

SECTION 32 14 13.16
BITUMEN-SET PRECAST CONCRETE PAVING SLABS
(1995 MasterFormat Section 02784)

NOTE: This guide specification is the U.S. for concrete paving slabs adhered with a neoprene mastic to a bitumen-sand setting bed and tack coat over a concrete base. Slabs installed with this method are not recommended for areas subject to vehicular traffic. Bitumen setting bed is not recommended on asphalt or aggregate bases. The text must be edited to suit specific project requirements. This Section includes the term "Architect." Edit this term as necessary to identify the design professional in the General Conditions of the Contract.

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Concrete paving slabs and joint sand.
 - 2. Bitumen setting bed.
 - 3. Asphalt tack coat.
 - 4. [Cleaning and Sealing].
- B. Related Sections
 - 1. Section [] - Cast-in-Place Concrete Slab [for asphalt bed and slabs].
 - 2. Section [] - Aggregate Subbase.
 - 3. Section [] - Storm Drainage.
 - 4. Section [] - Concrete [Walks] [Curbs] [and] [Gutters].
 - 5. Section [] - Concrete Accessories.
 - 6. Section [] - Joint Sealants.

Note: Pavements subject to vehicles should be designed in consultation with a qualified civil engineer, in accordance with established pavement design procedures and in accordance with the ICPI Tech Spec technical bulletins. Use the current year reference.

1.02 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. C 33, Specification for Concrete Aggregates.
 - 2. C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 3. C 144, Standard Specification for Aggregate for Masonry Mortar.
 - 4. C 920, Specification for Elastomeric Joint Sealants.
 - 5. D 977, Standard Specification for Emulsified Asphalt.
 - 6. D 3381, Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
- B. Canadian Standards Association (CSA)
 - 1. A231.1, Precast Concrete Paving Slabs.
- C. Interlocking Concrete Pavement Institute (ICPI):
 - 1. ICPI Tech Spec Technical Bulletins

1.04 SUBMITTALS

- A. In accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
- B. Manufacturer's drawings and details: Indicate perimeter conditions, relationship to adjoining materials and assemblies, [expansion and control joints,] concrete paving slab [layout,] [patterns,] [color arrangement,] installation [and setting] details.
- C. Neoprene modified asphalt adhesive product catalog sheets with specifications.
- D. Bituminous setting bed: asphalt cement mix design to be used in the bituminous setting bed conforming to ASTM D 3381.
- E. Sieve analysis per C 136 for sand mixed with bitumen and sand for joints between concrete

paving slabs.

- F. Concrete paving slabs:
1. [Four] representative full-size samples of each slab type, thickness, color, finish that indicate the range of color variation and texture expected in the finished installation. Color(s) selected by [Architect] [Engineer] [Landscape Architect] [Owner] from manufacturer's available colors.
 2. Accepted samples become the standard of acceptance for the work.
 3. Test results from an independent testing laboratory for compliance of concrete slabs with CSA A231.1.
 4. Manufacturer's certification of concrete slabs by ICPI as having met applicable [ASTM][CSA] standards.
 5. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
- G. Paving Slab Installation Subcontractor:
1. A copy of Subcontractor's current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
 2. Job references from projects of a similar size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.

1.04 QUALITY ASSURANCE

- A. Paving Subcontractor Qualifications:
1. Utilize an installer having successfully completed concrete paving slab installation similar in design, material, and extent indicated on this project.
 2. Utilize an installer holding a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.
- B. Regulatory Requirements and Approvals: [Specify applicable licensing, bonding or other requirements of regulatory agencies].
- C. Mock-Ups:
1. Install a 7 ft x 7 ft (2 x 2 m) paving slab area.
 2. Use this area to determine surcharge of the bitumen-sand layer and adhesive, joint sizes, lines, laying pattern(s), color(s) and texture of the job.
 3. This area will be used as the standard by which the work will be judged.
 4. Subject to acceptance by owner, mock-up may be retained as part of finished work.
 5. If mock-up is not retained, remove and properly dispose of mock-up.

1.05 DELIVERY, STORAGE & HANDLING

- A. General: Comply with Division 1 Product Requirement Section.
- B. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers packaging with identification labels intact.
1. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.
 2. Deliver concrete paving slabs to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
 3. Unload slabs at job site in such a manner that no damage occurs to the product.
- D. Storage and Protection: Store materials protected such that they are kept free from mud, dirt, and other foreign materials. [Store concrete paving slab cleaners and sealers per manufacturer's instructions.]
1. Cover joint sand with waterproof covering if needed to prevent exposure to rainfall or removal by wind. Secure the covering in place.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not install bitumen setting bed or paving slabs during heavy rain or snowfall.
 - 2. Do not install bitumen setting bed and paving slabs over frozen base materials.
 - 3. Do not install frozen bitumen setting bed materials.
 - 4. Do not install concrete paving slabs on frozen bitumen setting bed materials.

