Engineering Policy Ballot

Effective: January 1, 2026

Level 2

Level two revisions require the approval of the **Assistant Chief Engineer** and the **Federal Highway Administration** only. The Senior Management Team is encouraged to review the content and provide comment to the appropriate director. For all other parties, these revisions are posted for information only.

ENGINEERING POLICY BALLOT

Effective: January 1, 2026

Issue 1: New MoDOT Test Method - Standard Test Method for Chemical Analysis of Concrete Cores by Extraction and Solubility

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Robert Marshall – CM

Summary: Proposed method evaluates concrete cores by concentrating on three phases (aggregate, paste, and voids) to assist and/or verify the reason(s) for the failure. This is one of three methods that could be utilized by industry to obtain measured results.

Publication: Engineering Policy Guide: 106.3.2 (New Test Method)

Issue 2: Signal timing: pedestrian buffer time decrease

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Ryan T. Hale – DE

Summary: The 'buffer interval' (after pedestrian change interval) changed from a minimum of 3 seconds to 2 seconds in the 11th Edition of the MUTCD. FHWA proposes this change to provide additional flexibility to agencies in optimizing the timing of traffic signals.

Publication: Engineering Policy Guide: 902.6.6

Issue 3: Addition to 941.6.3.6 Deposit Requirements

Approval: **Level 2 – Assistant Chief Engineer**

Sponsor: Candice Hubbard – TS

Summary: Performance bond table added to determine minimum performance bond amounts for permitted work.

Publication: Engineering Policy Guide: 941.6.3.6

Standard Test Method for Chemical Analysis of Concrete Cores by Extraction and Solubility

Scope: This method evaluates concrete cores by concentrating on three phases (aggregate, paste, and voids) to assist and/or verify the reason(s) for the failure.

Summary of Method: Aggregate and paste samples are meticulously extracted from the concrete core sample. The aggregate and paste samples are analyzed under a stereoscope for any contamination of paste on the aggregate and aggregate in the paste. The samples are crushed and sieved through a #40 sieve. The minus 40 material is evaluated by instrumental analysis for chemical tracers (indicators) potentially associated with the concrete failure. The remaining portions of the concrete core sample(s) are submerged in distilled water and boiled on a hot plate. A semi-quantitative analysis is performed on the extract for water-soluble elements (tracers) that could be potentially associated with the failure.

Equipment and Reagents: Glass beaker, 2000-ml; Nitric Acid (HNO3), Certified ACS grade; Distilled water; Mortar and pestle; Hammer; No. 40 sieve, conforming to ASTM E-11 specification; Hook/Straight Fork tip, 5 ½ in. in length; Brown waxed paper, for sample collection; Graphite crucible, 8-ml capacity; Clear plastic (polypropylene) beakers, 400-ml capacity; Magnetic stirring bars, length of bars should be ½" less than the inside diameter of the beaker; Lithium metaborate (LiBO2), reagent grade, anhydrous; Yttrium Stock Solution, 1000 ppm (mg/l); Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES), capable of internal standard correction; Filter paper, rapid filtering, #41 or equivalent; Filter funnel; Semi-quantitative standards, traceable to NIST, 10 ppm; Muffle furnace, 1000 C capability; Polypropylene digestion vessel with cap, 70-ml capacity; Porcelain crucible, 15-ml capacity.

Procedure: Place brown wax paper on floor and set the concrete core sample in the middle of the paper. Strike the sample with a hammer to expose the inside of the core. Examine the sample and choose section(s) to extract aggregate and paste from the concrete core. Sample a minimum of 5 large pieces of aggregate and paste to retain separately for further evaluation. Using a Hook Fork tip tool, chip off excess paste off the extracted aggregate and use a stereoscope to verify aggregate is not contaminated and retain. For extracted paster, use mortar and pestle to gently agitate paste to isolate any aggregate and sand in the paste. View under a stereoscope, remove aggregate and sand from the paste, if present, and retain. Use mortar and pestle to break each individual sample into a fine consistency and sieve through a #40 sieve. Repeat, if necessary, and retain for further testing. Determine the moisture content on the paste and aggregate separately in a 105 C drying oven for 2 hours on a 1 +/- 0.0005-gram sample in a porcelain crucible. Cool, weigh, record, and calculate.

