

DOCUMENT 000101 - PROJECT TITLE PAGE

1.1 PROJECT MANUAL VOLUME 1

- A. SEAL AND STRIP PARKING LOT
- B. DEPARTMENT OF VETERANS AFFAIRS, BATTLE CREEK VETERANS AFFAIRS MEDICAL CENTER
- C. Battle Creek, MI
- D. Owner Project No. 515-12-103
- E. Architect/Engineer Project No. 13-030



- F.
- G. Monument Engineering Group Associates, Inc.
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- L. Web Site: www.monumentengineering.com
- M. Issued: 11-08-13

END OF DOCUMENT 000101

DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

- A. Civil Engineer:
 - 1. Monument Engineering Group Associates, Inc.
 - 2. Allan W Pruss .
 - 3. State of Michigan 43168
 - 4. Responsible for Entire Project

END OF DOCUMENT 000107

**DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS**

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**SECTION 00 01 15
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The drawings listed below accompanying this specification form a part of the contract.

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G-001	LEGEND AND GENERAL NOTES
G-002	NOTES AND DETAILS
G-101	SHEET KEY
CS-101	EXISTING CONDITIONS LOT A
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CS-104	EXISTING CONDITIONS AND STRIPING PLAN LOT C
CS-105	EXISTING CONDITIONS AND STRIPING PLAN LOT D
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CS-107	EXISTING CONDITIONS AND STRIPING PLAN LOT F
CS-108	EXISTING CONDITIONS AND STRIPING PLAN LOT G
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CS-112	EXISTING CONDITIONS AND STRIPING PLAN LOT K
CS-113	EXISTING CONDITIONS AND STRIPING PLAN LOT L
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**SECTION 01 00 00
GENERAL REQUIREMENTS**

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**SECTION 01 00 00
GENERAL REQUIREMENTS**

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for Seal and Stripe Parking Lots, Project No. 515-12-103 as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the VA COR.
- C. Offices of Monument Engineering Group Associates, Inc., as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.
- D. Before placement and installation of work subject to tests by testing laboratory retained by Department of Veterans Affairs, the Contractor shall notify the VA COR in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the VA COR.
- E. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- F. Prior to commencing work, general contractor shall provide proof that an OSHA designated “competent person” (CP) (29 CFR 1926.20(b) (2) shall maintain a presence at the work site whenever the general or subcontractors are present.
- G. Training:
 - 1. All employees of general contractor or subcontractors shall have the 10-hour or 30-hour OSHA Construction Safety course and other relevant competency training, as

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determined by VA COR acting as the Construction Safety Officer with input from the facility Construction Safety Committee.

2. Submit training records of all such employees for approval before the start of work.
3. The General Contractor's site superintendent or any safety officer shall have the 30-hour OSHA certified Construction Safety Course.

H. VHA Directive 2011-36, Safety and Health during Construction, dated 9/22/2011 in its entirety is made a part of this section

1.2 STATEMENT OF BID ITEM(S)

- A. ITEM I, Seal and stripe Parking Lots Work includes general construction, alterations, necessary removal of existing structures and construction and certain other items.

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. AFTER AWARD OF CONTRACT, 5 sets of specifications and drawings will be furnished.
- B. Additional sets of drawings may be made by the Contractor, at Contractor's expense, from bond prints furnished by Issuing Office. Such bond prints do not need to be returned to the Issuing Office immediately after printing is completed.

1.4 CONSTRUCTION SECURITY REQUIREMENTS

- A. Security Plan:
 1. The security plan defines both physical and administrative security procedures that shall remain effective for the entire duration of the project.
 2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.
- B. 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.

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2. For working outside the “regular hours” as defined in the contract, The General Contractor shall give 3 days written 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.

D. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the VA COR for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.

E. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of “sensitive information” as defined in VA Directive 6609 dated 11-9-07.
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked “Law Enforcement Sensitive” or “Sensitive Unclassified”. Secure such information in separate containers and limit the access to only those who need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.

5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and VA COR immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

F. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. Separate permits shall be issued for General Contractor and its employees for parking in designated areas only.

1.5 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):
E84-2009..... Surface Burning Characteristics of Building Materials
2. National Fire Protection Association (NFPA):
10-2010 Standard for Portable Fire Extinguishers
30-2008 Flammable and Combustible Liquids Code

241-2009 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 VA COR, Contracting Officer and Facility Safety Officer 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, and use of VAMC equipment. Documentation shall be provided to the VA COR that individuals have undergone contractor's safety briefing.
- 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. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- E. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer or VA COR. 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. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.
- D. Working space and space available for storing materials shall be as determined by the VA COR.
- E. Execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times.
- F. 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.
 - 1. Do not store materials and equipment in other than assigned areas.
 - 2. Schedule delivery of materials and equipment to immediate construction working areas in 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.

G. Phasing: To insure such executions, Contractor shall furnish the VA COR with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site. In addition, Contractor shall notify the VA COR two weeks in advance of the proposed date of starting work in each specific area of site. Arrange such phasing dates to insure accomplishment of this work in successive phases mutually agreeable to Medical Center Director, VA COR and Contractor, as follows:

Phasing: The contractor shall furnish a Phasing plan within five (5) working days of Notice to Proceed to the VA COR and Contracting Officer for approval based on the following guidelines:

- a. No more than one parking lot at a time shall be under construction.
- b. No more than fifty percent (50%) of the following parking lots shall be under construction at any one time A, B, C, H, and N.
- c. For parking lots not completely closed during construction, contractor shall provide temporary signage for traffic flow in and out of the portion of the parking lot not under construction.
- I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 1.8m (six feet) minimum height, around any on-site or on station storage of construction material or open excavation. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by VA COR.
- K. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
 1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles.

- N. Coordinate the work for this contract with other construction operations as directed by VA COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.7 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the VA COR of areas in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both, to the Contracting Officer. This report shall list by rooms and spaces:
1. Shall note any discrepancies between drawings and existing conditions at site.
 2. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and VA COR.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of VA COR to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and VA COR together shall make a thorough re-survey of the areas involved. They shall furnish a report on conditions then existing, of the site as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such areas despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:

1. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.

1.8 INFECTION PREVENTION MEASURES (THIS SECTION NOT USED)

1.9 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed and from demolition shall be disposed of as follows:
 1. Reserved items which are to remain property of the Government are identified by attached tags as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by VA COR.
 2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.

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

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work sites, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation to remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting

from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.
- D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) permit is required for this project. The Contractor is considered an "operator" under the permit and has extensive responsibility for compliance with permit requirements. VA will make the permit application available at the (appropriate medical center) office. The apparent low bidder, contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements shall be satisfied by completing construction as shown and specified. Some requirements involve the Contractor's method of operations and operations planning and the Contractor is responsible for employing best management practices. The affected activities often include, but are not limited to the following:
- Designating areas for equipment maintenance and repair;
 - Providing waste receptacles at convenient locations and provide regular collection of wastes;
 - Locating equipment wash down areas on site, and provide appropriate control of wash-waters;
 - Providing protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic materials; and
 - Providing adequately maintained sanitary facilities.

1.11 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the VA COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the VA COR before it is disturbed. Materials and workmanship used in restoring work shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks and or anything else) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in 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, an or any other related infrastructure 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).

1.12 PHYSICAL DATA

- A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.
 - 1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by Monument Engineering Group Associates, Inc.

1.13 PROFESSIONAL SURVEYING SERVICES (THIS SECTION NOT USED)

1.14 LAYOUT OF WORK

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

- D. During progress of work Contractor shall have line of all pavement markings established as required by contract drawings.

- E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing and forward these drawings upon completion of work to COR.

- F. Upon completion of the work, the Contractor shall furnish the VA COR, reproducible drawings at the scale of the contract drawings, showing the finished grade on the grid developed for constructing the work, including burial monuments and fifty foot stationing along new road centerlines. These drawings shall bear the seal of the registered land surveyor or registered civil engineer.

1.15 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which shall 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 VA COR's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the VA COR within 15 calendar days after each completed phase and after the acceptance of the project by the VA COR.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.16 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the VA COR, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they shall be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this contract, Contractor shall construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.

1.17 VA COR'S FIELD OFFICE (THIS SECTION NOT USED)

1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT (THIS SECTION NOT USED)

1.19 TEMPORARY USE OF EXISTING ELEVATORS (THIS SECTION NOT USED)

1.20 TEMPORARY USE OF NEW ELEVATORS (THIS SECTION NOT USED)

1.21 TEMPORARY TOILETS

- A. Provide where directed, (for use of all Contractor's workmen) ample temporary sanitary toilet accommodations without sewer and water connections; or, when approved by VA COR, provide suitable dry closets where directed. Contractor shall keep such places

clean and free from flies, and shall removed prior to completion of contract, and premises left perfectly clean.

1.22 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. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.
- C. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.
- D. Electricity (for Construction and Testing): Furnish all temporary electric services.
 - 1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.
- E. Water (for Construction and Testing): Furnish temporary water service.
 - 1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. Water is available at no cost to the Contractor.
 - 2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes shall be cause for revocation (at the VA COR's discretion) of use of water from Medical Center's.

1.23 NEW TELEPHONE EQUIPMENT (THIS SECTION NOT USED)

1.24 TESTS (THIS SECTION NOT USED)

1.25 INSTRUCTIONS (THIS SECTION NOT USED)

1.26 GOVERNMENT-FURNISHED PROPERTY (THIS SECTION NOT USED)

1.27 RELOCATED EQUIPMENT ITEMS (THIS SECTION NOT USED)

1.28 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT (THIS SECTION NOT USED)

1.29 CONSTRUCTION SIGN (THIS SECTION NOT USED)

1.30 SAFETY SIGN (THIS SECTION NOT USED)

1.31 PHOTOGRAPHIC DOCUMENTATION (THIS SECTION NOT USED)

1.32 FINAL ELEVATION DIGITAL IMAGES (THIS SECTION NOT USED)

1.33 HISTORIC PRESERVATION (THIS SECTION NOT USED)

--- E N D ---

**SECTION 01 32 16.15
PROJECT SCHEDULES**

PART 1- GENERAL

1.1 DESCRIPTION:

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (VA COR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification shall apply.

1.3 CONTRACTOR'S CONSULTANT:

- A. The Contractor shall submit a qualification proposal to the VA COR, within 10 days of bid acceptance. The qualification proposal shall include:
 - 1. The name and address of the proposed consultant.
 - 2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 - 3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.
- B. The Contracting Officer has the right to approve or disapprove the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor

shall have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service shall include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the scheduling software approved by the Contracting Officer; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These shall be submitted with and substantively support the contractor's monthly payment request and the signed look ahead report. The VA COR shall identify the five different report formats that the contractor shall provide.
- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

- A. Within ten (10) calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be

accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but shall have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor shall provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- D. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan shall be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- E. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.
- F. The Complete Project Schedule shall contain approximately twenty (20) work activities/events.

1.6 WORK ACTIVITY/EVENT COST DATA

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates)

shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.

- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article, FAR 52.232 – 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 – 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).
- C. In accordance with FAR 52.236 – 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 – 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces shall perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
 - c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
 - d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.

- e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
 2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
 3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the VA COR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals shall not be less than 20 work days.
 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and shall not be allowed. Lead and lag time activities shall not be acceptable.
 5. The schedule shall be generally numbered in such a way to reflect, discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. The appropriate project calendar including working days and holidays.
 2. The planned number of shifts per day.
 3. The number of hours per shift.
- Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.
- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the VA COR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the VA COR's approval of the Project Schedule.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a

schedule, reflecting all the activities/events of the complete project schedule being submitted.

1.8 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 – 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 – 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file(s) of the resulting monthly updated schedule.
- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.9 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the VA COR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the VA COR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
 - 1. Actual start and/or finish dates for updated/completed activities/events.
 - 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
 - 3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
 - 4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
 - 5. Completion percentage for all completed and partially completed activities/events.
 - 6. Logic and duration revisions required by this section of the specifications.

7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the VA COR with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the COR within fourteen (14) calendar days of completing the regular schedule update.
- Before inserting the contract changes durations, care shall be taken to ensure that only the original durations shall be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor shall recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This shall require detailed record keeping for each of the manual progress payment updates.**
- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor shall conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting shall occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule,

discussions shall include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

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

1.11 CHANGES TO THE SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file(s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
 - 1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays shall not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 - 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 - 3. The schedule does not represent the actual prosecution and progress of the project.
 - 4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas

by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.

- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA COR.
- D. The cost of revisions to the project schedule resulting from contract changes shall be included in the proposal for changes in work as specified in FAR 52.243 – 4 (Changes) and VAAR 852.236 – 88 (Changes – Supplemental), and shall be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the VA COR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer- produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 – 4 (Changes) and VAAR 852.236 – 88 (Changes – Supplemental). The Contractor

shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.

- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

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**SECTION 01 33 23
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 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 Contracting Officer, 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 VA COR 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 therefor 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 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. 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, email or FAX shall contain the list of items, name of Medical Center, 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 Medical Center, 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 VA COR 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.
 - 1. For each drawing required, submit one legible photographic paper or vellum reproducible.
 - 2. Reproducible shall be full size.
 - 3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center 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. Samples, shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to

Monument Engineering Group Associates, Inc. (Architect-Engineer)

638 S Grand Ave.,

Fowlerville, MI 48836,

Phone: 517-223-3512 fax: 517-223-9987

email: apruss@monumentengineering.com

1-11. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the VA COR.

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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)
425 Eye Street N.W, (sixth floor)
Washington, DC 20001
Telephone Numbers: (202) 632-5249 or (202) 632-5178
Between 9:00 AM - 3:00 PM

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.

- AA Aluminum Association Inc.
<http://www.aluminum.org>
- AABC Associated Air Balance Council
<http://www.aabchq.com>
- AAMA American Architectural Manufacturer's Association
<http://www.aamanet.org>
- AAN American Nursery and Landscape Association
<http://www.anla.org>
- AASHTO American Association of State Highway and Transportation Officials
<http://www.aashto.org>
- AATCC American Association of Textile Chemists and Colorists
<http://www.aatcc.org>
- ACGIH American Conference of Governmental Industrial Hygienists
<http://www.acgih.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
ADC	Air Diffusion Council http://flexibleduct.org
AGA	American Gas Association http://www.aga.org
AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AHAM	Association of Home Appliance Manufacturers http://www.aham.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-qlulam.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>
- 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>

CPMB Concrete Plant Manufacturers Bureau

<http://www.cpmb.org>

CRA California Redwood Association

<http://www.calredwood.org>

CRSI Concrete Reinforcing Steel Institute

<http://www.crsi.org>

CTI Cooling Technology Institute

<http://www.cti.org>

DHI Door and Hardware Institute

<http://www.dhi.org>

EGSA Electrical Generating Systems Association

<http://www.egsa.org>

EEI Edison 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>

GANA Glass 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>

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
MDOT	Michigan Department of Transportation http://www.michigan.gov/mdot/
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>
- 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>
- PPIThe Plastic Pipe Institute
<http://www.plasticpipe.org>

PEIPorcelain Enamel Institute, Inc.

<http://www.porcelainenamel.com>

PTIPost-Tensioning Institute

<http://www.post-tensioning.org>

RFCI The Resilient Floor Covering Institute

<http://www.rfci.com>

RIS Redwood Inspection Service

See - CRA

RMA Rubber Manufacturers Association, Inc.

<http://www.rma.org>

SCMA Southern Cypress Manufacturers Association

<http://www.cypressinfo.org>

SDI Steel Door Institute

<http://www.steeldoor.org>

IGMA Insulating Glass Manufacturers Alliance

<http://www.igmaonline.org>

SJI Steel Joist Institute

<http://www.steeljoist.org>

SMACNA Sheet Metal and Air-Conditioning Contractors

National Association, Inc.

<http://www.smacna.org>

SSPC The Society for Protective Coatings

<http://www.sspc.org>

STISteel 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
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>

--- E N D ---

**SECTION 01 45 29
TESTING LABORATORY SERVICES**

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by Contractor.

1.2 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - T27-11..... Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - T96-02 (R2006)..... Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - T99-10..... Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
 - T104-99 (R2007) Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
 - 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 in.) Drop
 - T191-02(R2006) Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method
- C. American Concrete Institute (ACI):
 - 506.4R-94 (R2004)..... Guide for the Evaluation of Shotcrete
- D. American Society for Testing and Materials (ASTM):
 - A325-10..... Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - A370-12..... Standard Test Methods and Definitions for Mechanical Testing of Steel Products

A416/A416M-10	Standard Specification for Steel Strand, Uncoated Seven-Wire for Pre-stressed Concrete
A490-12.....	Standard Specification for Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
C31/C31M-10.....	Standard Practice for Making and Curing Concrete Test Specimens in the Field
C33/C33M-11a	Standard Specification for Concrete Aggregates
C39/C39M-12.....	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
C109/C109M-11b	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
C136-06	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
C138/C138M-10b	Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C140-12	Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
C143/C143M-10a	Standard Test Method for Slump of Hydraulic Cement Concrete
C172/C172M-10	Standard Practice for Sampling Freshly Mixed Concrete
C173/C173M-10b	Standard Test Method for Air Content of freshly Mixed Concrete by the Volumetric Method
C330/C330M-09	Standard Specification for Lightweight Aggregates for Structural Concrete
C567/C567M-11	Standard Test Method for Density Structural Lightweight Concrete
C780-11	Standard Test Method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019-11	Standard Test Method for Sampling and Testing Grout
C1064/C1064M-11	Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete

- C1077-11c..... Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
- C1314-11a Standard Test Method for Compressive Strength of Masonry Prisms
- D422-63(2007) Standard Test Method for Particle-Size Analysis of Soils
- D698-07e1 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
- D1140-00(2006) Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve
- D1143/D1143M-07e1 Standard Test Methods for Deep Foundations Under Static Axial Compressive Load
- D1188-07e1 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
- D1556-07 Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
- D1557-09 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft lbf/ft³ (2,700 KNm/m³))
- D2166-06 Standard Test Method for Unconfined Compressive Strength of Cohesive Soil
- D2167-08) Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- D2216-10 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- D2974-07a Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
- D3666-11 Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
- D3740-11 Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction

- D6938-10 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- E94-04(2010) Standard Guide for Radiographic Examination
- E164-08..... Standard Practice for Contact Ultrasonic Testing of Weldments
- E329-11c..... Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
- E543-09..... Standard Specification for Agencies Performing Non-Destructive Testing
- E605-93(R2011)..... Standard Test Methods for Thickness and Density of Sprayed Fire Resistive Material (SFRM) Applied to Structural Members
- E709-08..... Standard Guide for Magnetic Particle Examination
- E1155-96(R2008)..... Determining FF Floor Flatness and FL Floor Levelness Numbers

E. American Welding Society (AWS):

- D1.D1.1M-10..... Structural Welding Code-Steel

1.3 REQUIREMENTS:

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory’s scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the “Corporate Office.”
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by VA COR. When it appears materials furnished, or work performed by Contractor fails to meet construction contract requirements, Testing Laboratory shall direct attention of VA COR to such failure.