1.07 MAINTENANCE

- A. Extra Materials: Provide [Specify area.] [Specify percentage.] additional material for use by owner for maintenance and repair.
- B. Slabs shall be from the same production run as installed materials.

PART 2 PRODUCTS

2.01 CONCRETE PAVING SLABS

- A. Manufacturer: [Specify ICPI member manufacturer name.]
 - 1. Contact: [Specify ICPI member manufacturer contact information.]
- B. Concrete paving slabs:
 - 1. Slab type: [Specify name of product group, family, series, etc.]
 - a. Material Standard: Comply with material standards in CSA A231.1: 650 psi (4.5 MPa) average flexural strength. Freeze-thaw scaling testing requirements shall be waived for applications not exposed to freezing conditions.
 - b. Color [and finish]: [Specify color.] [Specify finish].
 - d. Size: [Specify.] inches [({Specify.}mm)] x [Specify.] inches [({Specify.}mm)] x [Specify.] inches [({Specify.} mm)] thick.
 - e. Manufactured in a plant where paving products are certified by ICPI as having passed manufacturer designated [ASTM] [CSA] requirements in this specification.

2.02 PRODUCT SUBSTITUTIONS

- A. Substitutions: No substitutions permitted.

2.04 BITUMEN SETTING BED MATERIALS

- A. Primer for base: Anionic asphalt emulsion SS-1h, per ASTM D 977.
- C. Sand for asphalt bed
 - 1. Clean, non-plastic, free from deleterious or foreign matter, symmetrically shaped, natural or manufactured from crushed rock.
 - 2. Do not use limestone screenings, stone dust, or sand in the bedding sand material that does not conform to the grading requirements.
 - 3. Graded according to ASTM C 136.
 - 4. Bedding Sand Material Requirements: Conform to the grading requirements of ASTM C 33 with modifications as shown in Table 1.

Table 1
Grading Requirements for Bedding Sand
ASTM C 33

Sieve Size	Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30

No. 100 (0.150 mm)	2 to 10
No. 200 (0.075 mm)	2 to 10

- C. Asphalt cement: heated to 300° F (150° C), 7% asphalt mixed with 93% sand in batches 145 lbs. (66 kg) asphalt to 1,855 lbs. (840 kg) sand. Exact proportions to be determined by the Contractor.
- D. Neoprene modified asphalt adhesive: Karnak 230 2% neo-asphalt paving block adhesive.

2.05 JOINT MATERIALS

- A. Joint sand: grading for conforming to ASTM C 144.
- B. Sealant and backer materials: see Section 07920 – Joint Sealants.

Note: Delete article below if cleaners, sealers, and/or joint sand stabilizers are not specified.

2.06 ACCESSORIES

- A. Provide accessory materials as follows:
 - 1. [Cleaners] [Sealers] [Joint sand stabilizers]
 - a. Material Type and Description: [Specify material type and description.].
 - b. Material Standard: [Specify material standard.].
 - c. Manufacturer: [Specify manufacturer.].

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

- A. [Specify acceptable paving subcontractors.].

3.02 EXAMINATION

- A. Acceptance of Site Verification of Conditions:
 - 1. General Contractor shall inspect, accept and certify in writing to the paving slab installation subcontractor that site conditions meet specifications for the following items prior to installation of concrete paving slabs:

Note: The elevations and surface tolerance of the concrete base determine the final surface elevations of concrete paving slabs. The paving slab installation contractor cannot correct deficiencies in the base surface with additional bitumen setting materials or by other means. Therefore, the surface elevations of the base should be checked and accepted by the General Contractor or designated party with written certification to the paving subcontractor, prior to placing bedding materials and concrete paving slabs.

- a. Verify that concrete base materials, thickness, surface tolerances and elevations conform to specified requirements.
- b. Verify location of [2 in. (50 mm) diameter] weep holes [at 20 ft (7 m)] centers [at lowest elevations] against curbs, walls, or other permanent structures [as indicated on the drawings]. Verify holes filled with washed pea gravel. Provide temporary plugs for holes to prevent ingress of sand-asphalt setting bed or neoprene adhesive during construction. Remove plugs when paving adjacent to drain holes.
- c. Verify that concrete surfaces to receive the bitumen bedding material are free of dust, oil, grease, paint, wax, curing compounds, primer, sealers, form release agents, from cracks over 3/16 in. (5 mm) in width, or any deleterious substances and debris which may prevent or reduce bonding.
- d. Conduct moisture tests to verify that concrete surfaces are cured, free from hydrostatic pressure and having a moisture content of less than 5%.
- e. Verify location, type, and elevations of edge restraints, [concrete collars

- around] utility structures, and drainage inlets.
- f. Do not proceed with installation of bedding sand and concrete paving slabs until base conditions are corrected by the General Contractor or designated subcontractor.

