



STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY  
GOVERNOR

October 20, 2006

ROADWAY DESIGN UNIT		
OCT 24 2006		
<input checked="" type="checkbox"/> ALLEN	<input checked="" type="checkbox"/> BLEVINS	<input checked="" type="checkbox"/> SYKES
<input checked="" type="checkbox"/> BREW	<input checked="" type="checkbox"/> HOUSER	<input checked="" type="checkbox"/> T. HOUSER
<input checked="" type="checkbox"/> COVERING	<input checked="" type="checkbox"/> D. TAYLOR	<input checked="" type="checkbox"/> BOGNIEN
<input checked="" type="checkbox"/> J. MOORE	<input checked="" type="checkbox"/> HARRIS	<input checked="" type="checkbox"/> SALTER
<input checked="" type="checkbox"/> B. MOORE	<input checked="" type="checkbox"/> LINDO TIPPETT	<input checked="" type="checkbox"/> H. SIMONS
SECRETARY		<input checked="" type="checkbox"/> [unclear]

cc: *JB*

**Memorandum To:** Steve Varnedoe, PE  
Steve DeWitt, PE  
Deborah Barbour, PE  
Lacy Love, PE  
Bill Rosser, PE

**From:** Len Sanderson, PE *LA Sanderson*  
State Highway Administrator

**Subject:** Alternate Base Pavement Design

In order to provide the most economical pavement structure possible, it has been decided that on selected projects we will provide an alternative for bidders between aggregate base course and Asphalt Concrete Base Course, Type B. This is effective immediately.

There are several attachments related to the implementation of this procedure. The first is the Criteria for use of Alternate Base Pavement Designs. It is intended that the Pavement Review Committee will use this criteria to determine whether alternative base bid items will be included in the final plans. The final pavement design letter will indicate whether alternates are to be included. For those projects in which the final pavement design has been issued, the Pavement Management Unit will reevaluate and issue revised pavement designs for those projects that fall within the criteria.

The second attachment is a revision to the Design Manual indicating how to show this information on the roadway plans.

The third attachment is an example of an earthwork summary showing how to show the difference in earthwork when utilizing the alternate bases.

In order to determine if both base course alternates perform equally, the Pavement Technical Committee is tasked to research, monitor, evaluate and document the short and long term performance of both base course designs. This evaluation should also document the constructability benefits or challenges presented with both base course designs.

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Mr. Steve Varnedoe, PE

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The Pavement Design and Pavement Technical Committees should also look at the benefits of and determine if we should do a controlled evaluation by specifying both base course designs on a project.

Again, this is to be effective immediately. If you have any questions regarding plan preparation, please contact Cynthia B. Perry in the Plan Review Section of the Project Services Unit at 919-250-4128.

JVB/bcr

**Attachments**

cc: Art McMillan, PE State Highway Design Engineer  
Judith Corley-Lay, PE State Pavement Management Engineer  
J. A. Bennett, PE State Roadway Design Engineer  
D. R. Henderson, PE State Hydraulics Engineer  
J. V. Barbour, PE State Project Services Engineer  
Rodger Rochelle, PE State Alternative Delivery Engineer  
R. A. Garris, PE State Contract Officer  
C. B. Perry, PE Plan Checking Section Engineer  
Division Engineers  
Fred Allen, North Carolina Aggregates Association  
C. A. Gardner, PE, Carolina Asphalt Paving Association

### Proposed Criteria for Use of Alternative Base Pavement Designs

- The project is on new location or is a widening project such that the construction of the pavement structure can be separated from traffic without the use of concrete barrier.
- The project is of sufficient length that it will provide for uniform maintenance treatments.
- Design-Build projects that meet the above criteria.

PAVEMENT ALTERNATE BASE COURSE MATERIALS

1-3F

Some major new location and existing two lane facilities widened to four lanes will require alternate base course materials. The alternate base course recommendation will allow the contractor the choice to construct either a pavement with aggregate base course or asphalt concrete base course. The Pavement Management Unit will select which projects require alternate base course materials and specify these bases in the pavement design recommendations sent to the Roadway Design Unit.