C. Written Reports: Testing laboratory shall submit test reports to VA COR, Contractor, unless other arrangements are agreed to in writing by the VA COR. Submit reports of tests that fail to meet construction contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to VA COR immediately of any irregularity.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:

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

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D698 and/or ASTM D1557.
2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556, or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the VA COR before the tests are conducted.

- a. Building Slab Subgrade: At least one test of subgrade for every 185 m² (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 185 m² (2000 square feet) of overlaying building slab, but in no case fewer than three tests.
 - b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
 - c. Pavement Subgrade: One test for each 335 m² (400 square yards), but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
 - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to VA COR. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.
- C. Fill and Backfill Material Gradation: One test per 1,000 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C136.
- D. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- E. Testing Materials: Test suitability of on-site and off-site borrow as directed by VA COR.

3.2 FOUNDATION PILES (THIS SECTION NOT USED)

3.3 FOUNDATION CAISSONS: (THIS SECTION NOT USED)

3.4 LANDSCAPING (THIS SECTION NOT USED)

3.5 ASPHALT CONCRETE PAVING:

- A. Aggregate Base Course:

1. Determine maximum density and optimum moisture content for aggregate base material in accordance with ASTM D1557, Method D
2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with ASTM D1556.
3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.

B. Asphalt Concrete:

1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).
2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.6 SITE WORK CONCRETE: (THIS SECTION NOT USED)

3.7 POST-TENSIONING OF CONCRETE: (THIS SECTION NOT USED)

3.8 CONCRETE: (THIS SECTION NOT USED)

3.9 REINFORCEMENT: (THIS SECTION NOT USED)

3.10 SHOTCRETE: (THIS SECTION NOT USED)

3.11 PRESTRESSED CONCRETE: (THIS SECTION NOT USED)

3.12 ARCHITECTURAL PRECAST CONCRETE: (THIS SECTION NOT USED)

3.13 MASONRY: (THIS SECTION NOT USED)

3.14 STRUCTURAL STEEL: (THIS SECTION NOT USED)

3.15 STEEL DECKING: (THIS SECTION NOT USED)

3.16 SHEAR CONNECTOR STUDS: (THIS SECTION NOT USED)

3.17 SPRAYED-ON FIREPROOFING: (THIS SECTION NOT USED)

3.18 TYPE OF TEST:

Approximate Number of Tests Required

A. Earthwork:

Laboratory Compaction Test, Soils:

ASTM D698 _____

Field Density, Soils (AASHTO T191, T205, or T238) _____

Penetration Test, Soils _____

B. Landscaping:

Topsoil Test _____

C. Aggregate Base:

Laboratory Compaction, (ASTM D1557) _____

Field Density (ASTM D1556) _____

Aggregate, Base Course Gradation (AASHTO T27) _____

Wear (AASHTO T96) _____

Soundness (AASHTO T104) _____

D. Asphalt Concrete:

Field Density, ASTM D1188 _____

Aggregate, Asphalt Concrete Gradation (AASHTO T27) _____

Wear (AASHTO T96) _____

Soundness (AASHTO T104) _____

--- E N D ---

**SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
 - 1. Adversely effect human health or welfare,
 - 2. Unfavorably alter ecological balances of importance to human life,
 - 3. Effect other species of importance to humankind, or;
 - 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
 - 1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
 - 2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
 - 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 - 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 - 5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.

6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.
7. Sanitary Wastes:
 - a. Sewage: Domestic sanitary sewage and human and animal waste.
 - b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

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

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. U.S. National Archives and Records Administration (NARA):
33 CFR 328..... Definitions

1.4 SUBMITTALS

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the VA COR to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the VA COR for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
 - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
 - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - d. Description of the Contractor's environmental protection personnel training program.

- e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
 - f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - h. Permits, licenses, and the location of the solid waste disposal area.
 - i. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.
 - j. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without

permission from the VA COR. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
 - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
 - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 100 year storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
 - b. Reuse or conserve the collected topsoil sediment as directed by the VA COR.
 - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.

5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities.
 8. Protect adjacent areas from despoilment by temporary excavations and embankments.
 9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
 10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 11. Handle discarded materials other than those included in the solid waste category as directed by the VA COR.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction if any.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.
- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Michigan Air Pollution Statute and Federal emission

and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.

1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the VA COR. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 7:30 a.m. and 5:00p.m unless otherwise permitted by local ordinance or the VA COR. Repetitive impact noise on the property shall not exceed the following dB limitations:

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

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

- a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75	BLASTING	NA
GENERATORS	75	SAWS	75
COMPRESSOR	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
- c. Provide soundproof housings or enclosures for noise-producing machinery.
- d. Use efficient silencers on equipment air intakes.
- e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
- f. Line hoppers and storage bins with sound deadening material.
- g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB (A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the VA COR noting any problems and the alternatives for mitigating actions.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor

shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.

- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the VA COR. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

- - - E N D - - -

**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).
 - 3. Clean dimensional wood and palette wood.
 - 4. Green waste (biodegradable landscaping materials).
 - 5. Engineered wood products (plywood, particle board and I-joists, etc).
 - 6. Metal products (eg, steel, wire, beverage containers, copper, etc).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials.
 - 9. Plastics (eg, ABS, PVC).
 - 10. Carpet and/or pad.
 - 11. Gypsum board.
 - 12. Insulation.
 - 13. Paint.
 - 14. Fluorescent lamps.

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.
 - 8. Mishandling.
 - 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
- E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.cwm.wbdg.org> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. 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).
- 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.
- 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 VA COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
 - 1. Procedures to be used for debris management.
 - 2. Techniques to be used to minimize waste generation.
 - 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, and recycled.
 - b. List of each material and quantity proposed to be taken to a landfill.
 - 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.

- b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - c. The names and locations of mixed debris reuse and recycling facilities or sites.
 - d. The names and locations of trash disposal landfill facilities or sites.
 - e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.
- B. 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. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

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.

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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 Article, 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 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- F. Construction Waste Management: Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT.
- G. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 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. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
 - 1. No wall or part of wall shall be permitted to fall outwardly from structures.
 - 2. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.
 - 3. 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.
 - 4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. 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 VA COR. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have VA COR's approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

1.4 UTILITY SERVICES:

- A. Demolish and remove outside utility service lines shown to be removed.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 DEMOLITION:

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
 - 1. As required for installation of new utility service lines.
 - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the VA COR. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- D. 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 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. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.
- E. 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 VA COR. When Utility lines are encountered that are not indicated on the drawings, the VA COR 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 VA COR. 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.

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**SECTION 10 14 00
SIGNAGE**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies interior signage for room numbers, directional signs, code required signs, telephone identification signs and temporary interior signs.
- B. This section also specifies exterior medical center identification signs, building identification signs, parking and traffic signs.
- C. Installation of Government furnished dedication plaque and VA seal.

1.2 RELATED WORK

- A. None

1.3 MANUFACTURER'S QUALIFICATIONS

Sign manufacturer shall provide evidence that they regularly and presently manufacture signs similar to those specified in this section as one of their principal products.

1.4 SUBMITTALS

- A. Samples: Sign panels and frames, with letters and symbols, each type. Submit 2 sets. One set of samples will be retained by VA COR, other returned to Contractor.
 - 1. Sign Panel, 200 mm x 250 mm (8 inches x 10 inches), with letters.
 - 2. Color samples of each color, 150 mm x 150 mm (6 inches x 6 inches. Show anticipated range of color and texture.
 - 3. Sample of typeface, arrow and symbols in a typical full size layout.
- B. Manufacturer's Literature:
 - 1. Showing the methods and procedures proposed for the concealed anchorage of the signage system to each surface type.
 - 2. Manufacturer's printed specifications, anchorage details, installation and maintenance instructions.
- C. Samples: Sign location plan, showing location, type and total number of signs required.
- D. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.
- E. Full size layout patterns for dimensional letters.

1.5 DELIVERY AND STORAGE

- A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.

- B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.
- C. Deliver signs only when the site and mounting services are ready for installation work to proceed.
- D. Store products in dry condition inside enclosed facilities.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - B209-07..... Aluminum and Aluminum-Alloy Sheet and Plate
 - B221-08..... Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and tubes.
- C. Federal Specifications (Fed Spec):
 - MIL-PRF-8184F..... Plastic Sheet, Acrylic, Modified.
 - MIL-P-46144C..... Plastic Sheet, Polycarbonate

1.7 MINIMUM SIGN REQUIREMENTS

- A. Permanent Rooms and Spaces:
 - 1. Tactile and Braille Characters, raised minimum 0.793 mm (1/32 in). Characters shall be accompanied by Grade 2 Braille.
 - 2. Type Styles: Characters shall be uppercase, Helvetica Medium, Helvetica Medium Condensed and Helvetica Regular.
 - 3. Character Height: Minimum 16 mm (5/8 in) high, Maximum 50 mm (2 in).
 - 4. Symbols (Pictograms): Equivalent written description shall be placed directly below symbol, outside of symbol's background field. Border dimensions of symbol background shall be minimum 150 mm (6 in) high.
 - 5. Finish and Contrast: Characters and background shall be eggshell, matte or other non-glare finish with adequate contrast with background.
 - 6. Mounting Location and Height: As shown. Mounted on wall adjacent to the latch side of the door and to avoid door swing and protruding objects.
- B. Overhead Signs:
 - 1. Type Styles: As shown. Characters shall have a width-to-height ratio between 3:5 and 1:1. Characters shall have a stroke width-to-height ratio of between 1:5 and 1:10.

2. Character Height: minimum 75 mm (3 in) high for overhead signs. As shown, for directional signs.
3. Finish and Contrast: Same as for signs of permanent rooms and spaces.
4. Mounting Location and Height: As shown.

1.8 COLORS AND FINISHES: (SECTION NOT USED)

PART 2 - PRODUCTS

2.1 GENERAL

- A. Signs of type, size and design shown on the drawings and as specified.
- B. Signs complete with lettering, framing and related components for a complete installation.
- C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
- D. Do not scale drawings for dimensions. Contractor is to verify and be responsible for all dimensions and conditions shown by these drawings. VA COR to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.
- E. The Sign Contractor, by commencing work of this section, assumes overall responsibility, as part of his warranty of work, to assure that assemblies, components and parts shown or required within the work of the section, comply with the Contract Documents. The Contractor shall further warrant: That all components, specified or required to satisfactorily complete the installation are compatible with each other and with conditions of installations.

2.2 PRODUCTS

- A. Aluminum:
 1. Sheet and Plate: ASTM B209.
 2. Extrusions and Tubing: ASTM B221.
- B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matt finish water white clear acrylic shall not be acceptable.
- C. Polycarbonate: MIL-P-46144C; Type I, class 1.
- D. Vinyl: 0.1 mm thick machine cut, having a pressure sensitive adhesive and integral color.

2.3 SIGN STANDARDS

A. Topography:

1. Type Style: Helvetica Medium and Helvetica Medium Condensed. Initial caps or all caps as indicated in Sign Message Schedule.
2. Arrow: See graphic standards in drawings.
3. Letter spacing: See graphic standards on drawings.
4. Letter spacing: See graphic standards on drawings.
5. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings is for layout purposes only; final text for signs is listed in Sign Message Schedule.

2.4 SIGN TYPES

A. General:

1. The interior sign system is comprised of sign types families that are identified by a letter and number which identify a particular group of signs. An additional number identifies a specific type of sign within that family.
 - a. IN indicates a component construction based sign.
 1. The exterior sign system shall be comprised of sign types families that are identified by a letter and number which identify a particular group of signs. An additional number identifies a specific type of sign within that family.
 2. EI designation indicates exterior internally illuminated sign.
 3. EN designation indicates exterior non-illuminated sign.

B. Interchangeable Component System:

1. Sign Type Families: 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16 and 17.
2. Interior sign system capable of being arranged in a variety of configurations with a minimum of attachments, devices and connectors.
 - a. Interchangeable nature of the system shall allow for changes of graphic components of the installed sign, without changing sign in its entirety.
 - b. Component Sign System is comprised of the following primary components:
 - 1) Rail Back utilizing horizontal rails, spaced to allow for uniform, modular sizing of sign types.
 - 2) Rail Insert mounted to back of Copy Panels to allow for attachment to Rail Back.

- 3) Copy Panels, made of a variety of materials to allow for different graphic needs.
 - 4) End Caps which interlock to Rail Back to enclose and secure changeable Copy Panels.
 - 5) Joiners and Accent Joiners connect separate Rail Backs together.
 - 6) Top Accent Bars which provide decorative trim cap that encloses the top of sign or can connect the sign to a Type 03 Room Number Sign.
- c. Rail Back, Rail Insert and End Caps in anodized extruded aluminum to allow for tight tolerances and consistent quality of fit and finish.
 - d. Signs in system shall be convertible in the field to allow for enlargement from one size to another in height and width through use of Joiners or Accent Joiners, which connect Rail Back panels together blindly, providing a butt joint between Copy Panels. Accent Joiners shall connect Rail Backs together with a visible 3 mm (1/8") horizontal rib, flush to the adjacent copy insert surfaces.
 - e. Sign configurations shall vary in width from 225 mm (9 inches) to 2050 mm (80 inches), and have height dimensions of 50 mm (2 inches), 75 mm (3 inches), 150 mm (6 inches), 225 mm (9 inches) and 300 mm (12 inches). Height shall be increased beyond 300 mm (12 inches), by repeating height module in full or in part.
3. Rail Back functions as internal structural member of sign using 6063T5 extruded aluminum and anodized black.
 - a. Shall accept an extruded aluminum or plastic insert on one sign or on both sides, depending upon sign type.
 - b. Shall be convertible in field to allow for connection to other Rail Back panels, so that additive changes can be made to sign unit.
 - c. Rail shall allow for a variety of mounting devices including wall mounting for screw-on applications, using pressure sensitive tape, freestanding mount, ceiling mount and other mounting devices as needed.
 4. Rail Insert functions as a mounting device for Copy Panels on to the Rail Back. The Rail Insert mounts to the back of the Copy Panel with adhesive suitable for use with the particular copy insert material.
 - a. Shall allow Copy Panels to slide or snap into the horizontal Rail Back for ease of changeability.

- b. Shall mount to the back of the Copy Panel with adhesive suitable for use with particular Copy Panel material.
5. Copy Panels shall accept various forms of copy and graphics, and attaches to the Rail Back with the Rail Insert. Copy Panels shall be either ABS plastic with integral color or an acrylic lacquer finish; photo polymer; or, acrylic.
 - a. Interchangeable by sliding horizontally from either side of sign, and to other signs in system of equal or greater width or height.
 - b. Cleanable without use of special chemicals or cleaning solutions.
 - c. Copy Insert Materials.
 - 1) ABS Inserts - 2.3 mm (.090 inches) extruded ABS plastic core with .07 mm (.003 inches) acrylic cap bonded during extrusion/texturing process. Pressure bonded to extruded Rail Insert using adhesive. Background color is either integral or painted in acrylic lacquer. ABS inserts finished in a chromium industries #HM335RA texture pattern to prevent glare.
 - 2) Photo polymer Inserts - 3 mm (.125 inches) phenolic photo polymer with raised copy etched to 2.3 mm (.0937 inches), bonded to an ABS plastic or extruded aluminum insert with adhesive. Background color is painted in acrylic enamel.
 - 3) Changeable Paper/ Insert Holder - Extruded insert holder with integral Rail Insert for connection with structural back panel in 6063T5 aluminum with a black anodized finish. Inserts into holder are paper with a clear 0.7 mm (.030 inches) textured cover. Background color is painted in acrylic lacquer.
 - 4) Acrylic - 2 mm (.080 inches) non-glare acrylic. Pressure bonded to extruded Rail Insert using adhesive. Background color is painted in acrylic lacquer or acrylic enamel.
 - 5) Extruded 6063T5 aluminum with a black anodized finish Insert Holder with integral Rail Insert for connection with Structural Back Panel to hold a 0.7 mm (.030 inches) textured polycarbonate insert and a Sliding Tile which mounts in the Inset Holder and slides horizontally.
 - 6) End Caps - Extruded using 6063T5 aluminum with a black anodized. End Caps interlock with Rail Back with clips to form an integral unit, enclosing and securing the changeable Copy Panels, without requiring tools for assembly.
 - a) Shall be interchangeable to either end of sign and to other signs in the system of equal height.

- b) Mechanical fasteners can be added to the End Caps that will secure it to Rail Back to make sign tamper resistant.
 - 7) Joiners - Extruded using 6063T5 aluminum with a black anodized finish. Rail Joiners connect Rail Backs together blindly, providing a butt joint between Copy Inserts.
 - 8) Accent Joiners - Extruded using 6063T5 aluminum with a mirror polished finish. Joiner shall connect Rail Backs together with a visible 3 mm (.125 inches) horizontal rib, flush to the adjacent Copy Panel surfaces.
 - 9) Top Accent Rail - Extruded using 6063T5 aluminum with a mirror polished finish. Rail shall provide 3 mm (.125 inches) high decorative trim cap, which butts flush to adjacent Copy Panel and encloses top of Rail Back and Copy Panel.
 - 10) Typography
 - a) Vinyl First Surface Copy (non-tactile) - Applied Vinyl copy.
 - b) Subsurface Copy Inserts - Textured 1 mm (.030 inches) clear polycarbonate face with subsurface applied Vinyl copy. Face shall be back sprayed with paint and laminated to an extruded aluminum carrier insert.
 - c) Integral Tactile Copy Inserts - phenolic photo polymer etched with 2.3 mm (.0937 inches) raised copy.
 - d) Silk-screened First Surface Copy (non-tactile) - Injection molded or extruded ABS plastic or aluminum insert with first surface applied enamel silk-screened copy.
- C. Sign Type Family 01, 02.01 thru 02.05, 08, 09 and 20:
- 1. All text and graphics are to be first surface silk-screened.
 - 2. IN-01.12 & IN-01.13: Refer to Sign Type 03 specification for tactile and Braille portion of sign.
 - 3. IN-02.4: All text and graphics are to be first surface vinyl letters.
 - 4. IN-01.1: Preparation of artwork for reproduction of "fire and emergency evacuation maps" is by manufacturer.
- D. Sign Type Family 04 and 11:
- 1. All text and graphics are to be first surface applied vinyl letters.