Determine the % Loss on Ignition (LOI) on the moisture free aggregate and paste samples at 950 C in a muffle furnace for 2 hours. Cool, weigh, record, and calculate. Use the % LOI result to calculate corrected weight from 0.25 +/- .0005 grams. As an example, if the % LOI is 35%, take (100% - 35%) = %65%. From there, take 0.25 +/- .0005 grams * 0.65 = 0.1625 grams. This is the corrected weight and is used to fuse with LiBO2. For fusion of aggregate and paste, add ¼ teaspoon of LiBO2 to 2 graphite crucibles and use a test tube with the same inner diameter of the crucible, press down on the LiBO2 to make a bed. Use the % LOI of the aggregate and paste, and determine corrected weight, as described above, to weigh into the bed of LiBO2 in the crucibles. Once weighed up, add another ¼ teaspoon of LiBO2 over the sample in the crucibles. Load crucibles into a 1000C muffle furnace for a minimum of 15 minutes, use tongs to remove crucibles, swirl bead in crucible, and

carefully drop fused pellet into a clear plastic beaker containing 200-ml of 1:24 HNO_3. Place beaker(s) on a stir plate and stir for at least 10 minutes until dissolved. Filter through a #41 filter paper into a 250-ml volumetric flask. Dilute to volume and analyze on ICP-OES using prescribed test template set up for aggregate analysis. 1-ml of Yttrium can be added initially to the 250-volumetric flask prior to filtration of adjusted accordingly based off elemental analysis and volume.

Take remaining pieces of the concrete core sample, after extraction of aggregate and paste, and place in a 2000-ml beaker. Cover the sample with distilled water, cover with suitable watch glass, and boil on hot plate for at least 30 minutes. Take beaker off hot plate, and cool to room temperature. Pour water extract into at least 3 70-ml polypropylene digestion vessels and cap. Analyze water extract on ICP-OES with blank (1:24 HNO_3) and 10 ppm semi-quantitative standards. Dilute, if needed, and print report.

The main analytes to evaluate on **aggregates** are calcium (CaO), magnesium (MgO), and aluminum (Al_2O_3). Measure CaO/MgO ratio versus Al_2O_3 concentration to validate if aggregate is reactive based off MoDOT TM-93 graph.

The **paste** analysis measures moisture availability and total alkali content, which are variables associated with reactive aggregates. The paste is tested for LOI, CO_2, Na_2O, and K_2O. Total alkali content can be calculated by the following equation:

$Na_2O + 0.658*K_2O$

High alkali and moisture contents are indicators of tendencies for reaction to occur.

Chemical analysis by **solubility** is the last step of the concrete core analysis. This method is done to flush out any chemical tracers (indicators) that assist in pinpointing the cause of pavement distress. A semi-quantitative analysis measures the water extract from the core (entrapped and entrained air) and looks at over 60 analytes. The intensity values are displayed based on the concentration of the analytes present in the water extract.

In addition, chemical analysis of chloride (Cl^-), Sulfur (SO_3), and Ferric oxide (Fe_2O_3) should be noted as indicators and can be included in the **paste** analysis.

The chemical analysis of all three phases can assist in identifying the factors leading to the pavement distress.

902.6.6 Pedestrian Intervals and Signal Phases (MUTCD Section 4E.06)

Support. At times, it can be difficult to time for pedestrians. On one side is the duty to consider the time needed to allow pedestrians of all travel speeds to cross wide roadways. On the other side is the responsibility to operate busy arterials to their peak capacity by minimizing stops and delay for the vehicles. These two goals are usually in conflict if every green interval must be timed long enough to accommodate pedestrians.

The walk interval is intended for pedestrians to start their crossing. The pedestrian clearance time is intended to allow pedestrians who started crossing during the walk interval to complete their crossing. Confusion is common among pedestrians as to the meaning of the indications. This can result in a pedestrian turning back once the WALK time expires and not using the flashing DON'T WALK to cross. Every effort is to be made to educate the public to the meanings of these indications instead of lengthening the WALK time, since the flashing DON'T WALK time is the critical time. Countdown pedestrian indications can help confusion issues see EPG 902.6.7 Countdown Pedestrian Signals.

