall be reinforced concrete.
- B. Walls shall be reinforced concrete, precast concrete, or segmental block (ASTM C139).

### **2.15 CAST IRON FRAME AND COVER, STEPS, ETC.:**

Cast iron frame and cover, steps, etc. shall comply with State Department of Transportation standard details. Identify cover as "WATER".

### **2.16 FLEXIBLE EXPANSION JOINTS: (PROVIDE FOR DOMESTIC AND FIRE SERVICE)**

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Ductile iron with ball joints rated for 1725 kPa (250 PSI) working pressure conforming to ANSI/AWWA A21.53/C153, capable of deflecting a minimum of 30 degrees and expanding simultaneously to the amount shown on the drawings. Flexible expansion joint shall have the expansion capability designed as an integral part of the ductile iron ball castings. Pressure containing parts shall be lined with a minimum of 375  $\mu\text{m}$  (15 mils) of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be factory holiday tested with a 1500 volt spark test. Flexible expansion joint shall have flanged connections conforming to ANSI/AWWA A21.11/C110. Bolts and nuts high strength steel with synthetic gaskets that comply with AWWA C110.

### **2.17 POTABLE WATER:**

Water used for filling, flushing, and disinfection of water mains and appurtenances shall conform to Safe Drinking Water Act.

### **2.18 DISINFECTION CHLORINE:**

- A. Liquid chlorine shall conform to AWWA B301 and AWWA C651.
- B. Sodium hypochlorite shall conform to AWWA B300 with 5 percent to 15 percent available chlorine.
- C. Calcium hypochlorite shall conform to AWWA B300 supplied in granular form or 5.g tablets, and shall contain 65 percent chlorine by weight.

SPEC WRITER NOTE: Use non-detectable type for cemeteries only.

### **2.19 WARNING TAPE**

Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape, detectable type, blue with black letters, and imprinted with "CAUTION BURIED WATER LINE BELOW".

## **PART 3 - EXECUTION**

### **3.1 BUILDING SERVICE LINES:**

Install water service lines to point of connection within approximately 1500 mm (5 feet) outside of buildings to which such service is to be connected and make connections thereto. If building services have not been installed provide temporary caps.

### **3.2 REGRADING:**

Raise or lower existing valve and curb stop boxes and fire hydrants to finish grade in areas being graded.

### **3.3 PIPE LAYING, GENERAL:**

- A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined

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before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Resident Engineer.

- B. All pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective piping is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Government. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.
- C. All buried piping shall be installed to the lines and grades as shown on the drawings. All underground piping shall slope uniformly between joints where elevations are shown.
- D. Contractor shall exercise extreme care when installing piping to shore up and protect from damage all existing underground water line and power lines, and all existing structures.
- E. Do not lay pipe on unstable material, in wet trench, or when trench or weather conditions are unsuitable.
- F. Do not lay pipe in same trench with other pipes or utilities unless shown otherwise on drawings.
- G. Hold pipe securely in place while joint is being made.
- H. Do not walk on pipes in trenches until covered by layers of earth well tamped in place to a depth of 300 mm (12 inches) over pipe.
- I. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.
- J. Tees, plugs, caps, bends and hydrants on pipe installed underground shall be anchored. See section 3.7 "PIPE SUPPORTS".
- K. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water and chemical, or mechanical injury. At completion of all work, thoroughly clean exposed materials and equipment.
- L. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.
- M. Warning tape shall be continuously placed 300 mm (12 inches) above buried water pipes.

### **3.4 DUCTILE IRON PIPE:**

- A. Installing Pipe: Lay pipe in accordance with AWWA C600 with polyethylene encasement if required in accordance with AWWA C105. Provide a firm even bearing throughout the

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length of the pipe by tamping selected material at the sides of the pipe up to the spring line.