2. IN-04: When a Type IN-04 is to be mounted under a Type IN03, a connecting Accent Joiner is to be used to create a singular integrated sign.
- E. Sign Type 05:
1. Text if added to Copy Insert module to be first surface applied vinyl letters.
- F. Sign Type Family 06 and 07:
1. A11 text and graphics are to be first surface applied vinyl letters except for under sliding tile.
 2. Protect text, which is covered by sliding tile, so tile does not wear away letters.
- G. Sign Type Family 10:
1. Pocket depth is to be 0.3 mm (.0150 inches).
- H. Sign Type Family 12 and 13:
1. A11 text and graphics are to be first surface applied vinyl letters.
 2. IN-12: Provide felt, cork or similar material on bottom of desk mounting bracket to protect counter surfaces.
- I. Sign Type Family 17:
1. A11 text and graphics are to be first surface applied vinyl letters.
 2. IN-17: Directory constructed using elements of the Component System.
- J. Sign Type Family 18:
1. A11 text and graphics are to be first surface applied stylus cut vinyl letters.
 2. Provide in specified typeface, color and spacing, with each message or message group on a single quick release backing sheet.
- K. Sign Type Family 19:
1. Dimensional letters are mill or laser cut acrylic in the size and thickness noted in the drawings.
 2. Draft of letters is perpendicular to letters face.
 3. All corners such as where a letter stem and bar intersect are to be square so the letter form is accurately reproduced.
 4. Paint letters with acrylic polyurethane in specified color and finish.
- L. Sign Type Family (See Specialty Signs Section) 21:
1. IN-21.01: 57 mm (2.25 inches) polished aluminum tube mounted to weighted 356 mm (14 inches) diameter polished aluminum base. Sign bracket to hold a 6 mm (.25 inches) sign plaque.
 2. IN-21.02: 57 mm (2.25 inches) polished aluminum tube vertical support mounted to a weighted polished 57 mm (2.25 inches) aluminum tubular base. Rail Back

mechanically connected to vertical supports with Copy Panel attached to front and back.

3. IN-21.03 & 21.04: IN-21.02: 57 mm (2.25 inches) polished aluminum tube vertical support mounted to a weighted polished 57 mm (2.25 inches) aluminum tubular base. Rail Back mechanically connected to vertical supports with hinged locking glass door. Black felt covered changeable letter board or tan vinyl impregnated cork tack surface as background within case.

M. Sign Type Family 22:

1. IN-22.01: Extruded aluminum clip anodized black containing rollers to pinch and release paper. End caps are black plastic.
2. IN-22.02: Patient Information holder constructed of 18 gauge formed sheet metal painted in specified color. Polished aluminum connecting rods and buttons. Button covers for mounting screws are to permanently attach and securely conceal screws.

N. Temporary Interior Signs:

1. Fabricated from 50 kg (110 pound) matte finished white paper cut to 100 mm (4 inch) wide by 300 mm (12 inch) long. Punched 3 mm (.125 inch) hole with edge of hole spaced 13 mm (.5 inch) in from edge and centered on 100 mm (4 inch) side. Reinforce hole on both sides with suitable material that prevents tie form pulling through hole. Ties are steel wire 0.3 mm (0.120 inch) thick attached to tag with twist leaving 150 mm (6 inch) long free ends.
2. Mark architectural room number on sign, with broad felt marker in clearly legible numbers or letters that identify room, corridor or space as shown on floor plans.
3. Install temporary signs to all rooms that have a room, corridor or space number. Attach to door frame, door knob or door pull.
 - a. Doors that do not require signs are: corridor doors in corridor with same number, folding doors or partitions, toilet doors, bathroom doors within and between rooms, closet doors within rooms, communicating doors in partitions between rooms with corridor entrance doors.
 - b. Replace and missing damaged or illegible signs.

2.5 FABRICATION

- A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 °C (100 °F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.

- B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible.
- C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.
- D. Contact surfaces of connected members are true. Assembled so that joints will be tight and practically unnoticeable, without use of filling compound.
- E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces are smooth flat and without oil-canning, free of rack and twist. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches). Restore texture to filed or cut areas.
- F. Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.
- G. Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.
- H. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.
- I. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.
- J. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.
- K. Movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.
- L. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- M. No signs are to be manufactured until final sign message schedule and location review has been completed by the VA COR & forwarded to contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Protect products against damage during field handling and installation. Protect adjacent existing and newly placed construction, landscaping and finishes as necessary to prevent damage during installation. Paint and touch up any exposed fasteners and connecting hardware to match color and finish of surrounding surface.
- B. Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact VA COR for clarification.
- C. Contractor shall be responsible for all signs that are damaged, lost or stolen while materials are on the job site and up until the completion and final acceptance of the job.
- D. Remove or correct signs or installation work VA COR determines as unsafe or as an unsafe condition.
- E. At completion of sign installation, clean exposed sign surfaces. Clean and repair any adjoining surfaces and landscaping that became soiled or damaged as a result of installation of signs.
- F. Locate signs as shown on the Sign Location Plans.
- G. Certain signs may be installed on glass. A blank glass back up is required to be placed on opposite side of glass exactly behind sign being installed. This blank glass back up is to be the same size as sign being installed.
- H. Contractor will be responsible for verifying that behind each sign location there are no utility lines that will be affected by installation of signs. Any damage during installation of signs to utilities will be the sole responsibility of the Contractor to correct and repair.
- I. Furnish inserts and anchoring devices which must be set in concrete or other material for installation of signs. Provide setting drawings, templates, instructions and directions for installation of anchorage devices which may involve other trades.

- - - END - - -

**SECTION 32 12 16
ASPHALT PAVING**

PART 1 - GENERAL

1.1 DESCRIPTION

This work shall cover the composition, mixing, construction upon the prepared subgrade, and the protection of hot asphalt concrete pavement. The hot asphalt concrete pavement shall consist of an aggregate or asphalt base course and asphalt surface course constructed in conformity with the lines, grades, thickness, and cross sections as shown. Each course shall be constructed to the depth, section, or elevation required by the drawings and shall be rolled, finished, and approved before the placement of the next course.

1.2 RELATED WORK

- A. Laboratory and field testing requirements: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Pavement Markings: Section 32 17 23, PAVEMENT MARKINGS.
- C. Sealcoat: Section 32 90 10 Refined Coal Tar Emulsion Slurry with Additives

1.3 INSPECTION OF PLANT AND EQUIPMENT

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

1.4 ALIGNMENT AND GRADE CONTROL

The Contractor's Registered Professional Land Surveyor shall establish and control the pavement (aggregate or asphalt base course and asphalt surface course) alignments, grades, elevations, and cross sections as shown on the Drawings.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
- B. Data and Test Reports:
 - 1. Aggregate Base Course: Sources, gradation, liquid limit, plasticity index, percentage of wear, and other tests required by the current State of Michigan Department of Transportation Standards and Specifications for Construction.

2. Asphalt Base/Surface Course: Aggregate source, gradation, soundness loss, percentage of wear, and other tests required by the current State of Michigan Department of Transportation Standards and Specifications for Construction.
 3. Job-mix formula.
- C. Certifications:
1. Asphalt prime and tack coat material certificate of conformance to the current State of Michigan Department of Transportation Standards and Specifications for Construction.
 2. Asphalt cement certificate of conformance to the current State of Michigan Department of Transportation Standards and Specifications for Construction.
 3. Job-mix certification - Submit plant mix certification that mix equals or exceeds the current State of Michigan Department of Transportation Standards and Specifications for Construction.

PART 2 - PRODUCTS

2.1 GENERAL

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

2.2 AGGREGATES

- A. Provide aggregates consisting of crushed stone, gravel, sand, or other sound, durable mineral materials processed and blended, and naturally combined.
- B. Subbase aggregate (where required) maximum size: 38mm (1-1/2").
- C. Base aggregate maximum size:
 1. Base course over 152mm (6") thick: 38mm (1-1/2");
 2. Other base courses: 19mm (3/4").
- D. Asphaltic base course:
 1. Maximum particle size not to exceed 25.4mm (1").
 2. Where conflicts arise between this specification and the requirements in the latest version of the current State of Michigan Department of Transportation Standards

and Specifications for Construction, the current State of Michigan Department of Transportation Standards and Specifications for Construction shall control.

- E. Aggregates for asphaltic concrete paving: Provide a mixture of sand, mineral aggregate, and liquid asphalt mixed in such proportions that the percentage by weight will be within:

<u>Sieve Sizes</u>	<u>Percentage Passing</u>
19mm(3/4")	100
9.5mm(3/8")	67 to 85
6.4mm(1/4")	50 to 65
2.4mm(No. 8 mesh)	37 to 50
600µm(No. 30 mesh)	15 to 25
75µm(No. 200 mesh)	3 to 8

Plus 50/60 penetration liquid asphalt at 5 percent to 6-1/2 percent of the combined dry aggregates.

2.3 ASPHALTS

- A. Comply with provisions of Asphalt Institute Specification SS2:
 - 1. Asphalt cement: Penetration grade 50/60
 - 2. Prime coat: Cut-back type, grade MC-250
 - 3. Tack coat: Uniformly emulsified, grade SS-1H

2.4 SEALER

- A. Provide a sealer consisting of suitable fibrated chemical type asphalt base binders and fillers having a container consistency suitable for troweling after thorough stirring, and containing no clay or other deleterious substance.
- B. Where conflicts arise between this specification and the requirements in the latest version of the State of Michigan Department of Transportation Standards and Specifications for Construction, the current State of Michigan Department of Transportation Standards and Specifications for Construction shall control.

PART 3 - EXECUTION

3.1 GENERAL

The Asphalt Concrete Paving equipment, weather limitations, job-mix formula, mixing, construction methods, compaction, finishing, tolerance, and protection shall conform to the requirements of the appropriate sections of the current State of Michigan

Department of Transportation Standards and Specifications for Construction for the type of material specified.

3.2 MIXING ASPHALTIC CONCRETE MATERIALS

- A. Provide hot plant-mixed asphaltic concrete paving materials.
 - 1. Temperature leaving the plant: 143 degrees C (290 degrees F) minimum, 160 degrees C(320 degrees F) maximum.
 - 2. Temperature at time of placing: 138 degrees C (280 degrees F) minimum.

3.3 SUBGRADE

- A. Shape to line and grade and compact with self-propelled rollers.
- B. All depressions that develop under rolling shall be filled with acceptable material and the area re-rolled.
- C. Soft areas shall be removed and filled with acceptable materials and the area re-rolled.
- D. Should the subgrade become rutted or displaced prior to the placing of the subbase, it shall be reworked to bring to line and grade.
- E. Proof-roll the subgrade with maximum 45 tonne (50 ton) gross weight dump truck as directed by VA COR or VA Contracting Officer. If pumping, pushing, or other movement is observed, rework the area to provide a stable and compacted subgrade.

3.4 BASE COURSES

- A. Subbase (when required)
 - 1. Spread and compact to the thickness shown on the drawings.
 - 2. Rolling shall begin at the sides and continue toward the center and shall continue until there is no movement ahead of the roller.
 - 3. After completion of the subbase rolling there shall be no hauling over the subbase other than the delivery of material for the top course.
- B. Base
 - 1. Spread and compact to the thickness shown on the drawings.
 - 2. Rolling shall begin at the sides and continue toward the center and shall continue until there is no movement ahead of the roller.
 - 3. After completion of the base rolling there shall be no hauling over the base other than the delivery of material for the top course.
- C. Thickness tolerance: Provide the compacted thicknesses shown on the Drawings within a tolerance of minus 0.0mm (0.0") to plus 12.7mm (0.5").
- D. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 5mm in 3m (3/16 inch in ten feet).

- E. Moisture content: Use only the amount of moisture needed to achieve the specified compaction.

3.5 PLACEMENT OF ASPHALTIC CONCRETE PAVING

- A. Remove all loose materials from the compacted base.
- B. Apply the specified prime coat, and tack coat where required, and allow to dry in accordance with the manufacturer's recommendations as approved by the Architect or Engineer.
- C. Receipt of asphaltic concrete materials:
 - 1. Do not accept material unless it is covered with a tarpaulin until unloaded, and unless the material has a temperature of not less than 130 degrees C (280 degrees F).
 - 2. Do not commence placement of asphaltic concrete materials when the atmospheric temperature is below 10 degrees C (50 degrees F), not during fog, rain, or other unsuitable conditions.
- D. Spreading:
 - 1. Spread material in a manner that requires the least handling.
 - 2. Where thickness of finished paving will be 76mm (3") or less, spread in one layer.
- E. Rolling:
 - 1. After the material has been spread to the proper depth, roll until the surface is hard, smooth, unyielding, and true to the thickness and elevations shown on the drawings.
 - 2. Roll in at least two directions until no roller marks are visible.
 - 3. Finished paving smoothness tolerance:
 - a. No depressions which will retain standing water.
 - b. No deviation greater than 3mm in 1.8m (1/8" in six feet).

3.6 APPLICATION OF SEAL COAT

- A. Prepare the surfaces, mix the seal coat material, and apply in accordance with the manufacturer's recommendations as approved by the Architect or Engineer.
- B. Apply one coat of the specified sealer.
- C. Achieve a finished surface seal which, when dry and thoroughly set, is smooth, tough, resilient, of uniform black color, and free from coarse textured areas, lap marks, ridges, and other surface irregularities.

3.7 PROTECTION

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

3.8 FINAL CLEAN-UP

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

- - - E N D - - -

**SECTION 32 17 23
PAVEMENT MARKINGS**

PART 1 - GENERAL

1.1 DESCRIPTION

This work shall consist of furnishing and applying paint on pavement surfaces, in the form of traffic lanes, parking bays, areas restricted to handicapped persons, crosswalks, and other detail pavement markings, in accordance with the details as shown or as prescribed by the VA COR. Conform to the Manual on Uniform Traffic Control Devices for Streets and Highways, published by the U.S. Department of Transportation, Federal Highway Administration, for details not shown.

1.2 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish Manufacturer's Certificates and Data certifying that the following materials conform to the requirements specified.
- B. Paint.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
TT-P-1952D Paint, Traffic Black, and Airfield Marking, Waterborne
- C. Master Painters Institute (MPI):
Approved Product List - 2010

PART 2 - PRODUCTS

2.1 PAINT

Paint for marking pavement (parking lot and zone marking) shall conform to MPI No. 97, color as shown. Paint for obliterating existing markings shall conform to Fed. Spec. TT-P-1952D. Paint shall be in containers of at least 18 L (5 gallons). A certificate shall accompany each batch of paint stating compliance with the applicable publication.

2.2 REFLECTIVE GLASS BEADS (THIS SECTION NOT USED)

2.3 PAINT APPLICATOR

Apply all marking by approved mechanical equipment. The equipment shall provide constant agitation of paint and travel at controlled speeds. Synchronize one or more paint "guns" to automatically begin and cut off paint flow in the case of skip lines. The equipment shall have manual control to apply continuous lines of varying length and

marking widths as shown. Provide pneumatic spray guns for hand application of paint in areas where a mobile paint applicator cannot be used. An experienced technician that is thoroughly familiar with equipment, materials, and marking layouts shall control all painting equipment and operations.

2.4 SANDBLASTING EQUIPMENT

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall furnish not less than 0.08 m³/s (150 cfm) of air at a pressure of not less than 625 kPa (90 psi) at each nozzle used.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Thoroughly clean all surfaces to be marked before application of paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement with scrapers, wire brushings, sandblasting, mechanical abrasion, or approved chemicals as directed by the VA COR. The application of paint conforming to Fed. Spec. TT-P-1952D is an option to removal of existing paint markings on asphalt pavement. Apply the black paint in as many coats as necessary to completely obliterate the existing markings. Where oil or grease are present on old pavements to be marked, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application. After cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint. Pavement marking shall follow as closely as practicable after the surface has been cleaned and dried, but do not begin any marking until the VA COR has inspected the surface and gives permission to proceed. The Contractor shall establish control points for marking and provide templates to control paint application by type and color at necessary intervals. The Contractor is responsible to preserve and apply marking in conformance with the established control points.

3.2 APPLICATION

Apply uniformly painted and reflective pavement marking of required color(s), length, and width with true, sharp edges and ends on properly cured, prepared, and dried

surfaces in conformance with the details as shown and established control points. The length and width of lines shall conform within a tolerance of plus or minus 75 mm (3 inches) and plus or minus 3 mm (1/8 inch), respectively, in the case of skip markings. The length of intervals shall not exceed the line length tolerance. Temperature of the surface to be painted and the atmosphere shall be above 10°C (50°F) and less than 35°C (95°F). Apply the paint at a wet film thickness of 0.4 mm (0.015 inch). Apply paint in one coat. At the direction of the VA COR, markings showing light spots may receive additional coats. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of asphalt, and pick-up, displacement or discoloration by tires of traffic. If there is a deficiency in drying of the marking, discontinue paint operations until cause of the slow drying is determined and corrected. Remove and replace marking that is applied at less than minimum material rates; deviates from true alignment; exceeds stipulated length and width tolerances; or shows light spots, smears, or other deficiencies or irregularities. Use carefully controlled sand blasting, approved grinding equipment, or other approved method to remove marking so that the surface to which the marking was applied will not be damaged.

3.3 PROTECTION

Conduct operations in such a manner that necessary traffic can move without hindrance. Protect the newly painted markings so that, insofar as possible, the tires of passing vehicles will not pick up paint. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic. Efface and replace damaged portions of markings at no additional cost to the Government.

3.4 DETAIL PAVEMENT MARKING

Use Detail Pavement Markings, exclusive of actual traffic lane marking, at exit and entrance islands and turnouts, on curbs, at crosswalks, at parking bays, and at such other locations as shown. Show the International Handicapped Symbol at indicated parking spaces. Color shall be as shown. Apply paint for the symbol using a suitable template that will provide a pavement marking with true, sharp edges and ends. Place detail pavement markings of the color(s), width(s) and length(s), and design pattern at the locations shown.

