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## Proposed method and procedure

# Core Drilling of Hot Mix Asphalt (HMA) for Specimens of 4" or 6" diameter

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## 1. SCOPE

- 1.1 This method is to establish a consistent method of the use of a diamond bit core to recover specimens of 4 or 6 inch diameter for laboratory analysis and testing.
- 1.2 The method will require the use of: water, ice (bagged or other suitable type), dry ice, and a water-soap solution to be utilized when coring asphalt rubber concrete.
- 1.3 Individuals doing the specimen recovery should be observing all safety regulations from the equipment manufacturer as well as the required job site safety requirements for actions, and required personal protective equipment.

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## 2. CORE DRILLING DEVICE

- 2.1 The core drilling device will be powered by an electrical motor, or by an acceptable gasoline engine. Either device used shall be capable of applying enough effective rotational velocity to secure a drilled specimen. The specimen shall be cored perpendicularly to the surface of pavement, and that the sides of the core are cut in a manner to minimize sample distortion or damage.
  - 2.2 The machinery utilized for the procedure shall be on a mounted base, have a geared column and carriage that will permit the application of variable pressure to the core head and carriage throughout the entire drilling operation. The carriage and column apparatus shall be securely attached to the base of the apparatus; and the base will be secured with a mechanical fastener or held in place by the body weight of the operator.
  - 2.3 The core drilling apparatus shall be equipped with a water spindle to allow water to be introduced inside of the drill stem while operating.
  - 2.4 The cutting edge of the core drill bit shall be of hardened steel or other suitable material with embedded diamond chips in the cutting surface. The core barrel shall be of sufficient diameter to secure a specimen that is a minimum of four or six inches or whichever is prescribed for necessary testing. The core barrel shall not be missing more than one of the teeth used for cutting; if so it shall be discarded and another barrel shall be used. The core barrel shall also be a minimum of two inches longer than the anticipated depth of pavement in accordance with project paving plans.
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### 3. ACCESSORY EQUIPMENT

- 3.1 A sufficient supply of ice and dry ice shall be provided to sufficiently cool the pavement prior to securing the samples from the designated areas in the pavement. The ice should also be used to adjust the temperature of the water used to cool the core bit.
- 3.2 A water supply (usually a plastic 35 – 55 gal drum) with sufficient hose to introduce the water into and through the spindle of the coring device by gravity feed. The drum should be white or light in color to minimize excessive thermal heating of the water (*for coring of asphalt rubber cores see footnote 1*).
- 3.3 At no time shall the water utilized in the coring operation exceed 65° F during the coring operation. Ice shall be utilized to ensure the temperature control of the water being introduced during the cutting operation.
- 3.4 An ice chest or other suitably insulated container that can maintain a temperature of less than 70° F shall be used to secure the specimens during transport. The container will be equipped with flat shelving that will support the drilled cores throughout the entire specimen dimension during transport back to the testing facility.
- 3.5 Miscellaneous hand tools to remove the drilled specimen from the drill hole or the core barrel taking great care in not disturbing the specimen more than necessary (refer to fig. 1 in ASTM D 5361-05).

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### 4. PROCESS

- 4.1 The pavement surface at the time of coring shall not exceed a temperature of 90° F, the pavement shall be conditioned with ice or dry ice to ensure that this requirement is met.
- 4.2 Immediately after it has been ensured that the pavement has dropped to the required temperature, core drilling shall begin. The operator will then apply an even and continuous pressure (note 2) to penetrate through the full depth of the pavement. The operator will concurrently ensure that enough water is moving over the core surface as to adequately remove any and all cuttings that could damage the drilled core.
- 4.3 After the pavement thickness has been penetrated the core shall be carefully removed from either the drill hole or the core barrel and be immediately transferred to an ice chest or other suitable container.
- 4.4 Each individual core shall be placed on a shelf in the cooler with the exposed side of the specimen facing down, or the "top side" down. If the specimen is a two lift core, the only acceptable means of separating lifts is with a power or other acceptable wet saw type of equipment (conforming to ASTM D 5361-05); however, at no time shall cores be split using a mallet and screwdriver or metal straight edge when being tested for bulk density.

- 4.5 Perpendicularity of the specimen shall be checked in the field after the specimen has been extracted from the surface. The core operator shall hold the core up to eye level and place the core top side down in a "speed square" or small carpenter's square. The specimen placed in the square shall not depart from perpendicular to the axis more than  $0.5^\circ$  (approximately equivalent to 1/16 of an inch in 6 inches). If the specimen is outside of this distance from square it shall be discarded in the field and another sample cored that falls within tolerance.
- 4.6 The cores upon arriving at the laboratory for testing shall be carefully cleaned and measured for thickness in accordance with ASTM D 3549. A speed square shall be utilized to measure squareness as compared to a  $90^\circ$  degree angle and shall not depart from perpendicular to the axis more than  $0.5^\circ$  (approximately equivalent to 1/16 of an inch in 6 inches).
- 4.7 All remaining testing shall be done within the parameters of the current project and / or agency required specification.

- **Note 1** – It should be noted (as stated in Section 3.2) that when the material to be cored is a rubberized asphalt mixture a wetting agent such as liquid dish soap shall be added to the water barrel to hinder the material from sticking or allowing the binder to spread during coring.
- **Note 2** – Section 4.2 refers to pressure exerted on the core barrel and machine during the coring process. Too much pressure can cause damage to the core barrel and the motor; and too little pressure can cause a glazing of the diamonds, reducing cutting efficiency and premature wear of the barrel.