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**ASPHALT PAVING SURFACE TREATMENT:** **Marshall Overlay**

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| --- | --- | --- |
| **SECTION USAGE MATRIX** | | |
| C | NA | Seminary and Small Institute Standard Plan (CHURCH EDUCATION SYSTEM) - New Project |
| SM | NA | Standard MEETINGHOUSE and PHASED MEETINGHOUSE Standard Plan - New Project |
| R | SUP | OM/RI (REPLACEMENT & IMPROVEMENT) for Existing Meetinghouse / Seminary and Institute Project |
| CM | NA | Meetinghouse and Phased Meetinghouse Standard Plan with S&I MODULE ADDITION - New Project |
| SI | NA | S&I MODULE Addition to Existing Meetinghouse Building |
| MO | NA | MISSION OFFICE MODULE Addition to Existing Meetinghouse Building |
| UM | NA | URBAN MEETINGHOUSE for Custom Meetinghouse - New or Addition Project |
| FM | NA | Small Maintenance Project specification for FACILITY MANAGER |
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| --- | --- | --- |
| **MODIFICATION LOG** | | |
| DATE | SOURCE | DESCRIPTION |
| 26 Apr 24 | Mike Molyneux | Reference Standards Updated. |
| 19 Feb 19 | Gail Olsen | Reference Standards Updated. |
| 10 Jan 19 | Chris Barker | Asphalt Mix Design Criteria Summary Updated. |
| 02 May 18 | Chris Barker | Asphalt Reinforcement Fiber moved to Section 32 1217 and bid as an Alternate Asphalt Mix Criteria Summary updated. Reference Standards updated. |
| 14 Aug 17 | Chris Barker | Changes made to Field Tests And Inspections provided by Owner in Field Quality Control. |
| 02 May 17 | Chris Barker | Asphalt Reinforcement Fiber moved to Section 32 1217 and bid as an Alternate. |
| 19 Jul 16 | Chris Barker | Major Upgrade Procedural Notes Updated. Attachment 'Asphalt Information and Guidelines' omitted. |
| 27 Oct 15 | Chris Barker | Asphalt Reinforcement Fiber requirements updated. Procedural Note, Pre-Conference Agenda, and Field Quality Control changes. Reference Standards Updated. |
| 30 Apr 15 | Chris Barker | Updated Quality Assurance and Field Quality Control for Testing and Inspection. Updated Reference Standards. Added requirements for proposed Asphalt Mix Design if Installer cannot provide specified mix. Asphalt Reinforcement Fiber requirements updated. |

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| --- |
| PROCEDURAL NOTES |
| **COORDINATION**  GENERAL:   1. This Specification is written for small Maintenance Projects that use Division 01 Maintenance Project Specification instead of full Division 01 Specification. 2. Refer to 'Asphalt, Site Concrete and Pervious Concrete Maintenance Guidelines’ for preservation maintenance program and recommendations for each asphalt paving surface treatment at [http://aec.churchofjesuschrist.org/aec/design\_guidelines/](http://aec.churchofjesuschi.org/aec/design_guidelines/). 3. Refer to 'Asphalt Maintenance Checklists for Facilities Manager and Contractor’ available at http://aec.churchofjesuschrist.org/aec/design\_guidelines for project checklists. 4. Use the '*Agreement for Asphalt Maintenance'* available on MFD Resource Library for asphalt maintenance scoping, budgeting and for contracts. 5. **SUPERPAVE** and **MARSHALL** Method:    1. Use ‘Superpave’ method where it is no more expensive than ‘Marshall’ method and preferred or desired by Project Manager; otherwise use ‘Marshall’ method design mix.    2. 'Superpave' method preferred method for all Church asphalt paving projects. 6. **SITE ADAPT DESIGN**:    1. Design team is to site adapt and modify asphalt paving specifications to match a **LOCALLY** available or preferred and successful mix design. This is done primarily in Section 1.1 Summary.    2. Local Mix Designs are ordinarily derivatives of ‘Superpave’ and ‘Marshall’ mix specifications. 7. Warranty: 8. It is standard industry practice to provide limited one (1) year workmanship and materials warranty for asphalt parking lot construction. Warranty is generally limited to premature distress caused by poor workmanship and/or poor quality materials. 9. Applicators: 10. By requiring mechanical application and information about prior Projects, this specification is intended to limit bidding to top, professional applicators and products available in Project area. 11. If Project is in remote area or for some other reason contractors of level required to meet specification requirements are not available, Section should be edited to specify requirements which can be met by top applicators available in Project Area. 12. This relaxation of standard requirements should be done with prior approval of Owner’s Representative. 13. Testing and Inspection: 14. Testing for Asphalt Paving Surface Treatment Resurfacing.     1. Owner’s Representative should test and inspect asphalt overlays.     2. See Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control of this section for testing and inspection requirements for resurfacing of asphalt paving. 15. Asphalt Reinforcement Fibers: 16. Asphalt Reinforcement Fibers can be added to hot asphalt mix if approved by Project Manager. 17. Fibers can increase the life of the paving and decrease maintenance requirements. 18. Fibers are blend of non-resin impregnated fibrillated fibers and high-strength monofilament fibers known for its strength, durability, and binding properties. 19. Fibers help control thermal, reflective and fatigue cracking, as well as rutting, extends asphalt life. 20. Asphalt Reinforcement Fibers are included as Alternate ‘A’ as specified in Price and Payment Procedures in Part 1 of Specification Section 32 1717: 'Asphalt Reinforcement Fibers. |
| DESIGN INFORMATION AND BACKGROUND |