- B. All pipe shall be sound and clean before laying. When laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other approved means.
- C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut ends of pipe to be used with push-on bell to conform to the manufactured spigot end. Cement lining shall be undamaged.
- D. Jointing Ductile-Iron Pipe:
  - 1. Push-on joints shall be made in strict accordance with the manufacturer's instruction. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is joined, and pushed home with approved means.
  - 2. Mechanical Joints at Valves, Fittings: Install in strict accordance with AWWA C111. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gaskets with soapy water before tightening the bolts. Bolts shall be tightened to the specified torque.
  - 3. Ball Joints: Install in strict accordance with the manufacturer's instructions. Where ball joint assemblies occur at the face of structures, the socket end shall be at the structure and ball end assembled to the socket.
  - 4. Flanged joints shall be in accordance with AWWA C115. Flanged joints shall be fitted so that the contact faces bear uniformly on the gasket and then are made up with relatively uniform bolt stress.

### **3.5 PVC PIPE:**

- A. PVC piping shall be installed in strict accordance with the manufacturer's instructions and AWWA 605. Place selected material and thoroughly compacted to one foot above the top of the pipe and thereafter back filled as specified in Section 31 20 00, EARTH MOVING.
- B. Copper Tracer Wire: Copper tracer wire consisting of No. 14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape. At least every 300 m (1000 feet), provide a 2.3 kg (5

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pound) magnesium anode attached to the main tracer wire by solder. The solder joint shall be wrapped with rubber tape and with electrical tape. An anode shall be attached at the end of each line.

- C. Magnetic markers may be used in lieu of copper tracer wire to aid in future pipe locating. Generally, install markers on 6 m (20 foot) centers. If pipe is in a congested piping area, install on 3 m (10 foot) centers. Prepare as-built drawing indicating exact location of magnetic markers.

### **3.6 COPPER PIPE:**

Copper piping shall be installed in accordance with the Copper Development Association's Copper Tube Handbook and manufacturer's recommendations. Copper piping shall be bedded in 150 mm (6 inches) of sand and then back filled as specified in Section 31 20 00, EARTH MOVING.

### **3.7 PIPE SUPPORTS:**

- A. Supports:
  - 1. All piping shall be properly and adequately supported. Hangers, supports, base elbows and tees, and concrete piers and pads shall be provided as indicated on the drawings. If the method of support is not indicated on the drawings, exposed piping shall be supported by hangers wherever the structure is suitable and adequate to carry the superimposed load. Supports shall be placed approximately 2.4 m (8 feet) on centers and at each fitting.
  - 2. Hangers shall be heavy malleable iron of the adjustable swivel type, split ring type, or the adjustable-swivel, pipe-roll type for horizontal piping and adjustable, wrought iron, clamp type for vertical piping. Flat steel strap or chain hangers are not acceptable unless indicated on the drawings.
  - 3. Hangers shall be attached to the structure, where possible, by beam clamps and approved concrete inserts set in the forms before concrete is poured. Where this method is impractical, anchor bolts with expanding lead shields, rawl drives, or malleable iron expansion shields will be permitted.
  - 4. Where hangers cannot be used, the Contractor shall provide pipe saddle supports with pipe column and floor flange.

### **3.8 RESTRAINED JOINTS:**

- A. Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained "locked-type" joints and the joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure but not less

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than 1375 kPa (200 psi). The pipe and fittings shall be restrained push-on joints or restrained mechanical joints.