Standard. At intersections equipped with pedestrian signal heads, the pedestrian signal indications shall be displayed except when the vehicular traffic control signal is being operated in the flashing mode. At those times, the pedestrian signal indications shall not be displayed.

When the pedestrian signal heads associated with a crosswalk are displaying either a steady WALKING PERSON (symbolizing WALK) or a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication, a steady red signal indication shall be shown to any conflicting vehicular movement that is approaching the intersection or midblock location perpendicular or nearly perpendicular to the crosswalk.

When pedestrian signal heads are used, a WALKING PERSON (symbolizing WALK) signal indication shall be displayed only when pedestrians are permitted to leave the curb or shoulder.

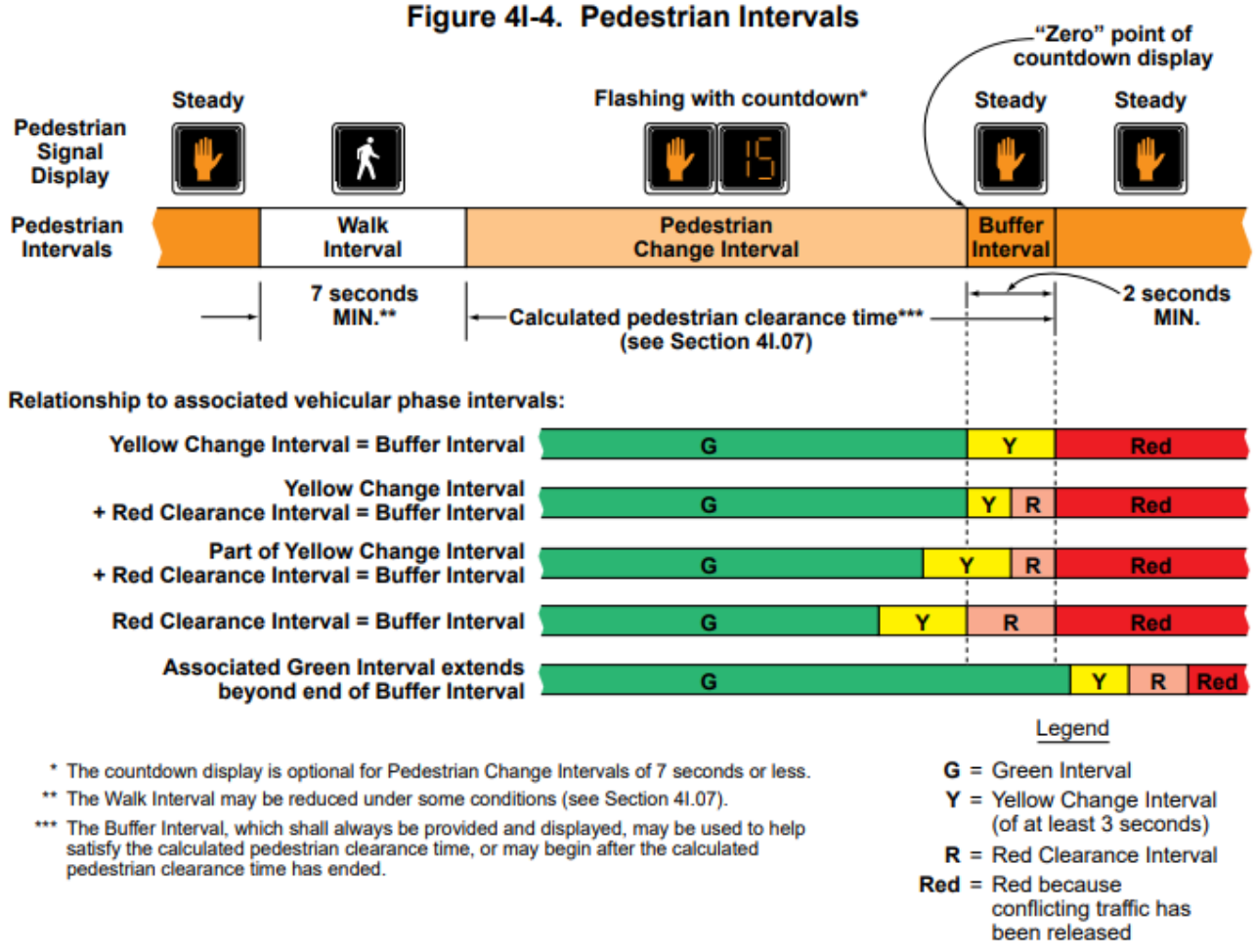
A pedestrian change interval consisting of a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication shall begin immediately following the WALKING PERSON (symbolizing WALK) signal indication. Following the pedestrian change interval, a buffer interval consisting of a steady UPRAISED HAND (symbolizing DONT WALK) signal indication shall be displayed for at least ~~3~~2 seconds prior to the release of any conflicting vehicular movement. The sum of the time of the pedestrian change interval and the buffer interval shall not be less than the calculated pedestrian clearance time (see below). The buffer interval shall not begin later than the beginning of the red clearance interval.