SECTION 32 0113

ASPHALT PAVING SURFACE TREATMENT: Marshall Overlay

1. GENERAL
   * + 1. SUMMARY
          1. Includes But Not Limited To:

Furnish and install asphalt paving overlay in driveways and parking areas as described in Contract Documents including following, but not limited to:

Asphalt Mix Design Criteria Summary:

|  |  |  |
| --- | --- | --- |
|  | Design team to site adapt and modify asphalt paving specifications to match **LOCALLY** available or preferred and successful mix design. Site adapt and edit accordingly, including asphalt paving thicknesses. Binder grade to be site adapted and design team to determine whether asphalt fibers will be used and contact local asphalt supplier to site adapt asphalt mix design criteria. | |
|  | Asphalt Binder: | PG 58-28 (or Binder locally used by DOT) |
|  | Nominal maximum size aggregate (Nmas): | 9.5 mm (3/8 inch) |
|  | Maximum size aggregate: | 12.5 mm (1/2 inch) |
|  | Mix Designator (compaction effort); Ndesign: | 50 |
|  | Antistrip Agent: | If required by supplier’s mix design (use 1 percent or greater lime slurry when required |
|  | Asphalt Reinforcement Fibers: | Specified in Section 32 1217 as Alternate ‘A’ |
|  | Reclaimed Asphalt Pavement (RAP): | Allowed up to 25 percent. Asphalt binder shall be one grade softer when more than 15 percent RAP is used |
|  | ROSP: | Not allowed. |
|  | Minneral Filler: | Not allowed. |
|  | Warm Mix Additive: | If required by supplier’s mix design |
|  | Recycle Agent: | If required by supplier’s mix design |

Design Air Voids:

Three and one-half percent (3.5 percent).

Tack coat: Application of asphaltic material to existing asphalt concrete or portland concrete surfaces before asphalt concrete pavement.

Blotter materials and procedures for absorbing excess asphalt as required.

* + - * 1. Related Requirements:

Section 01 0000: ‘General Requirements’:

Section 01 1200: ‘Multiple Contract Summary’ for multiple contracts.

Section 01 4523: ‘Testing and Inspecting Services’ for testing and inspection, and testing laboratory services for materials, products, and construction methods.

Section 32 0113.01: ‘Asphalt Paving Surface Treatment: Asphalt Based Penetrating Seal’.

Section 32 1717: ‘Asphalt Reinforcement Fibers’.

**EDIT REQUIRED:** Include following paragraph if included in Project.

Section 32 1713: 'Parking Bumpers'.

Section 32 1723: 'Pavement Markings'.

* + - 1. PRICE AND PAYMENT PROCEDURES
         1. Alternates:

Asphalt Reinforcement Fibers are bid as Alternate ‘A’ as specified in Price and Payment Procedures in Part 1 of Section 32 1216. Owner’s Representative will review bid and decide if asphalt reinforcing fibers will be included in Project.

* + - 1. REFERENCES
         1. Association Publications:

Asphalt Institute, 2696 Research Park Dr., Lexington, KY [www.asphaltinstitute.org](http://www.asphaltinstitute.org):

MS-2*, ‘Mix Design Methods’* (7th Edition 2015).

* + - * 1. Definitions:

Aggregate: Hard inert mineral material, such as gravel, crushed rock, slag, or sand.

Coarse Aggregate: Aggregate retained on or above No. 4 (4.75 mm) sieve.

Coarse-Graded Aggregate: Aggregate having predominance of coarse sizes.

Dense-Graded Aggregate: Aggregate that is graded from maximum size down through filler with object of obtaining an asphalt mix with controlled void content and high stability.

Fine Aggregate: Aggregate passing No. 4 (4.75 mm) sieve.

Fine-Graded Aggregate: Aggregate having predominance of fine sizes.

Mineral Filler: Fine mineral product at least 70 percent of which passes a No. 200 (75µm) sieve.

Air Voids: Total volume of small air pockets between coated aggregate particles in asphalt cement concrete (ACC); expressed as percentage of bulk volume of compacted paving mixture.

Anti-Stripping Agent: Chemicals added to bitumen to improve the adhesion of the bitumen to hydrophilic aggregates

Asphalt Binder: Asphalt cement or modified asphalt cement that binds aggregate particles into dense mass.

Asphalt Cement used in paving applications that has been classified according to the Standard Specification for Performance Graded Asphalt Binder, AASHTO Designation MP 320. It can be either unmodified or modified Asphalt Cement, as long as it complies with specifications.

Asphalt-Aggregate Designator: Alpha-numeric code that indicates nominal maximum size of aggregate, and type and grade of asphalt in aggregate-asphalt mix.

Example: “12.5 PG70-28” means aggregate asphalt mix shall be composed of aggregate gradation with 12.5 mm (1/2 inch) nominal maximum size and performance grade asphalt binder designed to perform between temperatures of 70 deg C and -28 deg C (158 deg F and -18.4 deg F).

Equivalent Single Axle Load (ESAL): Effect on pavement performance of any combination of axle loads of varying magnitude equated to number of 18,000-lb. (80-kN) single-axle loads that are required to produce an equivalent effect.

Performance Graded Asphalt Binder (PGAB): Asphalt binder designed to produce HMA that meets certain performance standards. Designations for performance-graded asphalt binders are prefixed with PG. Each grade designation also includes two sets of numbers that denote temperature range. This is a range of climate temperatures to which road may be exposed and still be expected to give superior performance.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

Pre-emergent Herbicide: Chemical that is applied before weeds emerge. It acts by killing weed seedlings and /or establishing layer of chemical on or near soil surface that is toxic to germinating seeds and young seedlings.

Reclaimed Asphalt Pavement (RAP): Existing asphalt mixture that has been pulverized, usually by milling, and is used like aggregate in recycling of asphalt pavements.