- B. The minimum number of restrained joints required for resisting force at fittings and changes in direction of pipe shall be determined from the length of retained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. Restrained pipe length shall be as shown on the drawings.
- C. Restrained joint assemblies with ductile iron mechanical joint pipe shall be "Flex-Ring", "Lok-Ring", or mechanical joint coupled as manufactured by American Cast Iron Pipe Company, "Mega-Lug" or approved equal.
- D. Ductile iron pipe bell and spigot joints shall be restrained with EBBA Iron Sales, Inc. Series 800 Coverall or approved equal.
- E. Ductile iron mechanical joint fittings shall be restrained with EBBA Iron Sales, Inc. Series 1200 Restrainer. The restraining device shall be designed to fit standard mechanical joint bells with standard T head bolts conforming to AWWA C111 and AWWA C153. Glands shall be manufactured of ductile iron conforming to ASTM A536. Set screws shall be hardened ductile iron and require the same torque in all sizes. Steel set screws not permitted. These devices shall have the stated pressure rating with a minimum safety factor of 2:1. Glands shall be listed with Underwriters Laboratories and/or approved by Factory Mutual.
- F. Thrust blocks shall not be permitted.
- G. Where ductile iron pipe manufactured with restrained joints is utilized, all restrained joints shall be fully extended and engaged prior to back filling the trench and pressurizing the pipe.
- H. PVC pipe bell and spigot joints shall be restrained with the Uni-Flange Corp. Series 1350 Restrainer or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.
- I. Ductile iron mechanical joint fittings used with PVC pipe shall be restrained with UNI-Flange Corp. Series 1300 Restrainer, EBBA Iron, Inc, Series 2000PV Mechanical Joint Restrainer Gland, or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A-536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.

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### 3.9 PIPE SEPARATION:

#### A. Horizontal Separation-Water Mains and Sewers:

1. Water mains shall be located at least 3 m (10 feet) horizontally from any proposed drain, storm sewer, sanitary or sewer service connection.
2. Water mains may be located closer than 3 m (10 feet) to a sewer line when:
  - a. Local conditions prevent a lateral separation of 3 m (10 feet); and
  - b. The water main invert is at least 450 mm (18 inches) above the crown of the sewer; and
  - c. The water main is either in a separate trench or in the same trench on an undisturbed earth shelf located one side of the sewer.
3. When it is impossible to meet (1) or (2) above, both the water main and drain or sewer shall be constructed of mechanical joint ductile iron pipe. Ductile iron pipe shall comply with the requirements listed in this specification section. The drain or sewer shall be pressure tested to the maximum expected surcharge head before back filling.

#### B. Vertical Separation-Water Mains and Sewers:

1. A water main shall be separated from a sewer so that its invert is a minimum of 450 mm (18 inches) above the crown of the drain or sewer whenever water mains cross storm sewers, sanitary sewers or sewer service connections. The vertical separation shall be maintained for that portion of the water main located within 10 feet horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain.
2. Both the water main and sewer shall be constructed of slip-on or mechanical joint ductile iron pipe or PVC pipe equivalent to water main standards of construction when:
  - a. It is impossible to obtain the proper vertical separations described in (1) above; or
  - b. The water main passes under a sewer or drain.
3. A vertical separation of 450 mm (18 inches) between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking the water main.

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4. Construction shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer or drain line is at least 3 m (10 feet).

### **3.10 SETTING OF VALVES AND BOXES:**

- A. Provide a surface concrete pad 450 by 450 by 150 mm (18 by 18 by 6 inches) to protect valve box when valve is not located below pavement.
- B. Clean valve and curb stops interior before installation.
- C. Set valve and curb stop box cover flush with finished grade.
- D. Valves shall be installed plumb and level and in accordance with manufacturer's recommendations.

### **3.11 SETTING OF FIRE HYDRANTS:**

- A. Set center of each hydrant not less than 600 mm (2 feet) nor more than 1800 mm (6 feet) back of edge of road or face of curb. Fire apparatus connection shall face road with center of nozzle 450 mm (18 inches) above finished grade. Set barrel flange not more than 50 mm (2 inches) above finished grade.
- B. Set each hydrant on a slab of stone or concrete not less than 100 mm (4 inches) thick and 375 mm (15 inches) square. The service line to the hydrant, between the tee and the shoe of the hydrant, shall be fully restrained.
- C. Set bases in not less than 0.4 cubic meter (1/2 cubic yard) of crushed rock or gravel placed entirely below hydrant drainage device.
- D. Clean interiors of hydrants of all foreign matter before installation.

### **3.12 PIPE SLEEVES:**

Install where water lines pass through retaining walls, building foundations and floors. Seal with modular mechanical type link seal. Install piping so that no joint occurs within a sleeve. Split sleeves may be installed where existing lines pass through new construction.

SPEC WRITER NOTE: Edit the following section to conform with governing Health Department/Department of Environment Quality Regulations.