3.5 TEMPORARY PAVEMENT MARKING

When shown or directed by the VA COR, apply Temporary Pavement Markings of the color(s), width(s) and length(s) shown or directed. After the temporary marking has served its purpose and when so ordered by the VA COR, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that the surface to which the marking was applied will not be damaged. As an option, an approved preformed pressure sensitive, reflective, adhesive tape type of temporary pavement marking of the required color(s), width(s) and length(s) may be furnished and used in lieu of temporary painted and reflective marking. The Contractor shall be fully responsible for the continued durability and effectiveness of such marking during the period for which its use is required. Remove any unsatisfactory tape type marking and replace with painted and reflective markings at no additional cost to the Government.

3.6 FINAL CLEAN-UP

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

--- E N D ---

**SECTION 32 90 10
REFINED COAL TAR EMULSION SLURRY
WITH ADDITIVES
ASPHALT PAVEMENT SEALCOAT**

PART 1 - GENERAL

1.01 - SUMMARY

A. Section Includes

1. Refined coal tar emulsion slurry seal coat with additive over existing, aged asphaltic concrete pavement.

1.02 - DESCRIPTION

- A. Provide two coats of refined coal tar emulsion sealer with additive in all areas.

1.03 - REFERENCES

A. ASTM Standards

1. C136 Method of Sieve Analysis of Fine & Coarse Aggregates
2. D160 Practice of Sampling Bituminous Materials
3. D490 Standard Specification for Road Tar
4. D2939 Standard Test Methods for Emulsified Bitumen Used as Protective Coatings
5. D4866 Standard Performance Specification for Coal Tar Pitch Emulsion
6. Pavement Sealer Mix Formulations Containing Mineral Aggregates and Optional Polymeric Admixtures

B. Federal Specifications

1. RP-355 Pitch, Coal Tar Emulsion (Coating for Bituminous Pavements)

PART 2 - PRODUCTS

2.01 - MATERIALS

A. Refined Coal Tar Emulsion: A refined coal tar emulsion prepared from a High temperature refined coal tar conforming to the requirements of ASTM Specification D490 for RT12. The use of oil and water gas tar is not allowed. Base refined coal tar emulsion must conform to all requirements of Federal Specification RP-355.

B. Aggregate: Use washed dry silica sand or boiler slag free of dust, trash, clay, organic materials or other contaminants. It is recommended that this aggregate meet the gradation in Table 1, when tested in accordance with ASTM C136.

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TABLE 1. GRADATION OF AGGREGATES *

Sieve Size	Percent Retained	Minimum	Maximum
#20 or coarser (0.850 mm)	0	2	
#30 (0.600 mm)	0	12	
#40 (0.425 mm)	2	60	
#50 (0.300 mm)	5	60	
#70 (0.212 mm)	5	60	
#100 (0.150 mm)	5	30	
#140 (0.106 mm)	0	10	
#200 (0.075 mm)	0	2	
Finer than #200	0	0.3	

* Table 1 represents the maximum range of aggregate gradations. In all cases the refined coal tar emulsion supplier is to give written approval of the aggregate used in the mix design.

C. Additive: As specified by the coal tar emulsion manufacturer. (See Appendix A, #1 of PCTC 01.)

D. Water: Use water for mixing that is potable and free of harmful soluble salts. Control water temperature so it is at least 50°F (10°C).

E. Crack Sealant: Must be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the VA COR.

F. Oil Spot Primer: Must be certified for compatibility with the refined coal tar emulsion by the manufacturer of the refined coal tar emulsion, and approved by the engineer.

2.02- APPLIED MIXTURE

A. Composition: The refined coal tar emulsion seal coat is to consist of a mixture of refined coal tar emulsion, water, additive and aggregate. For each gallon of coal tar emulsion, do not add more than 7 pounds of aggregate. The composition must have written approval of the coal tar emulsion manufacturer.

B. Application Rate: Application rates are not to exceed 0.17 gal/SY/coat, and at no time are total coats to exceed 0.51 gal/SY.

2.03 PRECAUTIONS

- A. Sealer should not be applied unless pavement temperature is at least 50 degrees F (10 degrees C) and the air temperature is 50 degrees F (10 degrees C) and rising.
- B. Sealer should not be applied during rainy or wet weather, or when rain is anticipated within eight hours after application is completed.
- C. Sealer should not be applied to hot surfaces under the summer sun (over 90 degrees F, ambient) without first cooling the surface with clean water. Water should dampen the surface without leaving puddles.
- D. Since an emulsion may be damaged by freezing, it should be protected at all times when the temperature drops below 40 degrees F (4 degrees C).

2.04 EQUIPMENT

- A. Use application equipment that is capable of applying the required coating rates evenly over the entire width of the application mechanism to provide a uniformly coated surface. To insure this, equip all spray units with a pumping distribution system using positive displacement pumps. Equip all squeegee/ brush units with squeegees/brushes that are properly adjusted and in a condition so that the application of seal coat materials is without streaks.
- B. The mixing part of the application equipment must be tank type with a mechanically powered, full sweep mixer capable of homogeneously mixing the entire contents of the tank.
- C. Use of hand squeegee or brush application is to be restricted to places not accessible to the mechanized equipment or to accommodate neat trim work at curbs, etc. Material that is applied by hand is to meet the same standards as that applied by machine.

PART 3--EXECUTION

3.01 SURFACE PREPARATION

- A. Preparation of Aged Asphalt Pavement Surfaces (See Appendix A, #5)
 - 1. Patching: Patch bituminous pavement surfaces which have been softened by petroleum derivatives or have failed due to any other cause. Remove damaged pavement to the full depth of the damage and replace with new bituminous concrete similar to that of the existing pavement. If cold-applied asphalt material contains solvent, complete patching a minimum of 90 days prior to the planned application of the sealer to permit solvent to escape before sealing.

2. Crack Sealing: Remove all vegetation and debris from cracks to a minimum depth of ½". If extensive vegetation exists treat the specific area with a concentrated solution of a water-based herbicide (as recommended by the coal tar emulsion manufacturer). Fill all cracks, ignoring hairline cracks (< 1/4" wide) with a crack sealant. Wider cracks (over 1½" wide), along with soft or sunken spots, indicate that the pavement or the pavement base should be repaired or replaced as in #1 above.
3. Cleaning Existing Surface: Clean pavement surface immediately prior to placing the prime coat or seal coat by sweeping, flushing well with water, leaving no standing water, or a combination of both, so that it is free of dust, dirt, grease, vegetation, oil or any type of objectionable surface film.
4. Oil Spot Priming: Remove oil or grease that has not penetrated the asphalt pavement by scraping or by scrubbing with a detergent, then wash thoroughly with clean water. After cleaning, treat these areas with the oil spot primer (as recommended by the coal tar emulsion manufacturer).
5. Pavement Priming: Older, highly oxidized pavements sometimes have trouble allowing pavement sealers to adhere. To insure adhesion to sound but oxidized pavements, mix and apply a prime coat of a type and at a rate recommended by the coal tar emulsion manufacturer, after all loose aggregate is removed.

3.02 MIXING and APPLICATION OF REFINED COAL TAR EMULSION SLURRY

A. MIXING

1. Blend the coal tar emulsion mixture in the equipment described in section 2.04 using the ingredients recommended by the coal tar emulsion manufacturer. The mixing must produce a smooth homogeneous mixture of uniform consistency. (Consult coal tar emulsion supplier for its recommended order of addition of the ingredients). During the entire mixing and application process, no breaking, segregating or hardening of the emulsion, nor balling or lumping of the sand is to be permitted. Continue to agitate the sealcoating mixture in the mixing tank at all times prior to and during application so that a consistent mix is available for application.
2. Small additional increments of water may be needed to provide a workable consistency, but in no case is the water content to exceed the amount specified by the coal tar emulsion manufacturer.

B. APPLICATION OF AGGREGATE FILLED SEALCOAT

1. Water Fog: To provide maximum adhesion the coal tar emulsion manufacturer may require a water fog spray (dampening).
2. Prime Coat: As needed, see 3.01-A.5.
3. First Coat: Apply the mixture uniformly to obtain the rates specified in 2.02-B above.
4. Drying and Initial Cure Between Coats: Allow each coat to dry and initially cure before applying any subsequent coats. Follow coal tar emulsion manufacturer's recommendations.
5. Second Coat: Apply the second coat as outlined for the first coat above.
7. Final Look: The finished surface must present a uniform texture.

C. DRYING AND INITIAL CURE

1. The final coat must be allowed to dry a minimum of eight hours of good daylight drying conditions before opening to traffic, and initially cure enough to drive over without damage to the sealcoat.
2. If marginal weather conditions exist during this eight hour drying time, additional time will be required. In some cases this could exceed 24 hours. Check the surface after this for trafficability before opening it to vehicle traffic.

D. STRIPING

1. Use a compatible striping paint recommended by the coal tar emulsion manufacturer.

Appendix A

Definition of Terms

1. Additive: One or more ingredient that can be added to a specific refined coal tar emulsion, water and/or sand mixture to improve the coatings' durability, fuel resistance, drying time, color uniformity, and/or length of time required before opening the surface to traffic. This material can also be used to modify the wet mixture's viscosity to improve aggregate suspension.
2. Application Rate: The amount of volume of mixed material applied per area of pavement surface, usually expressed in gallons per square yard.
3. Applied Mixture: The combination of all ingredients mixed together and ready for application to the pavement. Also referred to as seal coat or sealer.
4. Asphaltic Concrete Pavements, New: Pavements that have been placed less than 90 days.

5. Asphaltic Concrete Pavements, Aged: Pavements that have weathered over at least one summer season and have shown signs of one or more of the following: cracking, raveling, aggregate polishing and/or graying due to oxidation.
6. ASTM: American Society of Testing and Materials; a scientific and technical organization for the development of standards on characteristics and performance of materials, products, systems and services.
7. Brush applicator: A hand type or mechanized brush used to apply pavement sealer.
8. Crackfiller: A material that is placed in a pavement crack or joint to fill but not necessarily seal the void created by the crack or joint.
9. Crack sealant: A material that has adhesive and cohesive properties to seal cracks, joints or other narrow openings (less than 1 1/2" wide) in pavements against the entrance or passage of water or other debris.
10. Crude Coal Tar: Condensed material taken from the coking process (high temperature heating of coal under a vacuum) and containing all the volatile constituents.
11. Cure, final (of the seal coat): The process of evaporation of water and volatiles of the applied sealcoating mixture over a period of days, resulting in the coating reaching its ultimate strength. The duration of this process is dependent upon ambient conditions.
12. Cure, initial (of the seal coat): The condition of an applied sealcoating material that enables it to withstand vehicle traffic without damage to the sealcoat.
13. Drying (of the seal coat): The process of evaporation of water of the applied sealcoating mixture, resulting in the coating being able to sustain light foot traffic.
14. PCTC: The Pavement Coatings Technology Center; a cooperative group of manufacturers, suppliers, contractors, government agencies and professional organizations that develop standards, specifications, test methods and other technical data for the pavement coatings industry.
15. Priming: Application of an initial coat of a material designed to assist the adhesion of the additional coats of sealcoating materials. Primers are always used as under-coatings and are not designed to be used by themselves.
16. Refined Coal Tar: A selectively distilled coal tar meeting the requirements of ASTM D490 grade RT-12.
17. Refined Coal Tar Emulsion: A stable and homogeneous dispersion of refined coal tar, clay, mineral fillers and specialty chemicals in water.
18. Sealcoating: Process of applying a protective coating to an asphaltic concrete pavement.

19. Spray Unit: A piece of equipment equipped with a mixing tank and positive displacement pump that can homogeneously mix and apply protective coatings uniformly over the entire width of a spray bar or wand type application device.

20. Squeegee Unit: A piece of equipment equipped with a mixing tank and squeegee that can homogeneously mix and apply protective coatings uniformly over the entire width of a rubber squeegee or brush type application device.

21. Trafficability: The ability of a sealcoating material to withstand vehicle traffic without damage to the sealcoat.

22. Uniform coated surface: A surface that has an even distribution of sealcoating material free of pinholes, streaks and/or other uneven characteristics.

Appendix B

Personnel Safety and Environment When Using Refined Coal Tar Emulsion

Coal tar and its derivatives have been in use since the early 1900s. Because of this lengthy history, the properties and characteristics of refined tar products are well known and understood. The term coal tar has historically referred to the crude coke oven tar produced in the manufacture of steel and not refined coal tar. Refined coal tar is a selectively distilled product that is utilized in the preparation of pavement sealers and other consumer and industrial products. Refined coal tar RT-12, as defined by ASTM D490, is the grade utilized in the manufacture of refined coal tar emulsion pavement sealer. Although it is produced using similar techniques that are employed in the production of asphalt from crude oil, it is not a petroleum derivative. Consequently, its unique composition imparts properties that make pavement sealers resistant to chemicals, oil, gas, water and ultraviolet radiation (sunlight).

Because of refined coal tar's distinct odor, there is a natural concern about its hazards. However, air monitoring studies conducted during various methods of application indicate that emissions are negligible and well below Occupational Health and Safety Administration (OSHA) exposure limits. Nevertheless, like many industrial chemicals, refined coal tar exhibits some potentially harmful properties, but can be controlled by using good personal hygiene and safe work practices.

- * Wash hands before eating, drinking or using tobacco products.
- * Wear full length clothing and change clothing daily.
- * Launder contaminated clothing thoroughly before wearing again.
- * Shower at the end of each work day.
- * Wear chemical or liquid repellent gloves.

* During spray applications wear protective glasses and a non-toxic particulate mask to avoid inhalation of sealer droplets, and work from "downwind to upwind."

* Use protective creams specifically formulated for coal tar products, or a general protective cream used in conjunction with a minimum SPF 15 sun block.

Adherence to these simple practices will limit potential exposures, including exposure to the sun (itself a contributor to skin cancer risk), thereby reducing the possibility of chronic exposure symptoms contributing to skin cancer.

Refined coal tar-based sealers can be specified throughout the country without restriction. Based upon extensive Toxicity Characteristic Leaching Procedure (TCLP) testing and the review of current Federal regulations, neither RT-12 pavement sealer base nor refined tar pavement sealer emulsion manufactured with ASTM D490 Grade RT-12 refined coal tar would be classified as a hazardous waste. Therefore, refined coal tar emulsions would not be subject to the Resource Conservation & Recovery Act (RCRA) disposal requirements. Further, refined coal tar is not banned by any state regulatory agency and complies with all current Volatile Organic Compound (VOC's) regulations.

Based upon its historical performance and widespread usage compared to other available products, refined coal tar emulsion remains the most effective and continues to be the preferred pavement sealer throughout the United States and Canada. Refined coal tar emulsion gives the sealer unsurpassed wear characteristics and protects the pavement from motor oil, gasoline and other petroleum products.

Ask your supplier for material safety data sheets and technical support to assure the safe and proper use of refined coal tar pavement sealer. Documentation and source reference reports are available for a nominal fee by writing the Pavement Coating Technology Center, Department of Civil Engineering, University of Reno, Reno, NV 89557-0152.

i "Using Refined Coal Tar Emulsions Safely," Pavement Maintenance Magazine — March 1992 Issue

ii "Toxicity Characteristics Leaching Procedure Results for RT-12 Refined Tar as well as Sealer" (Federal material and various design mixes formulated with RT-12)

END OF SECTION

Section 501. PLANT PRODUCED HOT MIX ASPHALT

501.01. Description. This work consists of providing and placing Hot Mix Asphalt (HMA) mix using Superpave Mixture Design Methods.

A. Terminology.

Broken Aggregate. Cracked aggregate caused by construction operations.

Crack. A visible fissure of varying length and orientation in the HMA, partially or completely through at least one course.

Flushing. A shiny or reflective condition, tacky to the touch, appearing on the HMA surface when asphalt binder collects in the voids at high pavement temperatures.

HMA Mix Design. The selection and proportioning of aggregates, mineral filler, Reclaimed Asphalt Pavement (RAP), and asphalt binder to meet the mix design criteria required by the contract.

HMA Segregation. Areas of HMA pavement exhibiting non-uniform distribution of coarse and fine aggregate particles, visually or otherwise identifiable.

Job Mix Formula (JMF). An HMA mix for a specific project, including adjustments to optimize the field application.

Lot. A discrete tonnage of one mix, typically made up of five sublots.

Pavement. The completed HMA placement, including layers on driving lanes and shoulders.

Pavement Edge. The extremity boundaries of the pavement.

Roller Cracking. High density surface map-cracking that appears immediately after rolling.

Rutting. A depression or displacement of the HMA surface that occurs in a longitudinal direction or a localized area.

Sublot. A portion of a lot represented by a complete set of quality assurance tests.

Target Value. A JMF parameter value that may be adjusted, if approved by the Engineer, to account for changes in the physical properties of the mixture.

501.02. Materials. Provide materials in accordance with the following:

Superpave HMA Mixtures..... [902](#)

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Superpave Aggregates.....	902
Mineral Filler, 3MF.....	902
Anti-Foaming Agent.....	904
Asphalt Binders.....	904
Bond Coat, SS-1h, CSS-1h.....	904

Plant produced HMA consists of asphalt binder, aggregates, mineral filler, and other additives.

Provide release agents that do not harm the HMA mixture. Do not use fuel oil or other distillate derivatives.

Provide the HMA mix type and the performance grade of asphalt binder as required by the contract.

Provide blended aggregates for HMA top course mixtures, except top courses for shoulders, bike paths, temporary roads, and parking areas, meeting the required Aggregate Wear Index (AWI).

A. Composition of HMA Mixtures.

1. **Mix Design.** Develop an HMA mix design in accordance with the [HMA Production Manual](#) and submit to the Department. The Department will evaluate the design in accordance with Section 1 of the [HMA Production Manual](#), "Procedures for HMA Mix Design Processing."

Provide written certification that the materials in the mix design are from the same source and meet the material properties in the mix design or the Department-approved JMF. Ensure that all JMF adjustments are in accordance with the [HMA Production Manual](#).

The Contractor may use mix designs approved by the Department on other projects, if approved by the Engineer. Provide combined aggregate blends meeting the properties specified in section [902](#). Provide a mix design that meets the requirements of Table 501-1, Table 501-2, and Table 501-3 as applied to combined aggregate blends.