Subgrade (definition varies depending upon stage of construction and context of work being performed):

Prepared natural soils on which fill, aggregate base, or topsoil is placed.

or

Prepared soils immediately beneath paving.

Tack Coat: Very light application of liquid asphalt or asphalt emulsion diluted with water.

* + - * 1. Reference Standards:

American Association of State and Highway Transportation Officials:

AASHTO T 304-17: ‘Standard Method of Test for Uncompacted Void Content of Fine Aggregate’.

AASHTO T 322-07(2016), ‘Standard Method of Test for Determining the Creep Compliance and Strength of Hot-Mix Asphalt (HMA) Using the Indirect Tensile Test Device.

ASTM International:

ASTM C29/C29M-17a, ‘Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate'.

ASTM C88-18, ‘Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate'.

ASTM C131/C131M-20, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine’.

ASTM C142/C142M-17, ‘Standard Test Method for Clay Lumps and Friable Particles in Aggregates'.

ASTM D242/D242M-19, ‘Standard Specification for Mineral Filler For Bituminous Paving Mixtures'.

ASTM D977-20, 'Standard Specification for Emulsified Asphalt’.

ASTM D979/D979M-15, 'Practice for Sampling Bituminous Paving Mixtures'.

ASTM D2041/D2041M-19, 'Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures’.

ASTM D2172/D2172M-17, ‘Standard Test Methods for Quantitative Extraction of Bitumen From Bituminous Paving Mixtures’.

ASTM D2256/ D2256M-21, ‘Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method’.

ASTM D2397/D2397M-20, 'Standard Specification for Cationic-Emulsified Asphalt’.

ASTM D2419-22, ‘Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate'.

ASTM D2726/D2726M-21, 'Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures’.

ASTM D2950/D2950M-22, ‘Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods'.

ASTM D3203/D3203M-17, ‘Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures'.

ASTM D3549/D3549M-18, ‘Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens’.

ASTM D3665-12(2017), ‘Standard Practice for Random Sampling of Construction Materials’.

ASTM D4318-17, ‘Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils’.

ASTM D4552/D4552M-20, ‘Standard Practice for Classifying Hot-Mix Recycling Agents'.

ASTM D4791-19(2023), ‘Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate’...

ASTM D5444-15, ‘Standard Method for Mechanical Size Analysis of Extracted Aggregate'.

ASTM D5821-13(2017), ‘Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate’.

ASTM D6307-19, ‘Standard Test Method for Asphalt Content of Hot-Mix Asphalt by Ignition Method'.

ASTM D6931-17, ‘Standard Test Method for Indirect Tensile (IDT) Strength of Bituminous Mixtures’.

* + - 1. ADMINISTRATIVE REQUIREMENTS
         1. Pre-Installation Conferences:

Participate in MANDATORY pre-installation conference as specified in Section 31 0501:

**EDIT REQUIRED:** Include following paragraph if other related sections are used in Project. Include only section(s) used for Project. Delete sections not used.

Schedule overlay pre-installation conference to be held jointly with any other 'Asphalt Surface Treatment' sections involving asphalt maintenance.

In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:

Review crack repair schedule and verify that other repairs will be completed before application of asphalt paving overlay.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

Review pre-emergent herbicide as specified in Section 31 0117.01 ‘Asphalt Paving Crack Seal’ or Section 31 0117.02 ‘Asphalt Paving Crack Fill’ for protection of adjoining property.

Review asphalt paving overlay schedule.

Review asphalt paving overlay mix design.

Review use of tack coat on existing surfaces.

Review asphalt paving overlay installation requirements.

Review safety issues.

Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.

Review requirements and frequency of testing and inspections.

Review Contractor Testing Agency Qualifications.

* + - * 1. Scheduling:

Provide to Owner’s Representative at least seven (7) days before asphalt overlay placement commences, approved Laboratory Report and Manufacturer’s Certificate of compliance with these specifications covering specific materials to be used on this project.

Notify Testing Agency and Architect twenty four (24) hours minimum before placing asphalt paving.

* + - 1. SUBMITTALS

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

* + - * 1. Action Submittals:

Product Data:

Pre-Emergent Herbicide:

Manufacturer's published product data on pre-emergent herbicide.

* + - * 1. Informational Submittals:

Certificates:

Require mix plant to furnish delivery/load tickets for each batch of asphalt. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:

Name of mix plant.

Date.

Name of contractor.

Name and location of Project.

Serial number of ticket.

Asphalt mix type (required).

Time loaded.

Identity of truck.

Installer to provide manufacturer’s Certificate of Compliance stating material authenticity and properties for review and acceptance by Engineer before product use.

Design Data:

Hot Mix Asphalt:

Design Criteria:

Develop mix design according to current Asphalt Institute MS-2 ‘Asphalt Mix Design Methods’ for Marshall Method.

Submittal format:

(1) Design mix submittal shall follow format as indicated in current Asphalt Institute MS-2*, ‘Mix Design Methods.*

Mix design must meet Design Criteria minimum requirements and show conformance to the following:

Mix design of asphalt paving must meet Design Criteria minimum requirements and show conformance to the following:

Location and name of hot mix asphalt concrete production facility.

Date of mix design. If older than two (2) years, recertify mix design.

Asphalt mix type.

Mix design method used.

Mix density.

Design air voids (three and one half (3.5) percent).

Asphalt content in percent.

Performance grade of asphalt binder.

Nominal maximum size of aggregate.

Aggregate source and gradation.

Mix properties and design parameters.

Temperature of mix at plant and in the field for optimum field compaction.

Amount of recycled asphalt pavement (RAP).

Mineral fillers, antistrip, and recycle agent percentages.