### **3.13 FLUSHING AND DISINFECTING:**

- A. Flush and disinfect new water lines in accordance with AWWA C651.
- B. Initial flushing shall obtain a minimum velocity in the main of 0.75 m/sec (2.5 feet per second) at 40 PSI residual pressure in water main. The duration of the flushing shall be adequate to remove all particles from the line.

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Pipe Diameter		Flow Required to Produce 2.5 ft/sec(approx.) Velocity in Main		Number of Hydrant Outlets			
				Size of Tap. in. (mm)			
In	(mm)			gpm	(L/sec)	1(25)	1 ½(38)
4	(100)	100	(6.3)	1	--	--	1
6	(150)	200	(12.6)	--	1	--	1
8	(200)	400	(25.2)	--	2	1	1
10	(250)	600	(37.9)	--	3	2	1
12	(300)	900	(56.8)	--	--	3	2
16	(400)	1,600	(100.9)	--	--	4	2

The backflow preventers shall not be in place during the flushing.

- C. The Contractor shall be responsible to provide the water source for filling, flushing, and disinfecting the lines. Only potable water shall be used, and the Contractor shall provide all required temporary pumps, storage facilities required to complete the specified flushing, and disinfection operations.
- D. The Contractor shall be responsible for the disposal of all water used to flush and disinfect the system in accordance with all governing rules and regulations. The discharge water shall not be allowed to create a nuisance for activities occurring on or adjacent to the site.
- E. The bacteriological test specified in AWWA C651 shall be performed by a laboratory approved by the Health Department Department of Environmental Quality of the State. The cost of sampling, transportation, and testing shall be the responsibility of the Contractor.
- F. Re-disinfection and bacteriological testing of failed sections of the system shall be the sole responsibility of the Contractor.
- G. Before backflow preventers are installed, all upstream piping shall be thoroughly flushed.

**3.14 HYDROSTATIC TESTING:**

- A. Hydrostatic testing of the system shall occur prior to disinfecting the system.
- B. After new system is installed, except for connections to existing system and building, backfill at least 300 mm (12 inches) above pipe barrel, leaving joints exposed. The depth of the backfill shall be adequate to prevent the horizontal and vertical movement of the pipe during testing.
- C. Prior to pressurizing the line, all joint restraints shall be completely installed and inspected.

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- D. If the system is tested in sections, and at the temporary caps at connections to the existing system and buildings, the Contractor shall provide and install all required temporary thrust restraints required to safely conduct the test.
- E. The Contractor shall install corporation stops in the line as required to purge the air out of the system. At the completion of the test, all corporation stops shall be capped.
- F. The Contractor shall perform pressure and leakage tests for the new system for 2 hours to 1375 kPa (200 psi). Leakage shall not exceed the following requirements.
  - 1. Copper Tubing: No leaks.
  - 2. Ductile Iron Pipe: AWWA C600. Provide to Resident Engineer office.
  - 3. Polyvinyl Chloride (PVC) AWWA C605. Provide to Resident Engineer office.

### **3.15 BACKFLOW PREVENTOR TESTING:**

- A. All backflow preventers shall be tested and certified for proper operation prior to being placed in operation.
- B. Original copies of the certification shall be submitted to the Resident Engineer.

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Hot Springs VA Road Repair

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**BLACK HILLS HEALTH CARE SYSTEM**  
**VAMC – Hot Springs**  
500 North 5<sup>th</sup> Street  
Hot Springs, South Dakota 57747

February 18, 2011

**Attn: Matthew Erpenbach**  
Project Engineer

**Subj: Report of Pavement Section Thickness**  
**VAMC Road Repair Project**  
Hot Springs, South Dakota

ATS No. 10-1325

### **Introduction and Brief History:**

This reports the results of pavement and aggregate base material thickness analysis for the pavement serving the VAMC roadways in Hot Springs, South Dakota. We determined the asphalt pavement and gravel base thickness at sixteen (16) locations within the VAMC road system. We also determined the soil classification of the subgrade soils below the respective pavement and aggregate base sections for you reference.