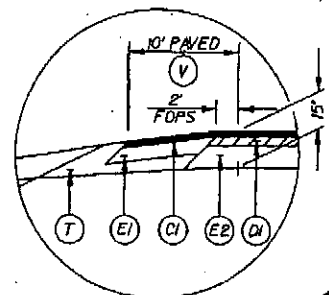
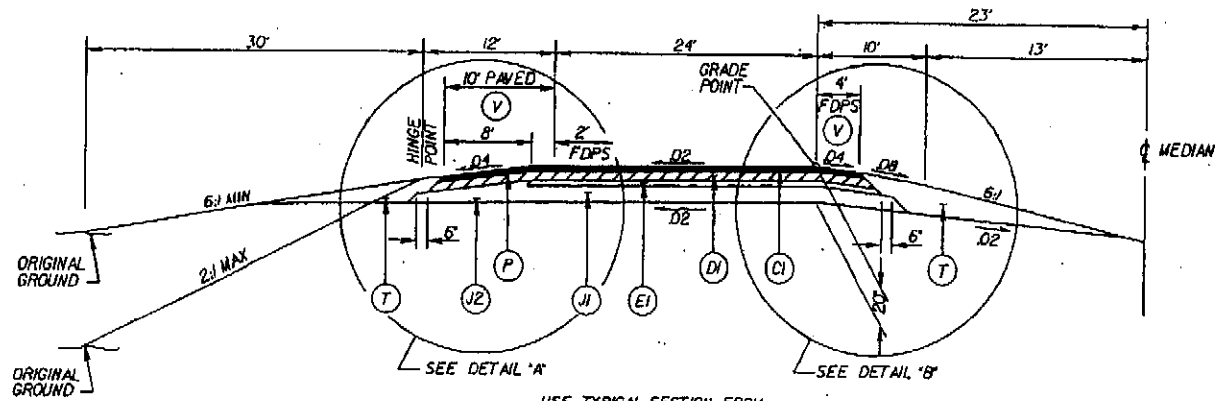
The roadway typical sections should show the aggregate base course design. Details or insets should supplement the typical sections showing the asphalt concrete base course alternate. (See 1-3F, FIGURE 1). The Pavement Management Unit will furnish the applicable shoulder drain designs for each alternate design. When coordinating with other units, specify that all work related to Geotechnical Engineering, Hydraulics and Utilities be performed assuming the aggregate base course alternate will be constructed.

Earthwork quantities are required for both alternates. However, the plans will include a single earthwork summary based on the aggregate base course alternate with a line item added to the bottom of the earthwork summary showing the differential volumes of the alternate design. Submit a combined balance summary sheet of both alternates to the Geotechnical Engineering Unit for use in preparing subsurface plans.

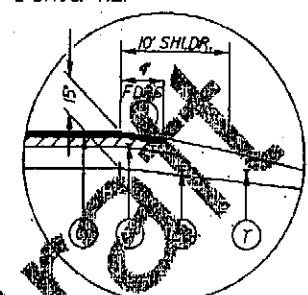
Use the aggregate base course alternate to prepare cross sections with a note on all the cross section summary sheets and the first cross section sheet (in addition to other standard notes) as follows:

"The cross sections reflect the aggregate base course alternate."

Any pay item quantities affected by the alternate base course materials should be computed and shown on the estimate within the alternate in which they apply. Some possible pay items required to be shown within each alternate are unclassified excavation, borrow excavation (borrow projects), aggregate base course, asphalt concrete, asphalt binder, prime coat and shoulder borrow (waste projects).



ALTERNATE PAVEMENT DESIGN  
DETAIL 'A'



ALTERNATE PAVEMENT DESIGN  
DETAIL 'B'

PAVEMENT SCHEDULE	
(C1)	PROP. APPROX 3" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B AT AN AVERAGE RATE OF 168 LBS. PER SQ YARD IN EACH OF TWO LAYERS.
(D1)	PROP. APPROX 4" ASPHALT CONCRETE INTERMEDIATE COURSE, TYPE I19.0B AT AN AVERAGE RATE OF 456 LBS. PER SQ YARD.
(E1)	PROP. APPROX 5" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B AT AN AVERAGE RATE OF 570 LBS. PER SQ YARD.
(E2)	PROP. APPROX 8" ASPHALT CONCRETE BASE COURSE, TYPE B25.0B AT AN AVERAGE RATE OF 456 LBS. PER SQ YARD, IN EACH OF TWO LAYERS.
(J1)	PROP. APPROX 8" AGGREGATE BASE COURSE.
(J2)	PROP. VARIABLE DEPTH AGGREGATE BASE COURSE.
(P)	PRIME COAT AT THE RATE OF 0.35 GALLONS PER SQ YARD.
(T)	EARTH MATERIAL
(V)	RUMBLE STRIP



STATE OF NORTH CAROLINA  
 DIVISION OF HIGHWAYS

**SUMMARY OF EARTHWORK**  
 IN CUBIC METERS

\* PAVEMENT STRUCTURE VOLUME 29,956 Cm

NOTE: Earthwork quantities are calculated by the Roadway Design Unit. These earthwork quantities are based in part on subsurface data provided by the Geotechnical Engineering Unit.