Identify if warm mix technologies will be used and how much warm mix additive will be used.

Within thirty (30) days prior to asphalt construction, submit actual design mix to Architect, Civil Engineering Consultant of Record and Independent Testing Laboratory for review and approval.

Test And Evaluation Reports:

Hot Mix Asphalt:

Contractor's Testing Agency copies of Field Test results to show compliance with all contract requirements and quality control for quality of asphalt mixture and asphalt installation.

Owner's Testing Agency copies of Field Tests and Inspections used to validate or determine discrepancies with testing by Contractor.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

Manufacturer Instructions:

Pre-Emergent Herbicide:

Application instructions for pre-emergent herbicide.

Qualification Statement:

Installer:

Provide Qualification documentation if requested by Owner's Representative.

* + - * 1. Closeout Submittals:

Include following in Operations And Maintenance Manual specified in Section 01 7800:

Record Documentation:

Manufacturer’s documentation:

Asphalt paving design.

Test reports.

Certificates from mix plant of delivery/load tickets.

Manufacturer’s Certificate of Compliance.

Testing and Inspection Reports:

Testing Agency Testing and Inspecting Reports of asphalt paving.

* + - 1. QUALITY ASSURANCE
         1. Qualifications. Requirements of Section 01 400 1.06 applies but not limited to following:

Asphalt Paving:

Foreman of asphalt paving crew has completed at least three (3) projects of similar size and nature.

Upon request, submit documentation.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

Pre-emergent herbicide:

Applicator:

Pre-emergent herbicide shall be applied by applicator certified by State in which Project is located as an applicator of agricultural chemicals.

* + - * 1. Testing and Inspection.

Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.

Owner will provide Testing and Inspection for asphalt paving surface treatment:

Owner will employ testing agencies to perform testing and inspection for asphalt surface treatment as specified in Field Quality Control in Part 3 of this specification.

Owner’s employment of an independent Testing Agency does not relieve Contractor of Contractor’s obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.

See Section 01 1200: ‘Multiple Contract Summary’.

* + - 1. DELIVERY, STORAGE, AND HANDLING
         1. Delivery And Acceptance Requirements:

Asphalt Material:

Each shipment must:

Be uniform in appearance and consistency.

Show no foaming when heated to specified loading temperature.

Do not supply shipments contaminated with other asphalt types or grades than those specified:

Do not use petroleum distillate as a release agent.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

Pre-emergent herbicide:

Materials shall be delivered in original, unopened packages with labels intact.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

* + - * 1. Storage And Handling Requirements:

Pre-emergent herbicide:

Do not freeze. Store in at temperatures above 41 deg F (5 deg C).

Follow Manufacturer’s storage and handling requirements.

* + - 1. FIELD CONDITIONS
         1. Ambient Conditions:

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

Pre-emergent herbicide:

Follow printed Manufacturers instruction for environmental hazards:

Follow printed Manufacturers instruction ambient conditions for application of product.

Tack Coat:

Apply only when air and roadbed temperatures in shade are greater than 40 deg F (4.4 deg C). Temperature restrictions may be waived only upon written authorization from Architect or Civil Engineer.

Do not apply to wet surfaces.

Do not apply when weather conditions prevent tack coat from adhering properly.

Asphalt paving:

Do not perform work during following conditions:

Ambient temperature is below 45 deg F (7.2 deg C) or will fall below 45 deg F (7.2 deg C) during placement.

Temperature of existing Surface Temperature is below 50 deg F (10 deg C).

Cold Weather Asphalt Paving Plan: If asphalt pavement is placed outside of these temperature limits or those identified in MINIMUM Temperature Degrees, a plan is required which includes:

Haul times.

Placement details.

Compaction aids used in production.

Owner does not assume responsibility for asphalt when placed outside temperature limits.

Presence of free surface water or weather is unsuitable.

Wind or ground cools mix material before compaction.

1. PRODUCTS
   * + 1. DESIGN CRITERIA:
          1. General:

Follow current Asphalt Institute MS-2 ‘Asphalt Mix Design Methods’ for Marshall Method.

* + - * 1. Asphalt Mix Site Adapt Design:

Thickness of overlay to be 1-1/2 inches (38 mm) minimum.

Asphalt Binder:

Performance Graded Asphalt Binder:

Use performance graded asphalt binder identified under Asphalt Mix Design Criteria.

Aggregates:

Use clean, hard, durable, angular, sound, consisting of crushed stone, crushed gravel, slag, sand, or combination.