### **Pavement & Base Thickness Analysis:**

The locations of the pavement cores were selected by you and are presented on the attached street site map. The locations and results of the core holes are as follows:

<u>Core #</u>	<u>Asphalt Thickness</u>	<u>Agg. Base Course Thickness</u>	<u>Subgrade Information</u>
1	2.75"	1.5" millings, 2.5" gravel	Sandy Clay w/gravel (CL), moist, frozen
2	2.50"	1.0" millings, 1.5" gravel	Medium Fat Clay (CL-GH), moist, stiff
3	2.50"	1.5" millings, 4" silty gravel	Clayey Sand (SC) Moist, m, dense
4	2.25"	1.5" millings, 4" silty gravel	Clayey Sand (SC) Moist, dense
5	2.25"	4" silty gravel	Clayey Sand (SC) Moist, m, dense
6	3.25"	3" asphalt millings	Clayey Sand (SC) Moist, dense

7	3.00"	4" silty gravel	Clayey Sand (SC) Moist, dense, frozen
8	3.50"	1" millings, 4.25" gravel	Sandy Clay (CL) Moist, stiff, frozen
9	2.50"	1" gravel, 4" millings	Sandy Clay (CL) Moist, m. stiff, frozen
10	2.00"	1.5" millings, 5" gravel	Sandy Clay (CL) Moist, stiff, frozen
11	1.75"	6.0" millings & gravel mix	Clayey Sand (SC) Moist, loose, frozen
12	1.50"	5.5" millings & gravel mix	Sandy Clay (CL) Moist, stiff, frozen
13	1.50"	6.5" millings & gravel mix	Sandy Clay (CL) Moist, v. stiff, frozen
14	3.50"	1.25" millings, 5" gravel	Sandy Clay (CL) Moist, stiff, frozen
15	1.00"	1.5" millings	Gravelly Sand (SP) Moist, dense
16	2.00"	4" millings & gravel mix	Clayey Sand (SC) Moist, dense

Approximate core locations are shown on the attached map.

**Observations, Analysis & Recommendations:**

Based upon our subsurface analysis, we offer the following observations:

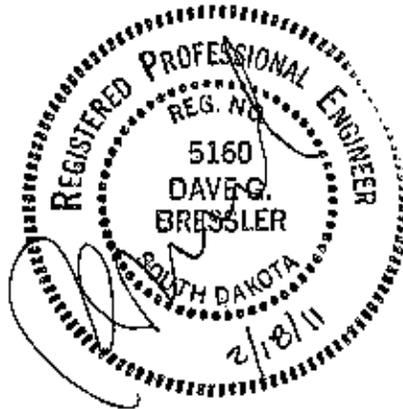
- 1) The existing asphalt surfacing varies in condition. Severely cracked pavement areas may signify subgrade failure as the consistency and density of the subgrade materials could not be accurately determined due to the presence of frost.
- 2) Based upon our analysis, it appears as though the existing asphalt and base sections are not sufficient for the truck traffic volume of the roadways.
- 3) Where "millings" are listed below asphalt pavement, the "millings" are likely severely oxidized asphalt pavement. Regardless, the oxidized asphalt or millings can be salvaged and reused as aggregate base or subbase or processed in-place if in-place processing and overlay is planned.
- 4) The subgrade soils will provide fair to good support characteristics if properly prepared. We recommend axle weight limits be enforced during spring thaw to prolong pavement life.

- 5) If total reconstruction is planned, the use of stabilization/separation fabric below the new pavement aggregate base should be considered. The use of such a fabric will decrease the aggregate base course required on the order of 4" to 6" and will aid long term performance by preventing base/subgrade mingling. We recommend a fabric such as Mirafi HP 370 or similar be considered.
- 6) We recommend new asphalt concrete pavement consist of SDDOT Class E, Type 1 mix.
- 7) Maintenance of the pavement via crack sealing and/or chip sealing should be scheduled and budgeted as a part of the pavement management system. Positive drainage should also be implemented and maintained as a part of the system.