For mix design purposes, top and leveling courses are the mix layers within 4 inches of the surface. The base course consists of the layers below 4 inches from the surface. For mix layers within the 4-inch threshold, if less than 25 percent of the mix layer is within 4 inches of the surface, the mix layer is a base course.

For projects that specify a mix type E03, the Contractor may use a mix type LVSP.

If High Stress HMA is shown on the plans, provide the same mix design as required for the mainline top and leveling courses, except change the performance graded binder as shown on the HMA application table.

Table 501-1 Superpave Mix Design Criteria					
Design Parameter	Mix Number				
	5	4	3	2	LVSP
Percent of Maximum Specific Gravity (%G _{mm}) at the design number of gyrations, (N _d) (c)	96.0% (a)				
%G _{mm} at the initial number of gyrations, (N _i)	See Table 501-3				
%G _{mm} at the maximum number of gyrations, (N _m)	98.0%				
VMA min % at N _d (based on aggregate bulk specific gravity, (G _{sb})) (c)	15.00	14.00	13.00	12.00	14.00
VFA at N _d	See Table 501-2 (b)				
Fines to effective asphalt binder ratio (P _{No200} /P _{be})	0.6–1.2				
Tensile strength ratio (TSR)	80% min				
<p>a. For mixtures meeting the definition for base course, design mixtures to 96.0% of Maximum Specific Gravity %G_{mm} at the design number of gyrations, (N_d). During field production, increase %G_{mm} at the design number of gyrations, (N_d) to 97.0%.</p> <p>b. For base course or regressed shoulder mixtures, the maximum criteria limits do not apply.</p> <p>c. Lower Target Air Voids by 1.0% if used in a separate shoulder paving operation, unless otherwise shown on the plans.</p>					

Table 501-2 VFA Minimum and Maximum Criteria			
Estimated Traffic (million ESAL)	Mix Type	Top & Leveling Courses	Base Course
≤0.3	LVSP	70–80	70–80
≤0.3	E03	70–80	70–80
>0.3 – ≤1.0	E1	65–78	65–78
>1.0 – ≤3.0	E3	65–78	65–78
>3.0 – ≤10	E10	65–78 (a)	65–75
>10 – ≤30	E30	65–78 (a)	65–75
>30 – ≤100	E50	65–78 (a)	65–75
a. The specified VFA range for mix Number 5 is 73%–76%.			

Estimated Traffic (million ESAL)	Mix Type	%G _{mm} at (N _i)	Number of Gyration (a)		
			N _i	N _d	N _m
≤0.3	LVSP	91.5%	6	45	70
≤0.3	E03	91.5%	7	50	75
>0.3 – ≤1.0	E1	90.5%	7	76	117
>1.0 – ≤3.0	E3	90.5%	7	86	134
>3.0 – ≤10	E10	89.0%	8	96	152
>10 – ≤30	E30	89.0%	8	109	174
>30 – ≤100	E50	89.0%	9	126	204

a. Compact mix specimens fabricated in the SGC to N_d. Use height data provided by the SGC to calculate volumetric properties at N_i. Compact mix specimens at optimum P_b to verify N_m for mix design specimens only.

2. **Recycled Mixtures.** The Contractor may substitute Recycled Asphalt Pavement (RAP) for a portion of the new material required to produce HMA mixture. Design and produce the mix to meet the criteria in this subsection and the contract.

- a. **Stockpile Requirements.** Process RAP to the size required for the specified HMA mix. Ensure the stockpile contains enough material to produce the recycled mixtures the Engineer approves for the project. If the RAP stockpile is not sufficient to produce recycled mix quantities required for the project, provide an Engineer-approved mix design without RAP at the same unit price.

Provide documentation of testing and accumulated tonnage in the stockpile to the MDOT laboratory. The Contractor may estimate the tonnage. The Department will begin evaluating the mix design after receipt of the documentation.

- b. **Mix Design.** Submit required documentation for recycled mix designs in accordance with Section 1 of the [HMA Production Manual](#), "Procedures for HMA Mix Design Processing."

B. **HMA Plant Certification.** Ensure hot mix asphalt plants are certified by the Department at least 3 work days before mix production begins. The Engineer will certify hot mix asphalt facilities in accordance with Section 2 of the [HMA Production Manual](#), "Certification Procedure of HMA Plants." Post a seal of certification in the plant control office.

C. **HMA Production.** Submit an approved mix design for the mix required to the Engineer at least 2 work days before production begins.

Ensure even heating of the mass of asphalt binders and maintain heat control. Heat asphalt binders to the temperature required for the type of binder, except ensure that neither the asphalt binder nor the HMA

exceed the maximum temperature specified in Table 904-7. The Department will reject asphalt binder and mix if the temperature exceeds the maximum specified in Table 904-7. The Department will reject contaminated asphalt binder.

Stockpile aggregates at the facility, in a manner that prevents segregation. Dry aggregates to a moisture content that will ensure an appropriately coated HMA mix. For batch and continuous plants, the Department will reject aggregates in the hot bins that contain sufficient moisture to cause foaming or a water-saturated mixture. Remove rejected materials from the bins.

Place uniform gradations of aggregates in the cold feed system. If providing a blend of aggregates for the mix by combining aggregates from at least two cold feed bins, ensure the blend meets the combined gradation (from JMF) quality control tolerances.

The Engineer will allow the use of at least one hot aggregate bin to proportion aggregates to meet the JMF tolerances, if the cold feed requirements are met.

501.03. Construction.

A. **Equipment.** Provide equipment in accordance with section [107](#), capable of producing pavement that meets the requirements of this section.

1. **Cold-Milling Machines.** Provide equipment that consistently removes the HMA surface, in one or more passes, to the required grade and cross section, and produces a uniformly textured surface. Provide machines equipped with the following:
 - a. Automatically controlled and activated cutting drums, and
 - b. Grade reference and transverse slope control capabilities.
2. **Hauling Equipment.** Ensure transport trucks are equipped to protect the mix from the weather and retard the loss of heat.
3. **Pressure Distributor.** Provide a pressure distributor in accordance with subsection [505.03.A.1](#).
4. **Pavers.** Equip each paver with a full-width vibratory or tamper bar screed capable of spreading and finishing HMA to the required cross section and grade. Use a paver that produces a uniformly finished surface, free of tears, other blemishes, and measurable segregation.

Equip the paver to provide a uniform head of material ahead of the screed. Install reverse pitch augers or paddles inside the ends of the auger shafts to force the mix to the center of the main screed.

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Ensure extensions, added to the main screed, provide the same vibrating or tamping action and heating capabilities as the main screed. Adjust extensions to the main screed so, after breakdown rolling, no longitudinal marks remain on the surface. Equip in-line screed extensions with a continuation of the automatically controlled spreading augers to within 12 inches of the outside edge. Follow the manufacturer's recommendations for other screed extensions.

Except for the paving operations listed in subsection [501.03.F.1.a](#) through subsection [501.03.F.1.d](#), equip pavers with an automatically controlled and activated screed with grade reference and transverse slope control. Use an Engineer-approved grade referencing attachment, at least 30 feet long, for lower courses and the first pass of the top course. Ensure the Engineer approves alternate grade referencing attachments before use.

After placing the first pass of the top course, the Contractor may, with prior approval from the Engineer, substitute a joint matcher, a grade referencing attachment at least 10 feet long, or other grade referencing equipment for constructing adjacent passes of the top course.

5. Rollers.

- a. **Steel-Wheeled Rollers.** Provide self-propelled vibratory steel-wheeled rollers, static tandem rollers, or self-propelled static three-wheeled rollers. Provide a steering device that allows the roller to follow the established alignment. Equip rollers with wheel sprinklers and scrapers. Provide smooth roller wheels, free of openings or projections that will mar the pavement surface.

Provide vibratory rollers with an automatic shutoff to deactivate the vibrators if the roller speed decreases below ½ mph. Provide rollers that operate in accordance with the manufacturer's recommended speed, impacts per foot, and vibration amplitude for the thickness of HMA mix.

- b. **Pneumatic-Tired Rollers.** Provide self-propelled pneumatic-tired rollers. Equip rollers with at least seven wheels spaced on two axles so the rear group of tires does not follow in the tracks of the forward group, providing at least ½-inch tire path overlap. Provide smooth tires capable of being inflated to the pressure recommended by the roller or tire manufacturer. Equip the rollers with a mechanism that can smoothly reverse the motion of the roller.

Equip the rollers with wheel scrapers and skirting to enclose the wheels to within 3 inches of the pavement surface. Use a release agent to prevent material from sticking to the tires and being deposited on the top course pavement during rolling.

- c. **Combination Rollers.** The Contractor may use combination pneumatic-tired and steel-wheeled rollers manufactured specifically for HMA compaction, if equipped with the required sprinklers and scrapers.
 6. **Spreaders.** Use self-propelled spreaders capable of pushing the hauling units. Ensure spreaders can maintain the required width, depth, and slope, without causing segregation.
 7. **Material Transfer Device.** When a Material Transfer Device (MTD) is required, it must be capable of delivering HMA mix from the truck transport to the paver hopper to ensure constant paver speed, remixing HMA material using manufacturer's developed technology, and depositing material in the paver hopper. Provide a paver hopper insert with at least a 10 ton capacity in the paver and keep at least one-third full of mix during paving.
 8. **Compressed Air System.** If a compressed air system is required for cleaning pavement, equip the air compressor with a moisture separator to remove oil and water from the air supply. Provide a compressor capable of producing at least 100 psi and continuous 150 cfm airflow.
 9. **Miscellaneous Equipment.** Provide a straightedge at least 10 feet long and other tools to finish the work.
 10. **Lights on Equipment.** If maintaining traffic on HMA construction, equip equipment within the project, including cold-milling machines, distributors, and rollers, with at least one Department-approved flashing, rotating, or oscillating amber light. Equip pavers with at least one light on each side. Mount the lights so the warning signal is visible to traffic in every direction. Operate the lights while work is in progress. Ensure hauling units activate four-way flashers on the project.
- B. **Preparation of Base.** Provide subgrade, subbase, aggregate base course, crushed and shaped base, or rubblized base in accordance with the relevant sections of Division 2 and Division 3, before HMA placement.
- C. **Preparation of Existing Pavement.** Prepare the existing surface as required to construct HMA pavements, shoulders, and approaches.

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1. **Drainage Structures, Monument Boxes, and Water Shutoffs.** Adjust, temporarily lower, or both, catch basins, manhole covers, monument boxes, and water shutoffs in accordance with subsection [403.03.A](#).

2. **Cleaning Pavement.** Using methods approved by the Engineer, clean dirt and debris from the pavement surface and paved shoulders before placing HMA. Remove loose material from joints and cracks using compressed air.

If the Engineer determines the compressed air system will not remove deleterious material, remove loose material by a hand or mechanical method, as approved by the Engineer. The Department will pay for removal of material by hand or mechanical methods in accordance with subsection [501.04.E](#).

Do not place HMA until the Engineer inspects and approves the condition of the existing pavement.

3. **Removing Existing Pavement for Butt Joints.** If a butt joint is required, remove the existing surface to the thickness of the proposed overlay, for the full width of the joint. Uniformly taper the removal to the original surface over at least 35 feet.
4. **Edge Trimming.** For required removal of HMA shoulder material or no greater than 1 foot width of HMA pavement, cut the HMA material full depth along the pavement edge or removal line to prevent tearing the pavement surface. Cut joints, where the completed surface will be exposed, with a saw, cold-milling machine, or other methods approved by the Engineer. Cut joints, where the completed surface will be covered by HMA mix, with a coulter wheel, saw, cold-milling machine, or other method approved by the Engineer.
5. **Cold-Milling HMA Surfaces.** Before milling existing pavement, obtain a Department-approved mix design in accordance with subsection [501.02.A](#), and ensure the availability of HMA mix quantities to cover milled surfaces.

Remove the HMA surface to the depth, width, grade, and cross section shown on the plans. Backfill and compact depressions resulting from removal of material below the specified grade, in accordance with subsection [501.03.C.9](#).

If the milling machine discovers buried structures within the specified grade, such as valve boxes, manholes, or railroad tracks that are not identified on the plans, the Department will pay for all associated costs, as extra work, in accordance with subsection [103.02](#).

Immediately after cold-milling, clean the surface. Dispose of removed material in accordance with subsection [104.07.D](#) and subsection [204.03](#).

6. **Removing HMA Surface.** Except as specified in subsection [501.03.C.4](#), removing HMA surface applies to removing HMA overlying a base course that is to remain in place.

Cut joints, exposed in the completed surface, with a saw or cold-milling machine. Cut joints, covered by HMA mix, with a coultter wheel, saw, or cold-milling machine. Obtain the Engineer's approval of alternate methods for cutting joints.

When removing HMA overlying a base course that is to remain in place, cut the edges of the surface requiring removal along straight lines for the full depth of the HMA surface.

When removing HMA by cold-milling, the Engineer may direct the Contractor to remove less than the full depth of HMA surface.

7. **Removing HMA Patches.** Remove patches that may compromise the performance of the overlay.
8. **Joint and Crack Clean Out.** If the plans show joint and crack clean out, use mechanical or hand methods to remove joint sealants to at least 1 inch deep. Remove vegetation, dirt, and debris that cannot be removed using the methods specified in subsection [501.03.C.2](#), from transverse and longitudinal joints and cracks. Use hand patching to fill cleaned joints and cracks at least 1 inch wide.
9. **Hand Patching.** If the contract requires hand patching, fill holes, depressions, joints, and cracks in the existing pavement and replace existing patches. Compact the hand patching material in no greater than 3 inch layers to the adjacent pavement surface grade using a machine vibrator or Department-approved roller. Use top course or other Engineer-approved mix for hand patching material.
10. **Repairing Pavement Joints and Cracks.** Repair joints and cracks as required.

D. **Bond Coat.** Uniformly apply the bond coat to a clean, dry, surface with a pressure distributor. Obtain the approval of the Engineer for the application rate after work begins. Apply the bond coat ahead of the paving operation to allow the bond coat to cure before placing HMA.

Do not leave pools of bond coat on the surface and do not spray the bond coat on adjacent pavement surfaces. Apply the bond coat to each

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HMA layer and to the vertical edge of the adjacent pavement before placing subsequent layers.

E. Transportation of Mixtures. Weigh each load of HMA, accepted by the Department, to the nearest 20 pounds on an approved scale with an automatic printout system. Provide a scale and printout system for platform and suspended scales in accordance with subsection [109.01.B.6](#).

Apply a release agent, in accordance with subsection [501.02](#), to hauling units. The Engineer will reject loads with excessive amounts of release agent. Do not place crusted HMA in the paver.

The Department will reject loads with a temperature either below 250 °F or greater than ±20 °F from the recommended maximum mixing temperature specified by the binder producer at the time of discharge from behind the screed.

F. Placing HMA.

1. **General.** Provide a pavement as shown on the plans.

Place HMA on a cured bond coat using pavers in accordance with subsection [501.03.A.4](#), unless placing mixtures for the following:

- a. Variable width sections;
- b. The first course of a base course mix on a subgrade or sand subbase;
- c. Base course mixtures for shoulders and widening less than 10½ feet wide; or
- d. Top and leveling course mixes for shoulders and widening less than 8 feet wide.

Place HMA mix in layers, and do not exceed the application rate. If the application rate for an HMA pavement exceeds the maximum rates specified in Table 501-4, and the edges are not confined, construct the pavement in at least two layers.

Mix Number	Course Application	Application Rate, (lb/yd ²) minimum–maximum (a)
2	Base	435–550
3	Base, Leveling	330–410
4	Leveling, Top	220–275
5	Top	165–220
LVSP	Leveling, Top	165–250
LVSP	Base	220–330

a. Minimum application rates do not apply to wedging courses.

Wedge with HMA to remove irregularities in the existing road surface. Place and compact HMA wedging to correct the foundation. Allow the wedging to cool enough to support construction equipment without causing visible distortion of the mat before placing subsequent wedging, base, leveling, or top course mixtures.

Place HMA mix to the slope and width shown on the plans. Place subsequent HMA course to align the vertical edge with the previous courses, without constructing a ledge. Correct ledges that result from placing material in excess of the width shown on the plans at no additional cost to the Department.

Place shoulder aggregate and compact flush after placement of each layer of HMA at the end of the paving day or place traffic control devices in accordance with subsection [812.03](#), at no additional cost to the Department. Complete final shaping and compaction of the shoulders after placing the top course of HMA.

If delays slow paving operations and the temperature of the mat immediately behind the screed falls below 200 °F, stop paving and place a transverse construction joint. If the temperature of the mat falls below 190 °F before initial breakdown rolling, remove and replace the mat at no additional cost to the Department.

If placing the uppermost leveling and top course, place the longitudinal joint to coincide with the planned painted lane lines.

If the temperature of the mat falls below 170 °F before placing the adjacent mat, apply bond coat to the vertical edge of the mat.

If constructing the lanes with at least two pavers in echelon, match the depth of loose HMA from each paver at the longitudinal joints.

Transition the new mat to existing surfaces at the beginning and end of resurfacing sections and at intersections unless using butt joints. Transition the new mat to existing surfaces at a rate of 1 inch over 35 feet. Construct transitions on a cured bond coat applied at a rate of 0.10 gallons per square yard. After compaction, spray with bond coat, sand, and roll the first 3 feet of the joint and 1 foot of the existing surface.

2. Joints in HMA Pavement.

- a. **Transverse Construction Joint.** If constructing a transverse construction joint, stop the paver and lift the screed before material falls below the auger shaft. Remove the paver and roll through the planned joint location. Cut a transverse vertical joint and remove excess HMA.

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Place burlap, canvas, or paper as a bond breaker ahead of, and against the vertical face. Place HMA against the bond breaker and taper from the new mat to the existing surface. Extend the temporary taper 5 feet for each inch of mat thickness, or as directed by the Engineer. Compact and cool the temporary taper before allowing traffic on the new surface. Remove the temporary taper before resuming paving.

- b. **Vertical Longitudinal Joint.** When opening to traffic, plan the work to resurface adjacent lanes to within one load of the same ending point at the completion of paving operations each day. Construct a vertical joint to conform to the pavement cross section.

When compacting an unsupported (unconfined) edge of the mat, keep the roller from 3 inches to 6 inches inside the unsupported edge on the first pass; ensure the roller overhangs the unsupported edge by 3 inches to 6 inches on the second pass.

