



# United States Department of the Interior

Bureau of Indian Affairs

Navajo Region

P. O. Box 1060

Gallup, New Mexico 87305



In Reply Refer To:  
Division of Transportation  
M/C: N370

JUL - 7 2016

## MEMORANDUM

**TO:** Mr. Harold J. Riley, Planning & Design Branch Chief  
Attention: Mr. Albert Lee, Supervisory Highway Engineer

**FROM:** Mr. Christopher Becenti, Highway Engineer-Materials Section *pure*

**SUBJECT:** Project No. N5001(1)1,2&4, FP-14 – Mainline Station 0+060.000 to 10+600.000

### PROJECT SCOPE

A technical review of Project No. N5001 was recently performed, attached are the recommendations concerning the first materials report and it's superseded design. This materials design memo presents the results of the pavement design analysis performed on BIA Project N5001 by BIA NRDOT's Architect and Engineering Consultant, AMEC.

BIA Project N5001 (1)1, 2 & 4 section is approximately 10.498-Kilometers long and located in the Shiprock Agency. The Project location is a primary route between Toadlena, NM, and NM491, with primary concern for the residents along the route. This route is situated completely within Navajo Nation Trust land. The roadway alignment largely follows the existing alignment. Currently, the existing alignment is a dirt roadway located crossing a couple of incised drainage locations. The Project scope plans on constructing a two lane rural roadway, with drainage, and signage.

Note: Report refers to FP-14.

### DESIGN ANALYSIS AND DISCUSSIONS

#### N5001(1)1,2&4 Toadlena, NM

In AMEC's designing of the roadway pavement section, the design traffic was based on the existing traffic analysis provided by Albert Lee, NRDOT Planning Engineer, projected for a design period of 20 years. A geotechnical report was then initiated by a geotechnical investigation for the N5001 (1)1, 2 & 4 Project providing boring logs, and R values. The information provided included the location of borings, and soil classification.

Table I below shows the parameters used for the design of the construction structural section for N5001 (1)1, 2 & 4.

Structural Number for Future Traffic

Parameter	N5001(1)1,2&4Paved Section
Design Life (years) (2033)	20
18-Kip ESALs (One Way)	69,000
Initial Serviceability (Po)	4.2
Terminal Serviceability (Pt)	2.25
Reliability Level	71.63%
Overall Standard Deviation (So)	0.45
RoadBed Soil Resilient Modulus	29,684.688 kPa
Required SN (per AASHTO 1993 Guide)	2.42

Description	Drainage Coef	Thickness (mm)
Double Chip Seal *	N/A	19
ABC	1	178
	total	197
* Surface does not provide any strength		

**Typical Section N5001 (1)1, 2 & 4,  
Station 0+060.000 TO 10+600.000**

**Cross Slope 2%**

**1 - 19 mm Double Chip Seal, tack as appropriate against curb and gutter.**

**1 - 178 mm ABC topped with Prime Coat.**

AMEC GEOTECHNICAL REPORT available

### **SECTION I – FLAT BOTTOM BORROW DITCH & SUBGRADE ACCEPTANCE**

Subgrade construction control R-value is 20. It is recommended that soil within 1 meter of the final subgrade elevation meet this construction control value, thereby all soils not meeting this value are considered unsuitable soils for strength. Inspection can use the NMDOT method of R-value estimate 60% confidence.

The Earthwork Factor is 12% shrink (differs from Geotechnical Report, experience used), previous estimate was 20%.

Off-site borrow shall meet the requirements set in the FP-14 704.06 unclassified borrow.

### **SECTION II - SUBGRADE, AND BASES**

**Item 1 - AGGREGATE BASE COURSE (ALTERED GRADATION)**

The Aggregate Base Course shall be an altered gradation, and shall be as specified in SUPPLEMENTAL Section 703.05 of the Specifications. The thickness of the Surface Course Aggregate layer shall be 178 mm.