Provide aggregate material properties to meet **Table 1 – AGGREGATE PHYSICAL PROPERTIES** requirements:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 1 –AGGREGATE PHYSICAL PROPERTIES** | | | | | |
| **Property** | | **ASTM** | **ESAL** | **Min** | **Max** |
| **Coarse Aggregate (does not pass No. 4 sieve)** | | | |  |  |
| Angularity (fractured faces), percent | | D5821 | less than 0.3 | 55 | -- |
| 0.3 to 3.0 | 75 | -- |
| greater than 3.0 | 85/80 | -- |
| Wear (hardness or toughness), percent | | C131/C131M | less than 0.3 | -- | 40 |
| 0.3 to 3.0 | -- | 35 |
| greater than 3.0 | -- | 35 |
| Flats or elongates (3:1 length to width), percent, maximum | | D4791 | -- | -- | 20 |
| **Fine Aggregate (passing No. 4 sieve)** | | | |  |  |
| Angularity (uncompacted void content), percent (AASHTO T304) | | -- | less than 0.3 | -- | -- |
| 0.3 to 3.0 | 40 | -- |
| greater than 3.0 | 45 | -- |
| Sand equivalent, percent | | D2419 | less than 0.3 | 40 | -- |
| 0.3 to 3.0 | 40 | -- |
| greater than 3.0 | 45 | -- |
| Friable particles, percent | | C142/C142M | -- | -- | 2 |
| Plastic limit, maximum | Liquid limit | D4318 | -- | -- | 25 |
| Plastic limit | D4318 | -- | -- | 6 |
| Notes:  ESAL in millions.  Angularity by weight retained above 9 mm sieve, with at least one fractured face. 85/80 denotes 85 percent coarse aggregate has one fractured face and 80 percent has two or more fractured faces.  Wear of aggregate retained above 2.36 mm sieve unless specific aggregates have higher values are known to be satisfactory.  Flats or elongates retained above 4.75 mm sieve.  Friable particles passing No. 4.75 mm sieve.  Plasticity, passing No. 4.75 sieve. Aggregate is no-plastic even when filler material is added to aggregate. | | | | | |
| **Blended Physical Properties** | | | |  |  |
| Dry-rodded unit weight, lb/ft3, minimum | | C29/C29M | - | 75 | -- |
| Weight loss (soundness), percent, maximum | | C88 | -- | 16 |
| Clay content or cleanliness (sand equivalent), percent | | D2419 | less than 0.3 | 45 | -- |
| more than 0.3 | 60 | -- |
| Notes:  Weight loss using sodium sulfate.  Sand equivalent value is after going through dryer or before drum mixer. The sand equivalent requirement is waived for RAP aggregate but applies to remainder of aggregate blend.  Friable particles of clay lumps, shale, wood, mica, and coal passing 4.75 sieve. | | | | | |

Admixture:

Antistrip: Heat stable, cement slurry, lime slurry, dry lime, or liquid antistrip.

Add if mix is moisture sensitive as determined by 'Moisture Susceptibility' paragraph below.

Mineral Filler: Comply with requirements of ASTM D242/D242M.

Recycle Agent: Comply with requirements of ASTM D4552/D4552M.

* + - 1. MATERIAL
         1. Asphalt Paving Surface Treatment:

Include mandatory Asphalt Paving Surface Treatment to be applied no sooner than thirty (30) days or no later than eighteen (18) months of placing Asphalt Paving to be included with this project.

Asphalt Based Penetrating Seal as specified in Section 32 0113.01 ‘Asphalt Paving Surface Treatment: Asphalt Based Penetrating Seal’.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

* + - * 1. Pre-Emergent Herbicide:

Design Criteria:

Selective type pre-emergence control chemical containing twenty-five (25 percent) Prometon minimum for control of annual grasses and broadleaf weeds.

Non-oil based sterilant.

Labeled for under-pavement use.

Type Two Acceptable Products:

Pramitol 25E Herbicide by WinField United, St Paul MN [www.winfieldunited.com](http://www.winfieldunited.com).

Apply at a rate of 10 gal (37.85 liter) per 1 acre (0.4046863 hectare) conforming to application rates indicated on product label.

Equal as approved by Architect before installation. See Section 01 6200.

* + - * 1. Reclaimed Asphalt Pavement (RAP):

Aggregate restrictions include:

Allowed up to 25 percent. Asphalt binder shall be one grade softer when more than 15 percent RAP is used.

* + - * 1. Fabrics:

Type One Acceptable Products:

Petromat 4599 by Propex Fabrics, Chattanooga, TN [www.propexglobal.com](http://www.propexinc.com).

AOH by Thrace-LINQ Inc, Summerville, SC [www.linqind.com](http://www.linqind.com).

Equal as approved by Architect before bidding. See Section 01 6200.

* + - * 1. Tack Coat:

Emulsified asphalt meeting requirements of ASTM D977, Grade SS‑1H, CQS-1H, or ASTM D2397/D2397M, Grade CSS-1H.

1. EXECUTION
   * + 1. INSTALLERS
          1. Approved Applicators. Section 01 4301 ‘Quality Assurance - Qualifications’:
       2. PREPARATION
          1. Owner Responsibilities:

Remove Ward Trailer(s) if needed.

* + - * 1. Protection Of In-Place Conditions:

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

Pre-emergent herbicide:

Take necessary precautions to protect adjoining property and areas designated for planting on building site.

Do not contaminate any body of water by direct application, cleaning of equipment or disposal of wastes.

Asphalt Paving:

Protect all structures, including curb, gutter, sidewalks, guard rails and guide posts.

Protect neighborhood, storm drains and down-stream fish habitat.

* + - * 1. Surface Preparation:

Locate, reference, and protect all utility covers, monuments, curb, and gutter and other components affected by asphalt paving operations.

Paint Stripes:

If existing paint stripes and markings are thermoplastic, remove stripes and markings.

Grease or Oil Patches:

Remove grease or oil spots, and spillage of any material that has adhered to pavement. Do not place tack coat or asphalt paving over unsound oil spots softened by fuel or oil.

Clean oil spots and treat with oil spot primer.

Seal areas damaged by oil or grease with an oil spot primer compatible with tack coat and asphalt paving. Use in accordance with Manufacturer’s recommendations.

Cleaning:

Remove all debris, dirt, dust, leaves, loose material, moisture, mud spots, sand, silt spots, vegetation (including moss), water and other objectionable and foreign material from existing surface prior to placing tack coat. In areas where moss is prevalent, apply herbicide.

Power brooms, power blowers, air compressors, vacuum sweepers, rotary brooms, water flushing equipment, and blowers or by another approved method.

Tack coat:

Clean surface of all materials such as mud, dirt, leaves, etc. that prevent tack from bonding to existing surfaces.

If flushed, allow surface to dry.

Asphalt paving:

Area shall be clean and tack coat applied before placing of asphalt paving.