When placing HMA in a lane adjoining a previously placed lane, place the mixture so that the strike off shoe will produce an edge that is adjacent to or minimally overlaps the adjoining course. Compact the longitudinal joint by rolling from the hot side, keeping the edge of the roller approximately 6 inches to 8 inches inside the cold joint for the first pass. For the second pass of the roller, compact the joint from the hot side while overlapping the cold side by 6 inches to 8 inches.

- c. **Tapered Overlapping Longitudinal Joint.** The Engineer will allow a tapered overlapping longitudinal joint in lieu of a longitudinal vertical joint.

If using tapered overlapping longitudinal joints, the Engineer will not require resurfacing lanes within one load of the same point-of-ending at the completion of paving operations each day. Pave adjacent lanes within 24 hours, unless delayed by inclement weather or approved by the Engineer.

Construct the tapered overlapping longitudinal joint by tapering the HMA mat at a slope no greater than 1:12. Extend the tapered portion beyond the normal lane width.

Place a ½-inch to 1-inch notch at the top of the taper on paving courses.

Provide a uniform slope by constructing the tapered portion of the mat using a Department-approved strike-off device that will not restrict the main screed.

Apply bond coat to the surface of the taper before placing the adjacent lane.

3. **Placing HMA Shoulders.** Use a self-propelled mechanical paver or spreader to place HMA shoulders.

If placing the top course on new shoulders, or placing leveling, or top course on existing HMA shoulders at least 8 feet wide, place the mix using a paver with an automatically controlled and activated screed and strike-off assembly and corresponding grade referencing equipment. Use grade-referencing equipment, as directed by the Engineer.

Stop shoulder paving at crossroad approaches, auxiliary lanes, commercial driveways, and ramps. Do not pave through these areas.

4. **Placing HMA Approaches.** Place HMA on driveway or crossroad approach foundations, approved by the Engineer.

Place approaches in layers no greater than the application rate. Do not stop mainline paving of lanes adjacent to the approach to pave the HMA approach.

- G. **Rolling.** Compact each layer of HMA in accordance with the contract and free of roller marks.

Keep the surface of the steel roller wheels moist during rolling.

- H. **Smoothness Requirements.** After final rolling, the Engineer may test the surface longitudinally and transversely using a 10-foot straightedge at selected locations in accordance with [MTM 722](#). Construct the surface and correct variations, at no additional cost to the Department, to the tolerances specified in this subsection.

1. **Base Course.** Construct lower layers of base courses to a tolerance of $\frac{3}{4}$ inch, and final layers of base courses to a tolerance of $\frac{3}{8}$ inch.
2. **Leveling and Top Course.** For multiple course construction, construct lower courses to a tolerance of $\frac{1}{4}$ inch, and top courses to a tolerance of $\frac{1}{8}$ inch.

Construct single courses to a tolerance of $\frac{1}{4}$ inch.

501.03

I. **Weather and Seasonal Limitations.**

1. **HMA Weather Limitations.** Except as limited by subsection [501.03.I.2](#), place HMA in accordance with the following restrictions:

- a. Do not place HMA or apply bond coat when moisture on the existing surface prevents curing;
- b. Do not place HMA unless the temperature of the surface being paved is at least 35 °F and there is no frost on or in the grade or on the surface being paved, unless otherwise approved by the Engineer in writing;
- c. Place only HMA courses that are greater than 200 pounds per square yard if the temperature of the surface being paved is greater than 35 °F;
- d. Place only HMA courses that are greater than 120 pounds per square yard if the temperature of the surface being paved is at least 40 °F; and
- e. Place any HMA course if the temperature of the surface being paved is at least 50 °F

2. **HMA Seasonal Limitations.** Unless otherwise approved by the Engineer in writing, place HMA in accordance with subsection [501.03.I.1](#) and the following seasonal limitations.

- a. From June 1 to October 15 for the Upper Peninsula;
- b. From May 15 to November 1 for the Lower Peninsula, north of M-46; and
- c. From May 5 to November 15 for the Lower Peninsula, south of M-46.

J. **Protection of Structures.** Protect bridges, curbs, gutters, driveways, sidewalks, barriers, and other appurtenances to prevent surfaces from becoming discolored during application of bond coat or HMA to the road surface. Remove material from appurtenances, as directed by the Engineer, at no additional cost to the Department.

K. **Aggregate Shoulders.** On resurfacing projects, scarify existing aggregate shoulder surfaces before placing new aggregate material.

Maintain the shoulder for vehicles to pass the construction equipment. If Contractor operations or traffic disturbs the area between the pavement and the right-of-way line, restore the area to a condition approved by the Engineer at no additional cost to the Department.

L. **Monument Boxes.** Place or adjust monument boxes in accordance with section [821](#).

M. **Quality Control (QC) Plan.** Prepare and implement a quality control (QC) plan for HMA, in accordance with the [HMA Production Manual](#).

Make adjustments in process controls to prevent production of non-conforming material in lieu of accepting payment at a reduced price. The Department will not allow continual production of non-conforming material at a reduced price in lieu of making adjustments.

The Engineer will not perform sampling or testing for quality control or assist in controlling the HMA production and placement operations.

N. **HMA Mix Acceptance.** The Engineer will inspect field-placed material, perform QA sampling and testing, and monitor Contractor adherence to the HMA-QC Plan.

1. **HMA Field-Placed Inspection.** The Engineer will perform inspection acceptance of HMA. The Department will inspect the base and leveling courses within 18 hours and the top course within 36 hours of placement. The Engineer will accept the pavement within these timeframes unless corrective action is required. If the Engineer determines that corrective action is required, inspection acceptance and paving of overlying courses will not occur until after the Contractor completes corrective action and the Engineer has determined that the pavement is in conformance with the contract.

The Engineer will determine the need for corrective action based on the acceptance factors specified in Table 501-5. Corrective action may include remedial treatment, including crack or surface sealing, or replacement.

Submit an action plan to the Engineer that addresses all acceptance factors that resulted in the need for corrective action. Complete all corrective action required to repair or replace unacceptable work at no additional cost to the Department.

If the Engineer and the Contractor agree, the Department may make a contract adjustment of no greater than 100 percent of the bid price for corrective action.

The Department will not grant time extensions for repair work to meet the inspection acceptance requirements specified in subsection [501.04.N.1](#).

The Engineer will determine the area subject to corrective action, for removal and replacement of top courses, as the longitudinal extent of corrective action multiplied by the width of the paving course affected.

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The Department will accept HMA subject to corrective action as follows:

- a. HMA placed for corrective action involving full removal and replacement will be accepted in accordance with the contract.
 - b. The area requiring corrective action other than full removal and replacement will not be measured for incentive payment.
 - c. If more than 10 percent of the area of a subplot requires corrective action, the subplot will not be measured for incentive payment.
2. **HMA Testing Acceptance.** The Engineer will accept HMA based on visual inspection, small tonnage, or QA sampling and testing acceptance criteria. The Engineer will notify the Contractor before conducting QA sampling to allow the Contractor to witness the sampling, but not in a manner that will allow alteration of production in anticipation of sampling. The Engineer will conduct QA sampling in accordance with [MTM 313](#).
- a. **Visual Inspection Acceptance Criteria.** The Engineer may accept quantities less than 500 tons, of any individual mixture, in accordance with the [Materials Quality Assurance Manual](#).
 - b. **Small Tonnage Acceptance Criteria.** If the total tonnage of a specific mix does not exceed 5,000 tons, the Engineer will perform QA sampling and testing in accordance with the contract.
 - c. **QA Sampling and Testing Acceptance Criteria.** If the total tonnage of a specific mix is greater than 5,000 tons, the Engineer will perform QA sampling and testing in accordance with the contract.
- O. **Asphalt Binder Acceptance.** The Department will accept asphalt binder in accordance with Department procedures.

Table 501-5 HMA Acceptance Factors and Corrective Action				
Acceptance Factors (a)	Length	Extent (b)	Severity	Corrective Action (c)
Segregation	—	>215 ft ² / 328 ft LL	Heavy (d)	Replace
Rutting	—	>32 ft	>¼ in average depth over the length of occurrence	Replace
Flushing	—	>108 ft ² / 328 ft LL	High (e)	Replace
Edge of Paved Shoulder	>33 ft	visible ledges	>3 in	Trim
Crack (g)	any	any	all	Seal (f)

Note: LL = lane length.
a. Acceptance factors apply to all courses except flushing, which applies to the top course only.
b. Extent is calculated by summing locations within the length required.
c. The appropriate corrective action is dependent on the extent and severity of the factor, and on the intended service life of the pavement.
d. Segregation severity will be determined in accordance with [MTM 326](#). If segregation thresholds are met twice on a paving course, the Contractor may be required to use a Material Transfer Device for the remaining paving for that course at no additional cost to the Department.
e. Flushing severe enough to significantly effect surface friction (Friction Number <35).
f. Other corrective action may be required as crack frequency increases.
g. A reflective crack determined by the Engineer to be caused by an underlying condition.

501.04. Measurement and Payment.

Pay Item	Pay Unit
HMA, 5 E _____	Ton
HMA, 4 E _____	Ton
HMA, 3 E _____	Ton
HMA, 2 E _____	Ton
HMA, LVSP _____	Ton
HMA, (type), High Stress _____	Ton
HMA Approach _____	Ton
HMA Approach, High Stress _____	Ton
Pavt for Butt Joints, Rem _____	Square Yard
Edge Trimming _____	Foot
Cold Milling HMA Surface _____	Square Yard, Ton
HMA Surface, Rem _____	Square Yard
HMA Patch, Rem _____	Square Yard
Joint and Crack, Cleanout _____	Foot
Hand Patching _____	Ton
Pavt, Cleaning _____	Lump Sum
Pavt Joint and Crack Repr, Det _____	Foot

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A. **HMA, (type), High Stress.** The Department may pay for **HMA, (type), High Stress** for up to 150 feet outside the limits shown on the plans to ensure the Contractor has time to transition to the high stress HMA. The Department will pay for high stress HMA placed outside the 150-foot limit as other HMA mix pay items.

B. **Pavement for Butt Joints, Removal.** The unit price for **Pavt for Butt Joints, Rem** includes the cost of removing and disposing of concrete or HMA materials.

C. **Edge Trimming.** The Engineer will measure **Edge Trimming** along the cut edge. The unit price for **Edge Trimming** includes the cost of cutting, removing, and disposing of excess HMA material.

D. **Cold Milling HMA Surface.** The unit price for **Cold Milling HMA Surface** includes the cost of removing, loading, hauling, weighing and disposing of the cold milled material, and cleaning the cold milled pavement. If paid by the ton for cold-milled HMA, deposit the cold milled material directly from the cold milling machine into the hauling units and weigh on a scale meeting the requirements of subsection [109.01.G](#) before placement in a stockpile or a disposal area.

The Engineer will not weigh or pay for material picked up by cleaning after cold milling.

E. **Pavement, Cleaning.** The Engineer will measure **Pavt, Cleaning** as a unit, including paved shoulders, approaches, and widened areas. The unit price for **Pavt, Cleaning** includes the cost of cleaning the foundation, joints, and cracks, and sweeping shoulders, base courses, and leveling courses.

If the Engineer directs additional hand or mechanical methods to clean the pavement, the Department will pay for this work as **Joint and Crack, Cleanout** if the contract documents include the pay item. If the contract documents do not include a pay item for joint and crack cleanout, the Department will pay for additional hand or mechanical work as extra work, in accordance with subsection [109.07](#).

F. **Joint and Crack, Cleanout.** The Engineer will measure **Joint and Crack, Cleanout** along the cleaned joint and crack. If using compressed air does not completely clean out the joint or crack, and the Engineer directs the use of hand or mechanical methods to remove loose material, then the Department will pay for this as extra work, in accordance with subsection [103.02](#).

G. **Hand Patching.** The unit price for **Hand Patching** includes the cost of placing HMA, by hand or other methods, and compacting the material.

H. **Removing HMA Surface.** The Engineer will measure, and the Department will pay for removing HMA surface, no greater than 12 inches thick, overlying material to remain in place, as **HMA Surface, Rem**. The unit price for **HMA Surface, Rem** includes the cost of edge cutting to establish a neat line, as required, and removal and disposal of the HMA material.

The Engineer will measure and the Department will pay for removing HMA surface, greater than 12 inches thick, overlying material to remain in place, as **Pavt, Rem** in accordance with subsection [204.04](#).

I. **Pavement Joint and Crack Repair.** The Engineer will measure **Pavt Joint and Crack Repr**, of the detail required, along the joint and crack. If the pavement joint and crack repair exceeds 30 inches in width, the Engineer will measure each 30-inch wide segment, or portion thereof, separately for payment. The Department will pay for the HMA material used to fill the joints, after removal of objectionable material, as **Hand Patching**.

J. **HMA.** The Engineer will measure, and the Department will pay for, **HMA** of the mix specified based on the weight placed, as supported by weigh tickets. The Engineer will adjust the unit price for HMA, of the mix specified, in accordance with the contract.

502.01

Section 502. HMA CRACK TREATMENT

502.01. Description. This work consists of treating cracks in Hot Mix Asphalt (HMA) surfaces using either a saw or rout and seal process or an overband process.

502.02. Materials. Provide materials in accordance with the following:

Hot Poured Joint Sealant.....	<u>914</u>
Asphalt Binder	<u>904</u>
Polyester Fibers.....	<u>904</u>

A. **Saw or Rout and Seal.** Provide hot-poured joint sealant that meets the requirements of subsection 914.04 for sealing sawn or routed cracks.

B. **Overband.** Provide overband material as specified in subsection 502.02.B.1 or subsection 502.02.B.2.

1. **Overband (Alternate 1).** Provide a field-blended liquid mixture with the following characteristics and proportions:

- a. Performance graded asphalt binder PG 64-22 south of M-46 and PG 58-28 north of M-46;
- b. Asphalt rubber product selected from the Qualified Product List, 5 percent by weight; and
- c. Polyester fibers, 5 percent by weight.

If using field mixed material, add the polyester fibers to the polymer modified asphalt cement and mix in the kettle. Do not allow field mix material to exceed 400 °F.

2. **Overband (Alternate 2).** Provide an asphalt rubber product selected from the Qualified Product List. Do not allow prepackaged material to exceed 400 °F.

502.03. Construction.

A. **Equipment.** Provide equipment, in accordance with section 107 and this subsection, capable of meeting the requirements of this subsection.

1. **Compressed Air System.** Provide and use a compressed air system that produces a continuous, high-volume, high-pressure stream of clean, dry air to prepare cracks. Equip the air compressor with a moisture separator to remove oil and water from the air supply. Provide a compressor capable of producing at least 100 psi at a continuous air flow of 150 cfm.

2. **Melter Applicator.** Provide a melter applicator consisting of a boiler kettle equipped with pressure pump, hose, and applicator wand. Equip the unit with the following:
 - a. Shutoff control on the applicator hose;
 - b. Mechanical full-sweep agitator in the kettle to provide continuous blending;
 - c. Thermometers to monitor the material temperature and the heating oil temperature; and
 - d. Thermostatic controls that allow the operator to regulate material temperature up to 425 °F.
 3. **Application Wand.** Apply the material using either a wand followed by a V-shaped or U-shaped squeegee or a round application head with a concave underside.
- B. Pre-Production Meeting.** Before beginning work, conduct an on-site pre-production meeting with the Engineer to discuss the following:
1. Contractor's detailed work schedule,
 2. Traffic control plan,
 3. Required project documentation,
 4. Inspection of the condition of equipment,
 5. The Contractor's Quality Control (QC) Plan, and
 6. The Contractor's designated Authorized Representative.
- C. Crack Preparation.** Clean and dry cracks using compressed air and other tools to remove loose dirt, vegetation, and deleterious material. Clean cracks no more than 10 minutes before filling.
- D. Crack Treatment Methods.**
1. **Saw or Rout and Seal.** Treat visible working cracks no greater than 1¼ inches wide in the pavement surface using the saw or rout and seal process. Treat working cracks in shoulders unless otherwise required. The Department defines working cracks as cracks that experience considerable horizontal or vertical movement, at least ⅛ inch, as a result of temperature change or traffic loading.

Create a reservoir by sawing or routing along the crack. Create the reservoir to a volume of at least 7.5 cubic inches per foot of crack and with a 1:1 width to depth ratio. Ensure the finished reservoir walls are vertical and the reservoir bottom is flat. Place sealant flush or no greater than ⅛ inch below the pavement surface.
 2. **Overband.** The Contractor may treat non-working cracks with material placed in an overband configuration. The Department defines non-working cracks as cracks that experience relatively little

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horizontal or vertical movement, less than $\frac{1}{8}$ inch, as a result of temperature change or traffic loading.

Apply overband material to clean, dry cracks. Apply overband 4 inches wide and from $\frac{1}{8}$ inch to $\frac{3}{16}$ inch thick.

The Contractor may increase the maximum application width to 6 inches for coverage of multiple cracks, with Engineer's prior written approval.

Place temporary pavement markings before opening the road to traffic if overband material obliterates existing pavement markings.

Apply overband as follows unless otherwise required:

- a. **Stand Alone Overband Crack Fill.** If no other surface treatment is required on the pavement, fill visible cracks in the road less than $1\frac{1}{4}$ inch wide.
- b. **Micro-Surfacing Preparation.** If preparing the pavement for a micro-surface overlay, fill visible cracks in the road less than $1\frac{1}{4}$ inch wide.
- c. **Chip Seal Preparation.** If preparing the pavement surface for a single or double chip seal, fill cracks greater than $\frac{1}{8}$ inch wide or 3 feet long. Seal cracks with varying widths and portions at least $\frac{1}{8}$ inch wide, along the entire length.
- d. **Paver Placed Surface Seal.** If preparing the pavement for a paver placed surface seal, fill cracks with widths from $\frac{1}{4}$ inch to $1\frac{1}{4}$ inch.
- e. **HMA Ultra-Thin Overlay.** If preparing the pavement for an HMA ultra-thin overlay, fill visible cracks less than $1\frac{1}{4}$ inch wide.

E. **Weather Limitations.** Place material at air temperatures from 45 °F to 85 °F. Do not place material if moisture is present in the crack.