### **SECTION 703 - AGGREGATE**

**703.05**

**Subbase, Base, and Surface Course Aggregate**

The Section (b) of this section is superseded with the following:

b) Subbase or base aggregate

1) Gradation

Table 703-2

Table 703-2

**Aggregate Base Gradation Special**

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO T27 & T11)
37.5 mm	100
25 mm	80-100
19 mm	65-80
9.5 mm	40-65
4.75 mm	30-50
425 µm	8-30
75 µm	2-12

### **SECTION III - SURFACE TREATMENTS AND PAVEMENTS**

N5001(1) is considered a low volume road with existing ADT around 282. Normally Low volume roads, ADT less than 400, are designed with a gravel surface. However, an all-weather surface is encouraged. An alternative to Hot Asphaltic Concrete Pavement would be Asphalt Treated Surfaces (AST). AST structural design is based primarily on strength attained in the gravel layer. The AST itself has no strength value assigned. The typical section reflects a designed strength section for a 7 year projected ADT. The choice of a 7 year projection is based on the presumed design life of 7 years of the chip seal. The use of AST is a common practice in a few states for low volume roads.

**ITEM 1 - PRIME COAT** The prime coat shall be as specified in Section 411 of the FP-14 Standard Specifications and supplemental specification for Penetrating Emulsified Prime (PEP).

**ITEM 2 – DOUBLE COURSE SURFACE TREATMENT DESIGNATION Type 2B CRS-2P.**  
(previous report called for Microsurfacing)

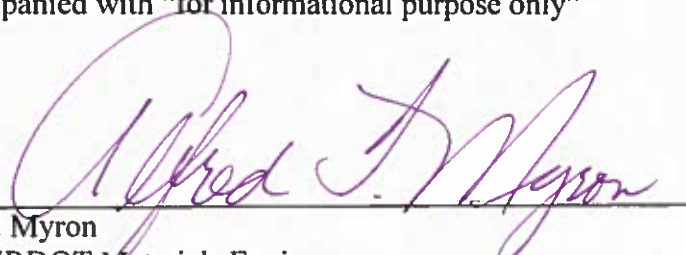
**1<sup>st</sup> APPLICATION ASPHALT SURFACE TREATMENT – CRS-2P, GRADE B** – Initial application rate of 2.1 L/m<sup>2</sup> is suggested, adjustment shall be at Construction Engineer's assessment at test strip. The asphalt surface treatment shall be as specified in Section 407 of the FP-14 Standard and Supplemental Specifications. 18-24 kg/m<sup>2</sup> aggregate application rate

2<sup>ND</sup> APPLICATION ASPHALT SURFACE TREATMENT – CRS-2P, GRADE C – Initial application rate of 2.4 L/m<sup>2</sup> is suggested, adjustment shall be at Construction Engineer's assessment at test strip. The asphalt surface treatment shall be as specified in Section 407 of the FP-14 Standard and Supplemental Specifications. 12-14 kg/m<sup>2</sup> aggregate application rate

BASIS OF ESTIMATED QUANTITIES				
Item No.	Description	Grade	Unit Weight	Application
30103-0500	Untreated Aggregate Base Course (Special)	Special (703-2)	2164 kg/m <sup>3</sup>	178 mm – mainline, 152mm turnout
40701-1300	Chip seal, type 2B, grading B	B	-	21 kg/m <sup>2</sup> application rate
40701-1400	Chip seal, type 2B, grading C	C	-	24 kg/m <sup>2</sup> application rate
40702-0800	Emulsified Asphalt	CRS-2P	1.001 L/Kg	2.1 L/m <sup>2</sup> 1st application rate 2.4 L/m <sup>2</sup> application
40601-0000	Fog Seal	CQS-III	1.001 L/Kg	0.35 L/m <sup>2</sup> Application rate Applied as seal coat to Chipseal.
41101-5000	Prime Coat	PEP	993 L/A	1.36 L/m <sup>2</sup> Application rate

#### SECTION IV – GEOTECHNICAL REPORT AVAILABILITY

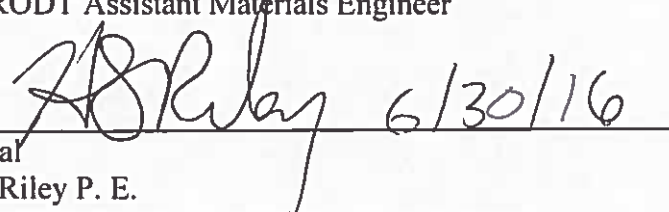
The General Notes in the Planset referring to Geotechnical Investigation Report, shall be accompanied with “for informational purpose only”

  
 Alfred Myron  
 BIA NRDOT Materials Engineer

6-30-16

  
 Christopher Becenti P. E.  
 BIA NRODT Assistant Materials Engineer

6-30-16

  
 Approval  
 Harold Riley P. E.  
 BIA NRODT Planning and Design Branch Chief