Remove all moisture, dirt, sand, leaves, and other objectionable material from prepared surface before placing asphalt.

Locate, reference, and protect all utility covers, monuments, curb, and gutter and other components affected by asphalt paving operations.

Allow sufficient cure time for tack coat before placing asphalt.

* + - 1. APPLICATION
         1. Interface With Other Work:

Do not apply overlay until completion of pavement repairs.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

* + - * 1. Pre-Emergent Herbicide:

Asphalt paving areas:

Follow Manufacturer’s printed application requirements:

Apply to prepared subgrade dispersed in liquid. Concentrate shall be such that Manufacturer's full recommended amount of chemical will be applied to every 1000 sq ft (93 sq m) and liquid will penetrate minimum of 2 inches (50 mm).

Application shall be no more than one (1) day before installation of aggregate base.

* + - * 1. Tack Coat:

General:

Tack coat vertical surfaces or existing asphalt cement concrete or portland cement concrete that will be in contact with asphalt paving.

Use tack coat diluted to a 2:1 (concentrate water) ratio.

Use pressure distributor to apply in uniform, continuous spread.

Cover all tacked surface areas with surfacing materials same day of application:

Application Rate:

Spread specified tack coat to existing horizontal paving surfaces in proper quantities as follows:

Open textured surface: 0.30 to 0.35 gal per sq yd (1.4 to 1.6 L per sq m) of diluted material.

Weathered surface: 0.25 to 0.30 gal per sq yd (1.1 to 1.4 L per m) of diluted material.

Non-Porous surface: 0.20 to 0.25 gal per sq yd (0.9 to 1.1 L per m) of diluted material.

Above application rates may vary according to field conditions. Obtain approval from Civil Engineer for quantities, rate of application, temperatures, and areas to be treated before any application.

**EDIT REQUIRED:** Delete following Paragraph if paving fabric not required.

* + - * 1. Fabric Installation:

Lay fabric with fuzzy surface down.

Lap joints 12 inches (305 mm) minimum, unless greater required by Manufacturer.

Remove excess wrinkles by cutting and lapping. Laps may require additional tacking material to achieve fabric penetration.

Do not apply fabric until asphalt overlay is available for prompt application.

* + - * 1. Asphalt Paving:

General:

Paving adjacent to cast-in-place concrete site elements shall be between 1/4 inch (6 mm) higher than concrete and flush with concrete.

Surface texture of hand worked areas shall match texture of machine-laid areas.

Surface shall be uniform with no 'birdbaths’. Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch (13 mm).

Cross Slope: 1/4 inch (6 mm) in 10 feet (3.0 m) perpendicular to centerline except at cross section grade breaks.

Grade: 1/8 inch (3 mm) in 10 feet (3.0 m) parallel to centerline.

Do not place on frozen aggregate base or during adverse climatic conditions such as precipitation or when roadway surface is icy or wet.

Uniformly mix materials so aggregate is thoroughly coated with asphalt.

Place at temperatures established by the mix design with self-propelled laydown machine.

Use **Table 2 – MINIMUM TEMPERATURE, DEGREES** as guide:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2 – MINIMUM TEMPERATURE, DEGREES** | | | | | | | |
| Ambient Air Temperature Deg F. | Ambient Air Temperature Deg C. | Compacted Paving Mat Thickness | | | | | |
| 3/4"  (19 mm) | 1”  (25 mm) | 1 1/2"  (38 mm) | 2”  (50 mm) | 3”  (75 mm) | 4” +  (100 mm) + |
| 45 – 50 | 7 – 10 | --- | --- | --- | --- | 280 | 265 |
| 50 – 59 | 10 – 15 | --- | --- | --- | 280 | 270 | 255 |
| 60 – 69 | 16 – 20 | --- | --- | 285 | 275 | 265 | 250 |
| 70 – 79 | 21 – 79 | 285 | 285 | 280 | 270 | 265 | 250 |
| 80 - 89 | 27 - 31 | 280 | 275 | 270 | 265 | 260 | 250 |
| 90+ | 32+ | 275 | 270 | 265 | 260 | 250 | 250 |

Longitudinal bituminous joints shall be vertical and properly tack coated if cold. Transverse joints shall always be tack coated.

Compaction:

Compact asphalt paving to ninety-six (96) percent minimum of Marshall value. Determine percent compaction by ASTM D2950/D2950M.

Alternate density and compaction:

Compact asphalt paving to ninety-four (94) percent of Maximum Theoretical Specific Gravity minimum plus three (3) percent and minus two (2) percent. Determine percent compaction by D2041/D2041M.

Roll with powered equipment capable of obtaining specified density while providing required smoothness.

Begin breakdown rolling immediately after asphalt is placed when asphalt temperature is at maximum:

Complete handwork compaction concurrently with breakdown rolling.

Execute compaction so visibility of joints is minimized:

Complete finish rolling to improve asphalt surface as soon as possible after intermediate rolling and while asphalt paving is still warm.

Do not use vibration for finish rolling.

* + - * 1. Tolerances:

Asphalt Paving:

Paving adjacent to cast-in-place concrete site elements shall be between 1/4 inch (6 mm) higher than concrete and flush with concrete.

Surface texture of hand worked areas shall match texture of machine-laid areas.

Surface shall be uniform with no 'birdbaths’. Leave finished surfaces clean and smooth. Variations from specified grades shall not exceed 1/2 inch (13 mm).

Cross Slope: 1/4 inch (6 mm) in 10 feet (3.0 m) perpendicular to centerline except at cross section grade breaks.

Grade: 1/8 inch (3 mm) in 10 feet (3.0 m) parallel to centerline.