F. **Cure Time and Repair.** Allow the material to cool before opening the road to traffic. Apply de-tackifying solution, if required, to protect the uncured crack treatment material from tracking. Do not use blotting materials, including sand, aggregate, sawdust, or paper. Repair treated pavement areas, damaged by traffic at no additional cost to the Department.

G. **Quality Control (QC).** Provide and follow a QC plan for production and construction processes. Provide the Engineer a copy of the QC plan for review and approval, prior to the pre-production meeting. Maintain QC measures until the Engineer accepts the work.

Comply with the approved QC plan throughout the project and allow the Engineer access to work in progress for assurance review and testing. If the Engineer identifies a condition causing unsatisfactory crack treatment, immediately stop production and correct the work at no additional cost to the Department.

Ensure the QC plan addresses at least the following:

1. A detailed description explaining how field crews will determine working and non-working cracks. Separately detail projects with multiple pavement sections.
2. The sealant material and equipment used to heat, handle, and apply sealant material in accordance with the manufacturer's specifications. Provide the material manufacturer's specifications to the Engineer upon request.
3. Reservoir configuration for the saw or rout and seal operation.
4. Procedures for crack cleaning.
5. Replacement criteria for cutting tools.
6. Controls implemented to ensure flying dust and debris is not directed toward adjacent traveled lanes, pedestrians, parked vehicles, or buildings.
7. An action plan for adjusting crack sealing operations to address actual environmental conditions if adverse environmental conditions occur.
8. Proposed procedure for monitoring the work to ensure acceptance requirements are met.

H. **Acceptance.** Upon completion of work, schedule an inspection with the Engineer. The Engineer will note deficiencies, including areas exhibiting adhesion failure, cohesion failure, missed cracks, or other factors the Engineer determines unacceptable. Correct work the Engineer identifies as unacceptable. Notify the Engineer upon completion of required corrective work.

502.04. Measurement and Payment.

Pay Item	Pay Unit
Overband Crack Fill, Roadbed	Roadbed Mile
Overband Crack Fill, Ramp	Roadbed Mile
HMA Crack Treatment, Roadbed	Roadbed Mile
HMA Crack Treatment, Ramp	Roadbed Mile

A. **Overband Crack Fill.** The Engineer will measure **Overband Crack Fill, Roadbed** along the roadway centerline. This measurement includes traffic lanes, paved shoulders, auxiliary lanes, and ramps to the

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2-foot gore point. For divided highways, the Engineer will measure the roadway separately in each direction.

The Engineer will measure **Overband Crack Fill, Ramp** along the ramp centerline beginning at the 2-foot gore point.

The unit prices for **Overband Crack Fill**, of the type required, include the cost of preparing and filling cracks using the overband method, providing the required documentation, corrective work, and temporary traffic markings.

B. HMA Crack Treatment. The Engineer will measure **HMA Crack Treatment, Roadbed** along the roadway centerline. This measurement includes traffic lanes, paved shoulders, auxiliary lanes, and ramps to the 2-foot gore point. For divided highways, the Engineer will measure the roadway separately in each direction.

The unit price for **HMA Crack Treatment, Roadbed** includes the cost of preparing, filling, and sealing the cracks, including treating working cracks with the saw or rout and seal method, and treating non-working cracks with the overband method.

The Engineer will measure **HMA Crack Treatment, Ramp** along the ramp centerline beginning at the 2-foot gore point.

The unit price for **HMA Crack Treatment, Ramp** includes the cost of preparing, filling, and sealing the cracks, including treating working cracks with the saw or rout and seal method, and treating non-working cracks with the overband method.

904.01

Section 904. ASPHALTIC MATERIALS

904.01. General Requirements. The certification program described in the [Materials Quality Assurance Procedures Manual](#) governs the asphalt binders in Table [904-2](#) and the emulsified asphalts in Table [904-4](#), Table [904-5](#), and Table [904-6](#). The Contractor may use materials listed in Table [904-2](#) through Table [904-6](#) on MDOT projects, if tested and approved for use in accordance with MDOT procedures.

The Engineer will notify the Contractor and the supplier to correct materials if test results for the requirements from Table [904-2](#), Table [904-3](#), Table [904-4](#), Table [904-5](#) and Table [904-6](#) deviate from the specified range.

Asphaltic materials testing will be in accordance with the specified ASTM, AASHTO or Department methods, as modified by this section.

904.02. Application Temperatures. Apply asphaltic materials at temperatures specified in Table [904-7](#).

904.03. Specific Requirements.

A. **Asphalt Binder.** Asphalt binder must be homogeneous, water-free, and must not foam when heated to the maximum temperature specified in Table [904-7](#) for the material required.

If using an anti-foaming agent, use a dimethyl polysiloxane type silicone material, preferably 1,000 centistoke viscosity grade, unless otherwise approved by the Engineer. Do not add amounts greater than 5 parts per million unless approved by the Engineer. Mechanically mix the asphalt binder after adding anti-foaming agent while in storage at the asphalt plant.

Asphalt cement must be prepared by refining crude petroleum with or without the addition of modifiers. Asphalt cement prepared with used motor oil is not allowed.

The Engineer will allow organic, virgin or recycled modifiers dissolved, dispersed, or reacted in asphalt cement to enhance performance.

Asphalt binder must be at least 99.0 percent soluble in accordance with AASHTO T 44 or ASTM D 5546.

This specification is not applicable for asphalt binders in which fibers or other discrete particles are larger than 250 micrometers in size.

B. **Cut-Back Asphalt.** Cutback asphalt must meet the requirements of Table [904-3](#) and this subsection.

Liquid asphalt must be homogeneous, must not foam when heated to the maximum required temperature and must be water-free unless otherwise required.

Caution: Use caution when heating cut-back asphalt, especially RC and MC asphaltic products containing naphtha and kerosene cutback asphalt, since the temperatures for use are near or above the flash points. If using heated cutbacks, keep open flames away from pugmill enclosures, tank car domes, distributor tank openings, and storage tank openings.

C. Emulsified Asphalt. Emulsified asphalt must meet the requirements of either Table 904-4, Table 904-5, or Table 904-6 and be made from asphalt having a negative spot test result using 35% xylene / 65% heptane solvent, Aniline No: 30 C \pm 2 degrees, AASHTO T 102. It must be homogeneous and show no separation of asphalt after thorough mixing, for a period of at least 30 days after delivery.

D. Polyester Fibers for Overband Crack Fill. Provide General Certification for polyester fibers used for overband crackfill. Polyester fibers must meet the requirements of Table 904-1.

Characteristic	Requirement	Test
Length	6.4 mm \pm 0.05 mm	—
Crimps	None	ASTM D 3937
Tensile strength	\geq 480 MPa	ASTM D 2256 (a)
Denier	3.0–6.0	ASTM D 1577 (a)
Specific gravity	1.32–1.40	—
Melting temperature	\geq 245 °C	—
Ignition temperature	\geq 540 °C	—
a. Obtain this data before cutting the fibers.		

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Table 904-2 Performance Graded Asphalt Binder Specification															
Performance Grade	PG 46			PG 52						PG 58					
	-34	-40	-46	-10	-16	-22	-28	-34	-40	-46	-16	-22	-28	-34	-40
Avg 7-day Max. Pavement Design Temp, °C (a)	46			52						58					
Minimum Pavement Design Temp, °C (a)	-34	-40	-46	-10	-16	-22	-28	-34	-40	-46	-16	-22	-28	-34	-40
Original Binder															
Flash Point Temp, T48/D 92: Min.	230 °C			230 °C						230 °C					
Viscosity, T 316/D 4402: Max. 3 Pa·s, Test Temp (b)	135 °C			135 °C						135 °C					
Dynamic Shear, T 315/D 7175: G*/sin θ, Min. 1.00 kPa Test Temp at 10 rad/s (c, g)	46 °C			52 °C						58 °C					
Rolling Thin Film Oven (T 240/D 2872)															
Mass Loss, Max. Percent	1.00			1.00						1.00					
Dynamic Shear, T 315/D 7175: G*/sin θ, Min. 2.20 kPa Test Temp at 10 rad/s (g)	46 °C			52 °C						58 °C					
Pressure Aging Vessel Residue (R 28/D 6521)															
PAV Aging Temp (d)	90 °C			90 °C						100 °C					
Dynamic Shear, T 315/D 7175: G*/sin θ, Max. 5,000 kPa Test Temp at 10 rad/s, °C (g)	10	7	4	25	22	19	16	13	10	7	25	22	19	16	13
Physical Hardening (e)	Report			Report						Report					
Creep Stiffness, T 313/D 6648: S, Max. 300 MPa, m-value, Min. 0.300 Test Temp at 60 s, °C (f)	-24	-30	-36	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30
Direct Tension, T 314/D 6723: Fail. Strain, Min. 1.0% Test Temp at 1.0 mm/min, °C (f)	-24	-30	-36	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30

Table 904-2 Performance Graded Asphalt Binder Specification (Continued)												
Performance Grade	PG 64						PG 70					
	-10	-16	-22	-28	-34	-40	>-10	-16	-22	-28	-34	-40
Avg 7 day Max. Pave Design Temp (a)	64 °C						70 °C					
Minimum Pavement Design Temp, °C	-10	-16	-22	-28	-34	-40	-10	-16	-22	-28	-34	-40
Original Binder												
Flash Point Temp, T48/D 92: Min.	230 °C						230 °C					
Viscosity, T 316/D 4402: Max. 3 Pa*s, Test Temp (b)	135 °C						135 °C					
Dynamic Shear, T 315/D 7175: G*/sin θ , Min. 1.00 kPa Test Temp at 10 rad/s (c,g)	64 °C						70 °C					
Rolling Thin Film Oven (T 240/D 2872)												
Mass Loss, Max. Percent	1.00						1.00					
Dynamic Shear, T 315/D 7175: G*/sin θ , Min. 2.20 kPa Test Temp at 10 rad/s (g)	64 °C						70 °C					
Pressure Aging Vessel Residue (R 28/D 6521)												
PAV Aging Temp, °C (d)	100						100 (110)					
Dynamic Shear, T 315/D 7175: G*/sin θ , Max. 5,000 kPa Test Temp at 10 rad/s, °C (g)	31	28	25	22	19	16	34	31	28	25	22	19
Physical Hardening (e)	Report						Report					
Creep Stiffness, T 313/D 6648: S, Max. 300 MPa, m-value, Min. 0.300 Test Temp at 60 s, °C (f)	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30
Direct Tension, T 314/D 6723: Fail. Strain, Min. 1.0% Test Temp at 1.0 mm/min, °C (f)	0	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30

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Table 904-2 Performance Graded Asphalt Binder Specification (Continued)										
Performance Grade	PG 76					PG 82				
	-10	-16	-22	-28	-34	-10	-16	-22	-28	-34
Avg 7 day Max. Pave Design Temp (a)	76 °C					82 °C				
Minimum Pavement Design Temp, °C	-10	-16	-22	-28	-34	-10	-16	-22	-28	-34
Original Binder										
Flash Point Temp, T 48/D 92: Min.	230 °C					230 °C				
Viscosity, T 316/D 4402: Max. 3 Pa•s, Test Temp (b)	135 °C					135 °C				
Dynamic Shear, T 315/D 7175: G*/sin θ, Min. 1.00 kPa Test Temp at 10 rad/s (c, g)	76 °C					82 °C				
Rolling Thin Film Oven (T 240/D 2872)										
Mass Loss, Max. Percent	1.00					1.00				
Dynamic Shear, T 315/D 7175: G*/sin θ, Min. 2.20 kPa Test Temp at 10 rad/s (g)	76 °C					82 °C				
Pressure Aging Vessel Residue (R 28/D 6521)										
PAV Aging Temp, °C (d)	100 (110)					100 (110)				
Dynamic Shear, T 315/D 7175: G*/sin θ, Max. 5000 kPa Test Temp at 10 rad/s, °C (g)	37	34	31	28	22	40	37	34	31	28
Physical Hardening (e)										
Creep Stiffness, T 313/D 6648: S, Max. 300 MPa, m-value, Min. 0.300 Test Temp at 60 s, °C (f)	Report					Report				
Creep Stiffness, T 313/D 6648: S, Max. 300 MPa, m-value, Min. 0.300 Test Temp at 60 s, °C (f)	0	-6	-12	-18	-24	0	-6	-12	-18	-24
Direct Tension, T 314/D 6723: Fail. Strain, Min. 1.0% Test Temp at 1.0 mm/min, °C (f)	0	-6	-12	-18	-24	0	-6	-12	-18	-24

**Table 904-2
Performance Graded Asphalt Binder Specification (Continued)**

- a. Pavement temperatures are estimated from air temperatures using an algorithm contained in the Superpave software program, may be provided by the specifying agency, or by following the procedures as outlined in MP2 and PP28.
- b. This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.
- c. For quality control of unmodified asphalt cement production, measurement of the viscosity of the original asphalt cement may be used or supplement dynamic shear measurements of $G^*/\sin \theta$ at test temperatures where the asphalt is a Newtonian fluid. The Contractor may use a standard means of viscosity measurement, including capillary (T 201/D 2170 or T 202/D 2171) or rotational viscometer (T 316/D 4402).
- d. The PAV aging temperature is based on simulated climatic conditions and is one of three temperatures 90°C, 100°C or 110°C. The PAV aging temperature is 100°C for PG 58- and above, except in desert climates, where it is 110°C.
- e. Physical Hardening – T 313/D 6648 is performed on a set of asphalt beams according to Section 13.1, except the conditioning time is extended to 24 h \pm 10 min at 10°C above the minimum performance temperature. The 24 h stiffness and m-value are reported for information purposes only.
- f. If the creep stiffness is below 300 MPa, the direct tension test is not required. If the creep stiffness is from 300 MPa to 600 MPa, the direct tension failure strain requirement can be used in lieu of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.
- g. $G^*/\sin \theta$ = high temperature stiffness and $G^*\sin \theta$ = intermediate temperature stiffness.

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Table 904-3				
Medium and Rapid Curing Cut-Back Asphalts				
Tests	Requirements			
	MC-30 (a)	MC-70 (a)	MC-250	RC-250
Kinematic Viscosity, 60 °C, mm ² /s, T 201/D 2170	30–60	70–140	250–500	250–500
Flash Point, deg °C:				
Tag Open Cup, min, T 79	37.8	37.8	—	26.7
Cleveland Open Cup, min, T 48/D 92	—	—	65.6	—
Distillation Test, T 78/D 402				
Distillate, % by Vol of Total Distillate to 360 °C				
To 225 °C	≤25	≤20	≤10 max	≥35
To 260 °C	40–70	20–60	15–55	≥60
To 315.5 °C	75–93	65–90	60–87	≥80
Residue from Distillation to 360 °C, min	50	55	67	65
Tests on Residue from Distillation, T 78/D 402:				
Penetration at 25 °C, 100 g, 5 sec, T 49/D 5	120–250	120–250	120–250	80–120
Ductility at 25 °C, cm, min T 51/D 113 (b)	100	100	100	100
Solubility in Trichloroethylene, %, min, T 44/D 2042	99.5	99.5	99.5	99.5
Spot Test, AASHTO T 102 (c)	Neg.	Neg.	Neg.	Neg.
Section Number Reference	—	914	—	710, 914
<p>a. Use MC-70 grade from June 1 to September 1 and MC-30 grade other times of the year, unless otherwise directed by the Engineer.</p> <p>b. If penetration of residue exceeds 200 and ductility, at 25 °C, is less than 100, the Engineer will accept the material if ductility at 15.6 °C exceeds 100.</p> <p>c. Use 35% Xylene, 65% Heptane solvent, aniline number: 30 °C ±2 °C.</p>				

Table 904-4 Anionic Emulsified Asphalts							
Anionic Emulsified Asphalts	Requirements						
	RS-1m	RS-2a	HFRS-2	MS-Op	MS-2h	MS-2s	SS-1h
Viscosity, Saybolt Furol, T 59-01/D 7496:							
At 25 °C, sec	20–100	—	—	—	—	—	20–100
At 50 °C, sec	—	50–300	50–300	15–150	50–300	50–300	—
Storage Stability Test, T 59-01/D 6930-04, 24 hr, % Difference max	2	2	2	3	3	3	2
Demulsibility, T 59-01/D 6936-04:							
35 ml 0.02 N CaCl ₂ , %	20–60	≥60	≥40	—	—	—	—
50 ml 0.1 N CaCl ₂ , %	—	—	—	—	—	—	≤2
50 ml 0.02 N CaCl ₂ , %	—	—	—	—	—	—	—
Sieve Test, T 59-01 / D 6933-04, % max	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Miscibility with Water, D 244 (a)	—	—	—	—	—	—	Yes
Distillation to 260°C, T 59-01/D 6997-04, % by Weight:							
Residue, Min	65	65	65	65	65	65	60
Oil Distillate, max	2	2	2	25	7	7	2
Tests on Distillation Residue:							
Penetration, 25 °C, 100 g, 5 sec, dmm, T 49/D 5	100–200	100–200	100–200	(b)	150–300	≥300	40–90
Float Test, sec, T 50/D 139:							
At 50 °C, max	—	—	—	200	—	—	—
At 60 °C, min	—	—	1,200	—	1,200	1,200	—
Ductility, 25 °C, cm, min, T 51/D 113	60	60	60	40 (b)	—	—	40
Solubility in Trichloroethylene, % min, T 44/D 2042	97.5	97.5	97.5	97.5	97.5	97.5	97.5
Ash Content, %, max, D 128	2	2	2	2	2	2	2
Specific Gravity, 25/25 °C, min., T 228/D 70	0.996	0.996	0.996	—	—	—	—
Toughness/Tenacity, 25 °C, 50 cm/min., Nm, min., D 5801	—	—	—	—	—	—	—
Elastic Recovery, 10 °C, % min., T 301/D 6084	—	—	—	—	—	—	—
Section Number Reference	—	401	—	501	—	501	501, 805
a. No appreciable coagulation or visible separation in 2 hours.							
b. Heat the distillation residue (ASTM D 243) to 100±15 penetration within 2 hours, and have a ductility of at least 40 cm.							