**Closure:**

If there are questions regarding the results or you desire additional consultation, feel free to call us at (605) 787-9303, and we will be glad to respond.

Sincerely,  
**AMERICAN TECHNICAL SERVICES, INC.**



Dave G. Bressler, P.E.  
Director of Engineering

Attachments: Appendix

CC: File

## **APPENDIX**

**SITE PLAN WITH BORING LOCATIONS**

**CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES**



Office of  
Construction  
and Facilities  
Management

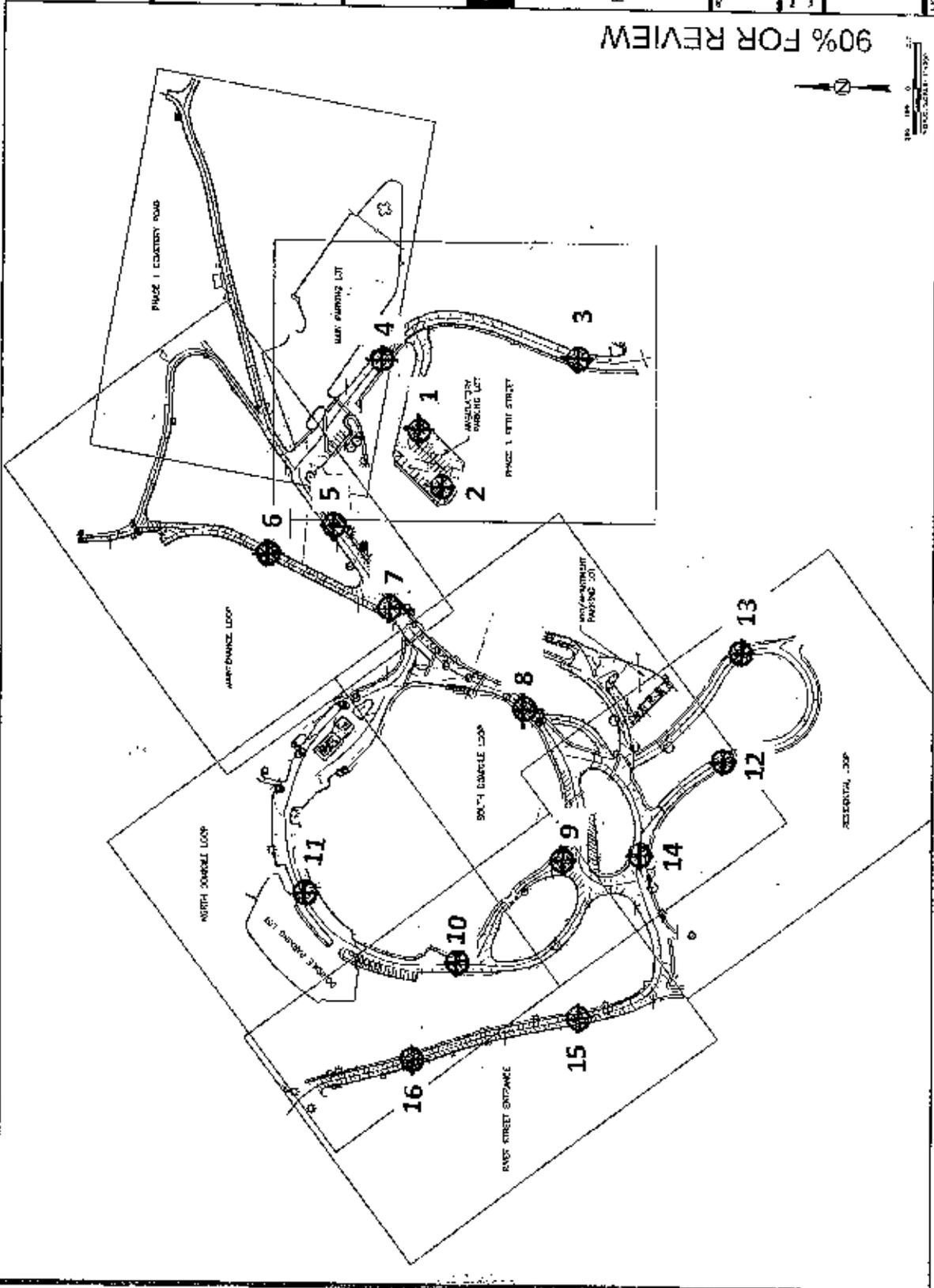


HOT SPRINGS VA  
MEDICAL CENTER  
DESIGN - BUILD  
ROAD REPLACEMENT

HOT SPRINGS, SD

OVERALL  
SITE PLAN

X-4



90% FOR REVIEW

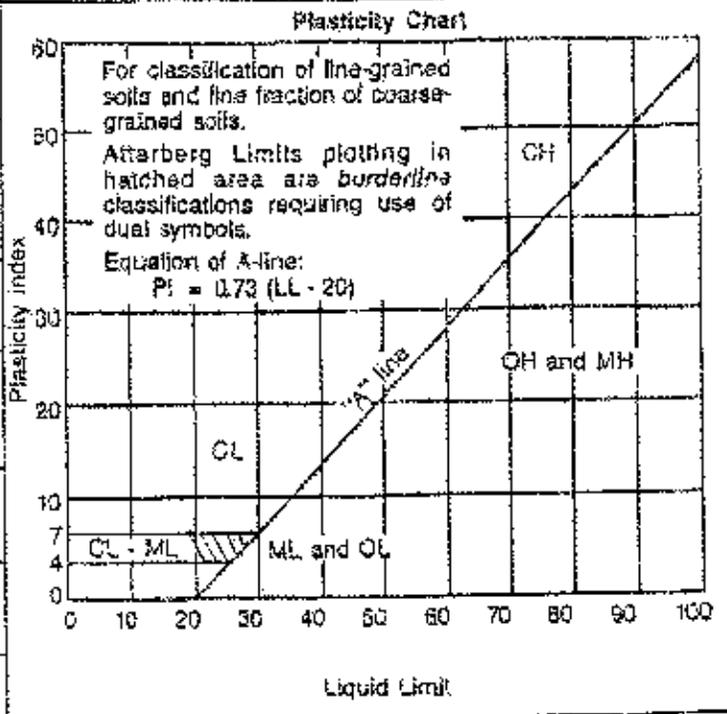
SITE PLAN WITH BORE LOCATIONS  
VAMC ROAD REPAIR PROJECT  
HOT SPRINGS, SD

# CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 — 69 AND D 2488 — 69

(Unified Soil Classification System)

Major divisions		Group symbols	Typical Names	Classification Criteria				
Coarse-grained soils More than 50% retained on No. 200 sieve*	Gravels 50% or more of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% pass No. 200 sieve . . . . . GW, GP, SW, SP More than 12% pass No. 200 sieve . . . . . GM, GC, SM, SC 5 to 12% pass No. 200 sieve . . . . . Borderline classifications requiring use of dual symbols	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3			
		GP	Poorly graded gravels and gravel-sand mixtures, little or no fines			Not meeting both criteria for GW		
		Gravels with fines	GM		Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols	
			GC		Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7		
		Sands More than 50% of coarse fraction passes No. 4 sieve	Clean sands		SW	Well-graded sands and gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
					SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW
	Sands with fines		SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4		Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7		
	Fine-grained soils 50% or more passes No. 200 sieve*	Silts and clays Liquid limit 50% or less	ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	<b>Plasticity Chart</b> For classification of fine-grained soils and fine fraction of coarse-grained soils. Atterberg Limits plotting in hatched area are <i>borderline</i> classifications requiring use of dual symbols. Equation of A-line: $P.I. = 0.73 (LL - 20)$		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
OL			Organic silts and organic silty clays of low plasticity					
Silts and clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts					
		CH	Inorganic clays of high plasticity, fat clays					
		OH	Organic clays of medium to high plasticity					
PI		Peat, muck and other highly organic soils						



\* Based on the material passing the 3 in. (76 mm) sieve.