* + - * 1. Asphalt Paving Surface Treatment:

Apply mandatory Asphalt Paving Surface Treatment no sooner than thirty (30) days or no later than eighteen (18) months of placing Asphalt Paving to be included with this project. Do not apply prior to asphalt curing (refer to ‘Asphalt, Concrete and Pervious Concrete Maintenance Guidelines’):

Asphalt Based Penetrating Seal as specified in Section 32 0113.01 ‘Asphalt Paving Surface Treatment: Asphalt Based Penetrating Seal’.

* + - * 1. Paint Stripes:

Apply paint stripes after asphalt has been installed and cured no sooner than 7 days after placement.

* + - 1. FIELD QUALITY CONTROL
         1. Field Tests And Inspections:

Civil and structural field tests, laboratory testing, and inspections are provided by Owner’s independent Testing Agency as specified in Section 01 4523 ‘Testing And Inspection Services’:

Quality Control is sole responsibility of Contractor:

Owner’s employment of an independent Testing Agency does not relieve Contractor of Contractor’s obligation to perform testing and inspection as part of his Quality Control:

Testing and inspections will be responsibility of Contractor, will be responsibility of Contractor to be performed by an independent entity.

Contractor bears full responsible for compliance with all contract requirements and quality control on project and will be responsible for quality of asphalt mixture and asphalt installation.

* + - * 1. Field Tests (Provided by Contractor):

Compaction Tests:

Contractor to provide compaction tests of asphalt being placed to establish rolling patterns and installation procedures.

Compaction tests by Contractor are independent of compaction tests being provided by Owner. See Section 01 4523 ‘Testing And Inspection Services’.

Compact asphalt paving to ninety-six (96) percent minimum of Marshall value. Determine percent compaction by ASTM D2041/D2041M:

Alternate density and compaction:

Compacted to ninety-four (94) percent of Theoretical Maximum Specific Gravity (Rice) minimum plus three (3) percent and minus two (2) percent. Determine percent compaction by ASTM D2950/D2950M.

Maximum average total air voids in completed hot mix asphalt shall be eight (8) percent but more than three (3) percent as determined by ASTM D2041/D2041M.

Thickness Tests:

Determine thickness of paving being placed, no less than one (1) test per 10,000 sq. ft. (930 sq. m) of paving or portion thereof, three (3) tests minimum.

* + - * 1. Field Tests And Inspections (Provided by Owner):

General:

Compaction tests provided by Owner will be used to validate or determine discrepancies with testing by Contractor.

Civil engineer applies pay factor for Gradation/Asphalt Content, In-Place Density. Civil engineer computes pay factor for each lot.

Opening paved surface to traffic does not constitute acceptance.

Unless required by the Owner’s Representative, Testing Agency is to base compaction testing on the Contractor’s submitted mix design for theoretical maximum specific gravity (Rice) or Marshall specific gravity (Bulk) values.

Asphalt-aggregate mix sampling as per ASTM D979/D979M.

Test for:

Air voids as per ASTM D3203/D3203M.

Asphalt binder content as per ASTM D6307.

Aggregate gradation as per ASTM D5444.

Lot size: 10,000 sq. ft. (930 sq. m) or part thereof.

Sub lot size: 5,000 sq. ft. (465 sq. m) or part thereof.

At Site Testing and Inspection:

Asphalt Paving:

Testing Agency shall provide full time nuclear density testing and inspection for asphalt paving during asphalt paving operations (nuclear density testing is informational testing only and does not constitute acceptance by Owner).

Inspection to include:

Aggregate coating.

Compaction control and effort required.

Suitability of spreading and asphalt paving equipment.

Temperature of mix as delivered and placed.

1. Reject mixes exceeding 325 deg F (163 deg C) in transport vehicle as required in Non-Conforming Work below.
2. Dispose of cold mix in paver hopper as thin spread underlay.

Field Tests:

When tested with 10 foot (3 meter) straight edge, surface of completed work shall not contain irregularities in excess of 1/4 inch (6 mm).

Determine percent compaction per ASTM D2950/D2950M unless other nondestructive nonnuclear methods such as sonar are used.

Provide written nuclear density testing, or other nondestructive nonnuclear methods such as sonar, of asphalt paving at minimum rate of one (1) per 2,500 sq. ft. (232 sq. m). Select test locations by ASTM D3665 and sample per ASTM D979/D979M before compaction. Minimum of three (3) tests required.

Compact asphalt paving to ninety-six (96) percent minimum of Marshall/Bulk value. Determine percent compaction by ASTM D2950/D2950M:

* + 1. Alternate density and compaction:

(a) Compact asphalt paving to ninety-four (94) percent of Theoretical Maximum Specific Gravity (Rice) plus three (3) percent or minus two (2) percent. Determine percent compaction by ASTM D2041/D2041M.

Maximum average total air voids in completed hot mix asphalt shall be eight (8) percent but more than three (3) percent as determined by ASTM D2041/D2041M.

Determine thickness of paving being placed, no less than one (1) test per 10,000 sq. ft. (930 sq. m) of paving or portion thereof, three (3) tests minimum.

At Laboratory Testing:

General:

Provide at least one (1) laboratory test series for every 10,000 sq. ft. (930 sq. m) or part thereof (minimum of one (1) test):

Test reports will show compliance with Contract Documents regarding type of aggregate base, depth of aggregate base, depth and density of asphalt paving, asphalt content, aggregate gradation, flow and stability, bulk specific gravity and maximum specific gravity.

Reports will also give test procedures used by testing laboratory.

Compaction and Final Density:

Pavement thickness and final density to be determined by results of coring. Provide one (1) core per 10,000 sq. ft. (930 sq. m) or part thereof. Minimum of three (3) tests required:

Based upon core samples, compaction is acceptable if test deviations are within pay factor 1.00 limits.