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Table 904-5 Cationic Emulsified Asphalts				
Cationic Emulsified Asphalts	Requirements			
	CRS-1	CRS-2	CMS-2	CSS-1h
Viscosity, Saybolt Furol, T 59-01/D 7496:				
At 25 °C, sec	—	—	—	20–100
At 50 °C, sec	20–100	100–400	50–450	—
Storage Stability Tests, T 59-01/D 6930-04, 24 hr, % Difference, max	1	1	1	1
Demulsibility, %, 35 ml 0.8% Dioctyl Sodium Sulfosuccinate, min, T 59-01/D 6936-04, (a)	40	40	—	—
Particle Charge Tests, T 59-01/D 7402 (b)	Positive	Positive	Positive	Positive
Sieve Tests, T 59-01/D 6933-04, % max (Distilled Water)	0.10	0.10	0.10	0.10
Distillation to 260 °C, T 59-01/D 6997-04, % by Weight (c)	—	—	—	—
Residue, min	60	65	65	60
Oil Distillate, max	3	3	12	—
Tests on Distillation Residue:				
Penetration, 25 °C, 100 g, 5 sec, dmm, T 49/D 5	100–250	100–250	100–250	40–90
Ductility, 25 °C, 5 cm/min, cm, min, T 51/D 113	40	40	40	40
Ductility, 4 °C, 5 cm/min, cm, T 51/D 113	—	—	—	—
Elastic/Recovery, 4 °C, % min, T 301/D 6084	—	—	—	—
Solubility in Trichloroethylene, % min, T 44/D 2042	97.5	97.5	97.5	97.5
Ash Content, % max, D 128	2	2	2	2
Specific Gravity, 25/25 °C, min, T 228/D 70	0.996	0.996	—	—
Toughness/Tenacity, 25 °C, 50 cm/min., Nm, min., D 5801	—	—	—	—
Elastic Recovery, 10 °C, % min., T 301/D 6084	—	—	—	—
Cement Mixing Test, T 59-01/D 6935-04, % max	—	—	—	2.0
Coating Ability and Water Resistance:				
Coating Dry Aggregate	—	—	Good	—
Coating After Spraying	—	—	Good	—
Coating Wet Aggregate	—	—	Fair	—
Coating After Spraying	—	—	Fair	—
Section Number Reference	—	—	501	501, 805
a. The Demulsibility Test must be made within 30 days from date of shipment.				
b. If Particle Charge Test is inconclusive, material having a maximum pH of 6.7 is acceptable.				

Table 904-6 Capital Preventative Maintenance (CPM) Emulsions (h)						
	Requirements					
	HFRS-2M	CRS-2M	CSS-1mM	CSS-1hM	PPSS	CSEA
Viscosity, Saybolt Furol, T 59-01/D 7496:						
At 25 °C, sec	—	—	20–100	20–100	20–100	—
At 50 °C, sec	75–300	75–300	—	—	—	75–400
Storage Stability Test, T 59-01/D 6930-04, 24 hr, % Difference max	1	1	1	1	1 (g)	1
Demulsibility, T 59-01/D 6936-04:						
35 ml 0.8% Dioctyl Sodium Sulfosuccinate, % min (a)	—	50	—	—	60	50
35 ml 0.02 N CaCl ₂ , % min.	—	—	—	—	60	—
50 ml 0.1 N CaCl ₂ , %	—	—	—	—	—	—
50 ml 0.02 N CaCl ₂ , %	≥50	—	—	—	—	—
Particle Charge Tests, T 59-01/D 7402 (b)		Positive	Positive	Positive	—	Positive
Sieve Test, T 59-01 / D 6933-04, % max	0.10	0.10	0.10	0.10	0.05	0.10
Miscibility with Water, D 244 (f)	—	—	—	—	—	—
Distillation to 260 °C, T 59-01/D 6997-04, % by Weight:	(e)	(e)(j)	(e)	(e)	(e)	(i)
Residue, Min	65	65	62	62	63	68
Oil Distillate, ml, max, D 244	2	3	—	—	2	3.0
Tests on Distillation Residue:						
Penetration, 25 °C, 100 g, 5 sec, dmm, T 49/D 5	80–150	80–150	70–90	40–90	80–150	70–100
Ductility, 25 °C, 5 cm/min, cm, T 51/D 113	—	—	40	40	—	40
Ductility, 4 °C, 5 cm/min, cm, T 51/D 113	—	—	35	—	—	—
Elastic/Recovery, 4 °C, % min, T 301/D 6084	—	—	65	—	—	—
Float Test, sec, T 50/D 139:						
At 50 °C, max	—	—	—	—	—	—
At 60 °C, min	1,200	—	—	—	—	—
Solubility in Trichloroethylene, % min, T 44/D 2042	—	—	97.5	97.5	—	97.5
Ash Content, %, max, D 128	2	2	2	2	—	2
Specific Gravity, 25/25 °C, min., T 228/D 70	—	—	—	—	—	—
Toughness/Tenacity, 25 °C, 50 cm/min., Nm, min., D 5801	4.5/3.5	4.5/3.5	—	—	—	9.0/7.0
Elastic Recovery, 10 °C, % min., T 301/D 6084	60%	60%	—	—	60	75
Tests on Residue from Evaporation, T 59-01/D 6934-04: (c)						
Softening Point, Ring & Ball, °C, min., T 53/D 36	—	—	60	57.2	—	—
Viscosity, 60C, Pa·S, T 202/D 2171	—	—	800 (d)	800 (d)	—	—
Section Number Reference	505	505	507	507	—	—
<p>a. The Demulsibility Test must be made within 30 days from date of shipment.</p> <p>b. If Particle Charge Test is inconclusive, material having a maximum pH of 6.7 is acceptable.</p> <p>c. Residue by evaporation: Oven evaporate an emulsion sample on a glass plate at a maximum temperature of 60 °C for 24 hours (forced draft oven recommended) or air dry the sample at ambient temperature for three days. Once dry, the sample is scraped from the plate using a razor blade tool.</p> <p>d. The minimum Viscosity will be obtained using a Cannon-Manning Vacuum Capillary Viscometer Tube No. 14 per T 202 / D 2171.</p> <p>e. ASTM D 6997, with modifications to include a 204 °C (± 6 °C) maximum temperature to be held for 15 minutes.</p> <p>f. No appreciable coagulation or visible separation in 2 hours.</p> <p>g. After standing undisturbed for 24 hours, the surface must show no white, milky colored substance, but must be a smooth homogenous color throughout. Any visible amount of white, milky colored substance is basis for non-acceptance.</p> <p>h. Samples of emulsified asphalt will be taken in accordance with ASTM D 140. Samples must be stored at a temperature of not less than 4 °C until tested.</p> <p>i. Residue determination and preparation may use the alternate ASTM D 6934 method, "Residue by Evaporation" so as to not destroy the properties of any polymer modifiers contained therein.</p>						

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Table 904-7 Temperatures for Asphaltic Materials		
Asphalt Type	Designation	Temperature, °F Distributor
Cut-Back Asphalts	RC-250	145–220
	MC-250	145–220
	MC-30	70–140
	MC-70	105–180
Emulsified	RS-1m, SS-1h, CSSmM, CRS-1, CSS-1h, CSS-1hM,	85–135
Asphalts	RS-2a, HFRS-2, HFRS-2M, MS-2h, MS-2s, CRS-2, CMS-2, CRS-2M	125–175
Asphalt Binder	All Grades	350 Maximum Mixing Temp (a)
a. Mixing temperature for all asphalt binders will be as specified by the modifier/binder producer.		

914.01

Section 914. JOINT AND WATERPROOFING MATERIALS

914.01. General Requirements. Joint and waterproofing material for use in concrete construction must meet the requirements of this section.

914.02. Testing. Steel joint material testing must be in accordance with ASTM E 8 or ASTM A 370 and the ASTM specifications applicable to the specific material.

Other joint and waterproofing material testing must be in accordance with the specified ASTM, AASHTO or Department methods, as modified by this section.

914.03. Joint Filler for Concrete Construction.

A. **Fiber Joint Filler.** Fiber joint filler for concrete construction must meet the requirements of ASTM D 1751.

Fiber joint filler must not deform or break due to twisting, bending, or handling when exposed to atmospheric conditions.

For concrete pavements, cut fiber joint filler into a rectangular shape and to the widths shown on the plans. Punch holes in the fiber joint filler for load-transfer bars in new concrete pavements as shown on the plans.

B. **Recycled Rubber Joint Filler.** Select recycled rubber joint filler from the Qualified Products List.

For concrete pavements, cut recycled rubber joint filler into a rectangular shape and to the widths shown on the plans. Punch holes in the recycled rubber joint filler for load-transfer bars in new concrete pavements as shown on the plans.

914.04. Joint Sealants for Concrete Construction.

A. **Hot-Poured Joint Sealant.** Hot-poured joint sealant must meet the requirements of ASTM D 6690, for Type II with the following exceptions:

1. Test sealant bond at -20°F for three complete cycles at 100 percent extension.
2. Penetration must be 130 ± 20 dmm at 77°F .
3. Penetration must be at least 40 dmm at 0°F . Prepare and test two specimens after 24 hours of conditioning at 0°F . Complete the test within 20 seconds after removal from the freezer.
4. Use 2NS sand as the fine aggregate in concrete mixture for bond blocks.
5. Allow at least 14 days from receipt of the sample to the time of reporting test results.

6. Material containers must be legibly marked with a non-fading, weather-resistant ink or paint. Include the manufacturer's name or trade name, batch number, recommended pouring temperature, and the maximum safe heating temperature on the label.

B. Backer Rod for Use with Hot-Poured Joint Sealant. Backer rod for use with a hot-poured joint sealant must be solid, round, heat resistant, closed-cell, cross-linked polyethylene foam meeting the requirements of ASTM D 5249, for Type I.

914.05. Epoxy Binder for Joint Spall Repair. Select one of the following types of epoxy binder material mixed with dry 2MS masonry sand to repair spalls adjacent to longitudinal or transverse joint grooves.

- A. If the concrete temperature is from 60 °F to 104 °F, select Type I epoxy binder.
- B. If the concrete temperature is from 35 °F to 59 °F, select Type II epoxy binder.

Epoxy components must be low-viscosity and come packaged to allow easy measurement and mixing in the field at a 1:1 ratio or a 2:1 ratio, by volume. Both component containers must show the volumetric mix ratio.

Epoxy binders must be composed of 100 percent nonvolatile materials and must not contain solvents or pigments. All epoxy binder ingredients must be reactive, become a permanent part of the cured adhesive system, and not lose adhesion due to small amounts of moisture that may be present in the concrete repair area.

Epoxy binders must meet the requirements of Table [914-1](#).

Mark containers with part, type, lot or batch number, and volumetric proportioning ratio. Allow at least two weeks for testing before intended use.

A batch of each component consists of quantities of material subjected to the same unit chemical or physical mixing process to make the final product uniform.

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Table 914-1 Epoxy Binder Physical Requirements		
Test	Type I	Type II
Part A, Epoxy Resin Base Polymer Viscosity, poises at 72 °F (a) (Brookfield viscometer, No. 2 Spindle)	5 – 30	5 – 20
Part B, Modified Curing Agent Viscosity, poises at 72 °F (a) (Brookfield viscometer, No. 2 Spindle)	3 – 30	3 – 20
Mixture A and B Gel Time, minutes (100 g initially at 72 °F)	25 – 50	8 – 15
Tensile Strength at yield, psi at 72 °F (b)(c)	≥3,000	≥2,500
Elongation, Ultimate, percent (c)	≥10	≥10
Absorption (24 h in water at 72 °F) percent by weight (c)	≤1.0	≤1.0
Shear Bond Strength, psi (On sawed concrete at 72 °F)	≥400	≥400
a. Perform viscosity tests in accordance with ASTM D 1084, Method B. b. Perform tensile tests at 0.2 in/min in accordance with ASTM D 638, Type 1 Specimen. c. Perform tensile, elongation, and absorption tests on specimens cut from a 1/8 in thick cast sheet of cured epoxy binder. Core times are 96 h for Type I, 24 h for Type II.		

914.06. Epoxy Resin Adhesive. Epoxy resin adhesive must be capable of being injected into, and flow along, a crack 0.005 inch wide. Select epoxy resin adhesive from the Qualified Products List.

Use a fast-setting grout or a fast-set temporary seal as recommended by the epoxy resin adhesive manufacturer.

914.07. Dowel Bars for Transverse Expansion and Contraction Joints. Dowel bars must be straight, smooth, round bars with the dimensions shown on the plans. Dowel bars must have a minimum yield strength of at least 40,000 psi and a minimum tensile strength of at least 70,000 psi. When welding is required, dowel bars must meet these strength requirements when tested after welding to the dowel basket assembly.

Provide dowel baskets from a Department-approved source. Secure the dowel bars into the baskets by welding or other mechanical method to ensure the dowels will maintain alignment during and after concrete placement.

The ends of dowel bars for expansion and contraction joints must be saw cut or sheared, and free of burrs. If dowel bars are sheared, ensure the ends remain round and do not deform.

Protect dowel bars from corrosion as specified in this subsection.

A. Coatings for Dowel Bars. If required, provide dowel bars coated with an epoxy resin coating selected from the Qualified Products List.

The supplier must identify the epoxy resin coating used and certify that the dowel bars underwent a surface preparation treatment before coating in accordance with the recommendations of the coating manufacturer.

The Engineer will sample and test dowel bars for average coating thickness, and check for chips, cracks, or other damage to the coating, and for the presence of a bond breaker, if required, before installation in the concrete construction. The Engineer may reject dowels with coatings not meeting the thickness requirements, or dowels with coating damage.

Epoxy coated dowel bars must have an average coating thickness not less than 0.010 inch, nor more than 0.014 inch on any bar, with individual determinations on a single bar within a tolerance of ± 0.004 inches of the average. Coating is not required on the end faces of the bars and on the cylindrical surface within 3 inches of the end fixed in the supporting basket by welding or other mechanical means.

To prevent bonding to concrete, epoxy coated dowels must be coated with an asphalt material meeting the requirements of MC-70 or RC-250, as specified in subsection [904.03.B](#); or an alternate bond release agent selected from the Qualified Products List. Bond release agents must provide a pull-out shear bond stress of the dowel bar no greater than 60 psi for initial and final movement of the dowel from the concrete specimen. The manufacturer of the asphalt material must provide certification to the Engineer that the coating material meets the 60-psi pull-out requirement.

The Contractor or supplier may apply asphalt coatings to the dowel bar and the dowel basket assembly. The manufacturer must apply the alternate bond release agents to the dowel bar and the dowel basket assembly.

B. Sleeves for Dowel Bars. Sleeves for dowel bars must be at least 0.01 inch thick and made of 300 series stainless steel, Monel metal, or a Department-approved equal. The sleeve must cover the bar to within 3 inches of the bar end that will be fixed in the supporting basket by welding or other mechanical means. The sleeve must wrap around the dowel bar and must not move in relation to the bar. A folded lock seam or a continuous weld must fasten the lap. The sleeve must contact the entire bar without gaps.

The Engineer will determine if sleeves do not fully contact dowel bars based on the formation of dimples in the sleeve when tapped lightly with a ball-peen hammer or similar tool.

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As an alternative to placing a sleeve on a carbon steel bar, the Contractor may provide a solid stainless steel bar meeting the other applicable requirements for dowel bars.

C. **Dowel Bar Expansion Caps.** Dowel bars for expansion joints must include metal or plastic expansion caps as shown on the plans and approved by the Engineer. Expansion caps must be sized to provide a slip fit onto the coated bar.

Expansion caps must have a uniform diameter for a length of at least 4 inches and must include a stop to ensure the end of the cap remains at least 1 inch away from the end of the dowel bar during concrete placement. Fabricate metal expansion caps from at least 28-gauge sheet steel, and close at the sides and end by crimping. Plastic expansion caps must be one piece, with a uniform thickness of at least $\frac{1}{16}$ inch, entirely closed on the end.

914.08. Devices for Transverse End-of-Pour Joints. Use straight steel tie bar devices for end-of-pour joints.

Straight tie bars for end-of-pour joints must consist of at least No. 5 steel deformed bars at least 30 inches long meeting the requirements of ASTM A 615, ASTM A 616-96a, ASTM A 617-96a, or ASTM A 706. Epoxy coat straight tie bars as specified in subsection [905.03.C](#), except the Engineer will not require the application of the epoxy coating within 4 inches of each end of the tie bar, or repair of damage to the coating within 4 inches of each end of the bar.

914.09. Lane Ties for Longitudinal Pavement Joints.

A. **Straight Tie Bars.** Straight tie bars for longitudinal pavement joints must consist of at least No. 5 steel deformed bars at least 24 inches long meeting the requirements of ASTM A 615, ASTM A 616-96a, ASTM A 617-96a, or ASTM A 706. Epoxy coat straight tie bars as specified in subsection [905.03.C](#), except the Engineer will not require the application of the epoxy coating within 4 inches of each end of the tie bar, or repair of damage to the coating within 4 inches of each end of the bar.

B. **Bent Tie Bars for Bulkhead Joints.** Bent tie bars for bulkhead joints must consist of at least No. 5 steel deformed bars at least 24 inches long as measured around the outside of the bend. The tie bars must have a yield strength of at least 40,000 psi and be capable of withstanding bending to a 90° angle, re-straightening, and then withstanding the pull-out test requirements specified in subsection [602.03.F](#).

Epoxy coat bent tie bars as specified in subsection [905.03.C](#), except the Engineer will not require the application of the epoxy coating within 4 inches of each end of the tie bar, or repair of damage to the coating within 4 inches of each end of the bar.

914.10. Structure Expansion Anchors and Bolts. Select expansion anchors from the Qualified Products List in the sizes and shapes shown on the plans. Bolts for flush-type anchors must meet the requirements of ASTM A 307, for Grade A.

914.11. Preformed Waterproofing Membranes and Joint Waterproofing. Select preformed waterproofing fabric system, including the manufacturer's recommended primer, from the Qualified Products List.

914.12. Elastomeric Bearings. Elastomeric bearings must meet the requirements of AASHTO Division II, Section 18.2, "Elastomeric Bearings," for 100 percent virgin polychloroprene bearings. Provide certification to the Engineer that bearings conform to this subsection.

Laminated bearings must have a shear modulus of 100 psi \pm 15 psi. Plain bearings must have a shear modulus of 200 psi \pm 30 psi. Rolled steel sheet laminates must meet the requirements of ASTM A 36 or ASTM A 1011, for Grade 36 or Grade 40. Blast-clean the surfaces of the laminates where elastomers are to be bonded.

914.13. Non-Metallic Washers. Washers used as spacers between pin plates and link plates must be polyethylene, high density, non-metallic washers meeting the requirements of ASTM D 1248, for Type III, Class B.