NEBRASKA DEPARTMENT OF ROADS
NDR STANDARD METHOD T 587

STANDARD TEST METHODS FOR DENSITY OF BITUMINOUS CONCRETE IN PLACE BY NUCLEAR METHODS

SCOPE

1.1 This test method describes a test procedure for determining the density of bituminous concrete by the attenuation of gamma radiation where the source and detector remain on the surface. *(Backscatter Method)*

APPLICABLE DOCUMENTS

2.1 **ASTM Standards:**

D 2950 "Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods."

2.2 **NDR Standards:**

AASHTO 166 "Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens."

NDRT 209 “Maximum Specific Gravity of Bituminous Paving Mixes”

NDRT 572 "Selection of Sampling Locations of Asphaltic Concrete."

PROCEDURE

3.1 Turn the nuclear gauge on for 10 minutes (*15 minutes in cold weather*) prior to use to allow it to stabilize and leave power on during the day’s testing.

3.2 Standardize the nuclear gauge at the start of each day’s work according to manufacturer’s recommendations. Keep a permanent record of the standard count.

3.3 Select a test location in accordance with Random Sampling Schedule/NDRT 572. If the nuclear gauge will be closer than 10” (250 mm) to any vertical mass that may influence the result, follow the manufacturer’s correction procedure.

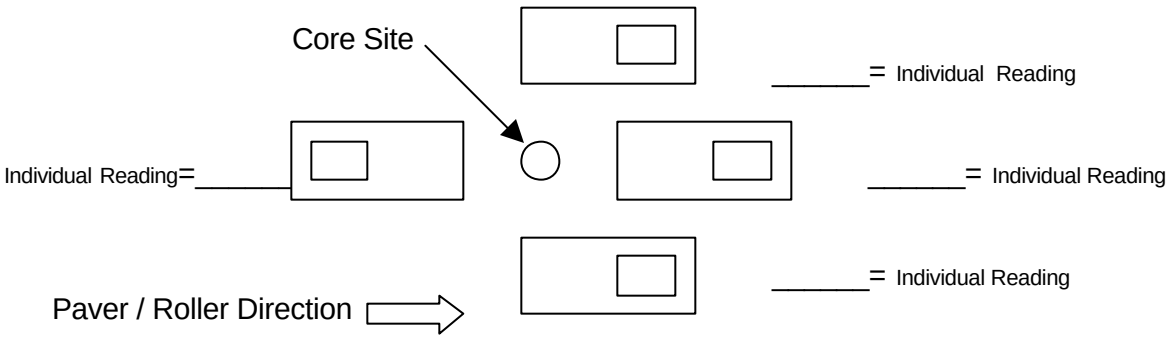
3.4 The maximum air void between the nuclear gauge and asphalt surface shall not exceed 1/4" *(6 mm)*. Use 20/40 masonry sand or finer to fill voids and level with scraper plate.

3.5 Use the Backscatter method to take 4 density readings while keeping the gauge turned parallel to the direction of the roller as shown in 3.8 below. The final nuclear density reading shall be the average of the 4 readings. Store all readings internal to the gauge. Mark reading location for possible core correlation.

3.6 The final percent density for a specific location shall be determined by calculations using the Theoritical Maximum Specific Gravity of the mix (Rice), Gmm, for the value of that sublot and the final nuclear reading (the average of 2 taken at 180 degrees of each) of the Nuclear Density Gauge gravity-once the required correction factor (sometimes referred to as offset) has been applied.
Percent Density = (Nuclear Density Gauge Gravity / Gmm) x 100.

3.7 Core first 5 Nuclear Density Gauge density reading locations of each mix type in each lift of each project or when aggregate percentages or sources change. The time between the nuclear gauge readings and corresponding corings shall be held to a minimum. Cut core to lift thickness being measured by gauge. Test core for bulk density per AASHTO 166. Compare core Bulk Specific Gravity, Gmb, with the average of the 4 Nuclear Density Gauge Gravity, readings to manufacturer's measurement specifications. Determine the correction factor if required and enter it into the nuclear gauge memory if possible. Record the correction factor on report of test form. The correction factor shall be verified with another core for every 15 density readings that are to be recorded. The correlation would be considered acceptable if the densities were found to be within 2 lbs/cu.ft., upon which no correction factor is required.

3.8 Procedure for calculating the correction factor(s):



Note: Not to scale, nuclear gauge will be placed directly adjacent to core hole.

lbs./cu. ft.

Nuclear Bulk Specific Gravity (Gmb) in lbs/cu. ft. (average of 4 readings) = _____

Laboratory Gmb of Roadway Core =_____ x 62.3 = _____

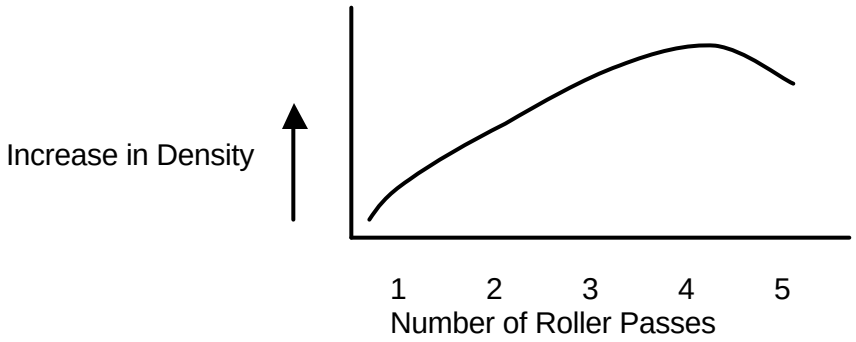
Difference in Density Measurement = _____*

Correction Factor * (also known as offset value input into Nuclear gauge) = _____

3.9 For each reportable and identified density location, after the correction factor has been established and entered in the nuclear gauge, take two nuclear readings at the same location. The Average of the readings will be the reported density for that location.

3.10 ROLLER PATTERN SET-UP

The use of the nuclear gauge to help establish an efficient roller pattern should be considered. It's a very simple procedure that just requires a nuclear reading after each pass of the roller. There is no real need to have the nuclear gauge even calibrated, you just want to detect the changes in relative density.
An example of what you will find:



This example shows that the maximum density is achieved after 4 roller passes. You may want to record the nuclear readings after each pass of the roller and do some follow up readings to see if any changes in the rolling pattern are needed.

Field Report of Nuclear Density Tests for Asphalt

Nebraska Department of Roads

Project:		Control No.	
Location:		Report No.	
Type of Work:	☐ Mainline ☐ Parking ☐ Wedging ☐ Shoulder ☐ Temporary ☐ Misc.		
Gauge Number	Rolling Pattern:		

Date					
Lot Number					
Sublot Number					
Mix Type					
Voidless Density					
Req. % of Voidless Density					
Station					
Offset Rt/Lt Centerline					
Thickness					
Lift (Bottom, Top, etc.)					
Density Standard Cnt.					
Density 1					
Density 2					
Average Density					
Correction Factor					
Corrected Density					
% of Voidless Density					
Lot Average					
Pay Factor					
Test Status	Pass/Fail/Deduct Comments:	Pass/Fail/Deduct Comments:	Pass/Fail/Deduct Comments:	Pass/Fail/Deduct Comments:	Pass/Fail/Deduct Comments:

Contractor:		Technician:	
Inspector:		Project Manager:	

Distribution: Project Manager
District Engineer
Materials & Research Division