3.03 PREPARATION

- A. Verify base is dry, certified by General Contractor as meeting material, installation and grade specifications.
- B. Verify that base is clean, dry, and ready to accept tack coat, bitumen setting bed, slabs, and imposed loads.

3.04 INSTALLATION

- A. Concrete base preparation
 1. Fill any cracks under 3/16 in. (5 mm) wide with mortar.
 2. Sweep the surface clean.
- B. Asphalt primer
 1. Apply at a rate of [] gal/yd² (l/m²).

Note: Emulsified asphalt primer tack coats are typically applied at a rate of 0.6 to 1.0 gal per 100 ft² (2.5 to 4.1 liters per 10.0 m²) to asphalt base and 0.9 to 1.3 gal per 100 ft² (3.6 to 5.3 liters per 10.0 m²) to concrete base. Cutback asphalt tack coats are typically applied at a rate of 1.0 to 1.3 gal per 100 ft² (4.1 to 5.3 liters per 10.0 m²) to asphalt base and 1.2 to 1.5 gal per 100 ft² (4.8 to 6.1 liters per 10.0 m²) to a concrete base. Once applied the tack coat should not be disturbed and should be allowed to cure or break before covering with the setting bed material. This may take a few hours dependent on weather conditions. Asphalt primer tack coats are recommended for vehicular applications but are not required in pedestrian applications typical to paving slab use.

- C. Bituminous setting bed
 1. Place in panels between ¾ in. (20 mm) high screed rails spaced approximately 12 ft (4 m). Rake and screed smooth with strike board.
 2. Use screed rails to achieve a level setting bed conforming to elevations and slope shown on the drawings. After one panel is complete, advance screed rails to the next position in readiness for screeding adjacent panels with strike board. Fill depressions left from removed screed rails and smooth to height consistent with panel.
 3. Place an area in size that will remain at least 270° F (130° C) during compaction.
 4. Compact the setting bed with a powered roller compactor to an even, nominal thickness of ¾ in. (20 mm) after compaction.
 5. Re-heat, fill, and compact low areas with setting bed materials to conform to slope and elevation shown on the drawings.
 6. Re-heat, remove, level, and compact setting bed in high areas to conform to slope and elevation shown on the drawings.
 7. Irregularities or evenness in the grade of the concrete base surface may be corrected with setting bed materials only with approval by the [Architect].
- D. Neoprene modified asphalt adhesive
 1. Apply to cold asphalt setting bed with notched trowel with serrations not exceeding 1/16 in. (2 mm). Do not apply slabs to adhesive until dry skin forms on surface of adhesive.
- E. Concrete paving slabs
 1. Free from dust, dirt, and stains. Do not use soiled, cracked, or broken units.
 2. Place paving units firmly onto adhesive with joints not to exceed 1/8 in. (3 mm), or as recommended in manufacturer's literature. Maintain straight pattern lines, joint lines and coursing per the drawings.
 3. Cut slabs to fit edges with a masonry saw. Firmly place all edge units on adhesive.
- F. Joint filler and sealant
 1. Extend control and structural joints through full depth of paving units. Do not extend joints

- through bituminous bedding materials from joints in concrete base that control shrinkage cracking.
2. Install joints at all building facades or other vertical surfaces.
 3. Install pre-molded joint filler as units are set in bituminous bed. Maintain top of filler 3/8 in. (10 mm) below exposed faces of paving units for insertion of sealant.
 4. Install joint sealant per manufacturer's recommendations.
- G. Joint sand
1. After the slabs, joint filler, and sealant are installed, spread dry joint sand and fill joints between the slabs.
 2. Sweep surface clean.

3.05 FIELD QUALITY CONTROL

Note: Surface tolerances on flat slopes should be measured with a rigid straightedge. Tolerances on complex contoured slopes should be measured with a flexible straightedge capable of conforming to the complex curves on the pavement surface.

- A. The final surface tolerance from grade elevations shall not deviate more than $\pm 3/8$ in. (± 10 mm) under a 10 ft (3 m) straightedge.
- B. Check final surface elevations for conformance to drawings.
- C. The surface elevation of slabs shall be 1/8 in. to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.
- D. Lippage: No greater than 1/8 in. (3 mm) difference in height between adjacent slabs.

Note: Cleaning and sealing may be required for some applications. See ICPI Tech Spec 5, Cleaning and Sealing Interlocking Concrete Pavements for guidance on when to clean and seal the slab surfaces, and when to stabilize joint sand. Delete article below if cleaners, sealers, and or joint sand stabilizers are not applied.

3.06 [CLEANING] [SEALING] [JOINT SAND STABILIZATION]

- A. [Clean] [Seal] [Apply joint sand stabilization materials between] concrete paving slabs in accordance with the manufacturer's written recommendations.

3.07 PROTECTION

- A. After work in this section is complete, the General Contractor shall be responsible for protecting work from damage due to subsequent construction activity on the site.

END OF SECTION