Option. During the yellow change interval, the UPRAISED HAND (symbolizing DON'T WALK) signal indication may be displayed as either a flashing indication, a steady indication, or a flashing indication for an initial portion of the yellow change interval and a steady indication for the remainder of the interval.

Support. Fig. 902.6.6 illustrates the pedestrian intervals and their possible relationships with associated vehicular signal phase intervals.

(REPLACE IMAGE IN FIG 902.6.6)

Figure 4I-4. Pedestrian Intervals



* The countdown display is optional for Pedestrian Change Intervals of 7 seconds or less.
** The Walk Interval may be reduced under some conditions (see Section 4I.07).
*** The Buffer Interval, which shall always be provided and displayed, may be used to help satisfy the calculated pedestrian clearance time, or may begin after the calculated pedestrian clearance time has ended.

Legend

G = Green Interval
Y = Yellow Change Interval (of at least 3 seconds)
R = Red Clearance Interval
Red = Red because conflicting traffic has been released

NOTE: THE REST OF 902.6.6 IS UNCHANGED

941.6.3.6 Deposit Requirements

Deposits are not routinely required for applicants constructing Type I (private residential/farm) entrances, however unusual conditions or construction may warrant a deposit. Deposits may be required for Type II (side street/road), Type III, Type IV, and Type V (commercial/industrial) entrances if the applicant is not a government agency. Details regarding entrance types, refer to the standard plans.

In order to maintain consistent deposit requirements for entrance permits, the cost of curbing required is used as a guide. If other circumstances or construction dictate the need to increase the deposit above the amount required to build the curbing, this increased amount is added to the deposit.

If the deposit is a cashier's check, a minimum amount of $500 and a maximum of $50,000 will be required. If deposit requirements exceed $50,000, a performance bond will be required. There is no maximum limit for a performance bond. The performance bond or cashier's check shall be made payable to Director of Revenue - Credit State Road Fund.

All deposit checks shall be transmitted to Financial Services using the following procedure:

1. Forward deposit as received to Financial Services by attaching the Receipt - Transmittal of Money form. It is imperative to furnish the remitter's correct name and address.

2. Upon satisfactory completion of the permit, the district advises Financial Services by email or other written communication to refund a check to the remitter.

3. Financial Services will transmit the check directly to the remitter and also notify the district by email that the check has been processed. The warrant request is attached to the file copy of the permit.

4. If the work is not completed as described in the permit, refer to Default of Permit Requirements.

Performance bonds for permits to work on Missouri Highways and Transportation Commission right of way will cover all permitted work for a five (5) year period beginning from the bond execution date. Bonds will be cancelled after all permit work covered by the bond is successfully completed and the permit is released by MoDOT. Any new permit work will require a new executed bond. Bonds can be cancelled by the principal or surety when there is no active work being completed. MoDOT reserves the right to cancel or hold a bond at their discretion.

Performance bonds for permits to work on Missouri Highways and Transportation Commission (MHTC) right of way should use this **table** to determine minimum performance bond amounts. All bond amounts should be discussed with a MoDOT representative. MoDOT reserves the right to adjust any performance bond amount at any time.

Number of Permits Per Year	Minimum Bond Amount
24	$120,000.00
40	$200,000.00
60	$300,000.00
100	$500,000.00