At Project Manager’s discretion, after consulting with design team, a Lot with a sub-lot test deviation greater than Reject may stay in place at fifty (50) percent cost.

Select test locations by ASTM D3665 and sample per ASTM D979/D979M after compaction.

Compaction Pay Factor:

Based upon core samples, compaction is acceptable if test deviations are within pay factor 1.00 limits.

At Project Manager’s discretion, after consulting with design team, a Lot with a sub-lot test deviation greater than Reject may stay in place at fifty (50) percent cost.

Average Density, in percent as per **Table 3 – COMPACTION PAY FACTORS**:

|  |  |
| --- | --- |
| **Table 3 – MINIMUM TEMPERATURE, DEGREES**  **(96 percent of laboratory required – Marshall Method ASTM D2726/D2726M)** | |
| Actual Density percent  As Compared Marshall/Bulk Density | Pay Factor  Applied to Bid Asphalt Qualities |
| 96.0 | 100.0 |
| 95.9 | 99.7 |
| 95.8 | 99.3 |
| 95.7 | 98.9 |
| 95.6 | 98.4 |
| 95.5 | 97.8 |
| 95.4 | 97.1 |
| 95.3 | 96.4 |
| 95.2 | 95.8 |
| 95.1 | 94.6 |
| 95.0 | 93.4 |
| 94.9 | 92.2 |
| 94.8 | 90.7 |
| 94.7 | 89.1 |
| 94.6 | 87.8 |
| 94.5 | 85.1 |
| 94.4 | 82.6 |
| 94.3 | 79.5 |
| 94.2 | 75.5 |
| 94.1 | 69.7 |
| 94.0 | 60.0 |
| Under 94.0 | REJECT |

Average Density determined by alternate method as shown in following **Table 4 – COMPACTION PAY FACTORS**:

|  |  |  |
| --- | --- | --- |
| **Table 4 – COMPACTION PAY FACTORS**  (94 percent of theoretical maximum specific gravity – Superpave (Rice)  (ASTM D2041/D2041M plus three (3) or minus two (2) percent) | | |
| Pay Factor | Density, in Percent | |
| Average | Lowest Test |
| 0.70 | More than 96 | --- |
| 1.00 | 92 to 96 | 89 or Greater |
| 0.90 | 92 to 96 | Less than 89 |
| Reject | Less than 92 | --- |
| Notes:  At Contractor’s discretion and expense, do Hamburg wheel track test (AASHTO T 304) on 3 additional random core samples from non-complying sub-lot of 5,000 sq. ft. (465 sq. m). Sub-lot will be accepted if average rut depth is less than 10 mm at 20,000 passes. | | |

Pavement Thickness:

Pavement thickness and final density to be determined by results of coring. Provide one (1) core per 10,000 sq. ft. (930 sq. m) or part thereof. Minimum of three (3) tests required:

Acceptance will be based on average of all thickness tests.

At Project Manager’s discretion, after consulting with design team, payment may be made for areas deficient in thickness by more than 0.75 inches (19.05 mm) at fifty (50) percent. If not, remove and replace at no additional cost to the Owner in following **Table 5 – THICKNESS PAY FACTORS**

|  |  |
| --- | --- |
| **Table 5 – THICKNESS PAY FACTORS** | |
| Pay Factors | Thickness Deficiency, in Inches  (ASTM D3549/D3549M) |
| 1.00 | 0.00 to 0.25 |
| 0.90 | 0.26 to 0.50 |
| 0.70 | 0.51 to 0.75 |
| Reject | 0.76 to 1.00 |

Air Voids:

Basis of evaluation is laboratory compacted samples (not field compacted samples).

Air voids will be mix design target plus or minus one (1) percent.

If test results are not within this Section’s limits, options include correction of production procedures or alternate mix design acceptable to Civil Engineer.

Dust to asphalt ratio.

Asphalt Content, Aggregate Gradation:

Lot is acceptable if test deviations are within pay factor 1.00 limits.

At Civil Engineer’s discretion, a Lot with sub-lot test deviation greater than pay factor 0.85 limits may stay in place at fifty (50) percent cost.

See ‘At Site Testing and Inspection’ above for pay factors for non-complying materials.

* + - * 1. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:

Asphalt Paving:

Deficient asphalt paving thickness:

Place additional material over deficient areas. Do not skin patch. Mill for inlay if necessary. Correct deficient asphalt paving thickness at no additional cost to the Owner.

Rejection and Removal of Asphalt Paving:

Remove asphalt paving found defective after installation and install acceptable product at no additional cost to the Owner.

Removal of Asphalt Paving:

Remove spatter, over-coat, or mar at no additional cost to the Owner.

Remove asphalt from borrow pits or gutters at no additional cost to the Owner.

Repair of Asphalt Paving:

Repair or replace defective joints, seams, edges at no additional cost to the Owner.

* + - 1. PROTECTION
         1. Tack Coat:

Protect all surfaces exposed to public view from being spattered or marred. Remove any spattering, over-coating, or marring at no additional cost to Owner.

Traffic:

Do not permit traffic to travel over tacked surface until tack coat has cured and dried.

* + - * 1. Asphalt Paving:

Protect hot mixed asphalt (HMA) pavement from traffic until mixture has cooled enough not to become marked.

**EDIT REQUIRED:** Include following paragraph if paving cracks contain weed and other live vegetation matter. Apply pre-emergent herbicide prior to application of asphalt paving patch repair.

* + - 1. CLEANING
         1. Waste Management:

Pre-emergent herbicide:

Follow Manufacturer’s recommendations for disposal of product at approved waste disposal facility.

Do not reuse empty containers.

END OF SECTION