LOCATION	UNCL. EXCAVATION	UNDERCUT	EMBT + %	BORROW	WASTE
<b>SUMMARY NO. 1</b>					
-L- 11+98.805 TO 19+00.000	163,668		2,638		161,030
-Y- 10+00.000 TO 13+40.000	3,850		554		3,296
-Y1- 10+00.000 TO 12+26.533	1,395		581		814
-Y1- 13+03.733 TO 14+20.000	507		107		400
-Y1 DET- 10+29.365 TO 14+16.948	2,827		4,504	1,677	
<b>DETOUR REMOVAL</b>					
SUMMARY NO. 1 TOTAL	172,247		3,062	3,062	165,540
			11,446	4,739	
<b>SUMMARY NO. 2</b>					
-L- 19+00.000 TO 26+17.519 L.B.	24,365		145,723	121,358	
SUMMARY NO. 2 TOTAL	24,365		145,723	121,358	
<b>SUMMARY NO. 3</b>					
-L- 25+77.880 L.A. TO 35+00.000	168,012	1,300	108,846		60,466
-Y2- 10+00.000 TO 13+07.000	5,013		6,870	1,857	
-Y2- 14+20.000 TO 17+39.078	768	600	24,275	23,507	600
SUMMARY NO. 3 TOTAL	173,793	1,900	139,991	25,364	61,066
<b>SUMMARY NO. 4</b>					
-L- 35+00.000 TO 44+00.000	343,420		35,086		308,334
-Y3- 10+00.000 TO 12+26.944	1,633		971		662
-Y3- 13+02.264 TO 14+54.746	1,097		690		407
-Y4- 10+00.000 TO 16+55.785	4,324		26,150	21,826	
-DET2- 12+37.210 TO 15+52.083	5,014		451		4,563
-DET3- 12+51.082 TO 12+95.313	84		0		84
SUMMARY NO. 4 TOTAL	355,572		63,348	21,826	314,050
<b>SUMMARY NO. 5</b>					
-L- 44+00.000 TO 53+00.000	396,205	9,200	54,924		350,476
-Y5- 10+00.000 TO 19+45.115	5,219	800	1,930		4,089
-RPB- 11+53.455 TO 15+26.124	21,810		27,978	6,168	
-RPC- 11+94.366 TO 14+94.366	543		32,014	31,471	
-LPB- 10+67.281 TO 12+51.310	0		62,292	62,292	
-LPC- 10+43.870 TO 12+30.352	5,399		30,923	25,524	
-FLY- 12+76.258 TO 18+50.963	45,289		151,585	106,296	
-Y6- 13+38.426 TO 20+85.589	12,910		17,308	4,398	
-Y6- 21+69.189 TO 28+00.000	25,899		47,316	21,417	
-Y6- 28+00.000 TO 36+00.000	25,504		47,426	21,922	
-Y6- 36+00.000 TO 45+00.000	9,727		106		9,621
-Y6- 45+00.000 TO 49+70.000	1,887		419		1,468
SUMMARY NO. 5 TOTAL	550,392	10,000	474,226	279,488	365,654

LOCATION	UNCL. EXCAVATION	UNDERCUT	EMBT + %	BORROW	WASTE
<b>SUMMARY NO. 6</b>					
-L- 53+00.000 TO 61+00.000	25,225		196,495	171,270	
-RPA- 11+14.406 TO 14+23.096	0		96,372	96,372	
-RPD- 11+30.762 TO 14+87.240	35,027		10,250		24,777
-LPA- 10+34.440 TO 12+28.790	0		56,563	56,563	
-FLY- 20+12.663 TO 21+45.365	48		57,430	57,382	
-FLY- 22+45.365 TO 27+05.599	28,653		124,396	95,743	
-Y6- 13+27.416 TO 20+92.218	26,713		11,202		15,511
-Y6- 21+75.818 TO 28+00.000	30,058		40,392	10,334	
-Y6- 28+00.000 TO 37+00.000	54,683		35,752		18,931
-Y6- 37+00.000 TO 45+80.000	10,026		632		9,394
SUMMARY NO. 6 TOTAL	210,433		629,484	487,664	
<b>SUMMARY TOTALS</b>					
ADDITIONAL UNDERCUT	1,486,802	11,900	1,464,218	940,439	974,923
LOST DUE TO CLEAR. & GRUB.	-15,000	7,000	8,400	8,400	7,000
ROCK WASTE IN LIEU OF BORROW					
EARTH WASTE IN LIEU OF BORROW					
ADJ. FOR ROCK WASTE			-2,705	-2,705	
SHOULDER MATERIAL			72,600	72,600	
PROJECT TOTALS	1,471,802	18,900	1,542,513	71,566	19,755
EST. TO REPLACE TOP					
SOIL ON BORROW PITS					
GRAND TOTALS	1,471,802	18,900		3,578	
SAY	1,472,000			75,144	19,755
PAV'T STRUCTURE VOLUME -L- = 29,956 Cu. Meters				75,200	
<b>EARTHWORK TOTALS FOR ALTERNATE PAV'T DESIGN</b>					
SUMMARY TOTALS	1,486,802	11,900	1,464,218	940,439	974,923
ADJ. FOR ALT. PAV'T DESIGN	-16,000		10,122	10,122	-16,000
ADDITIONAL UNDERCUT		7,000	8,400	8,400	7,000
LOSS DUE TO CLEAR. & GRUB.	-15,000				
ROCK WASTE IN LIEU OF BORROW					
EARTH WASTE IN LIEU OF BORROW					
ADJUSTMENT FOR ROCK WASTE			-2,705	-2,705	
SHOULDER MATERIAL			54,450	54,450	
PROJECT TOTALS	1,455,802	18,900	1,534,485	79,538	19,755
EST. TO REPLACE TOP					
SOIL ON BORROW PITS					
TOTAL	1,455,802	18,900		3,977	
SAY	1,455,900	18,900		83,515	
PAV'T STRUCTURE VOLUME -L- = 29,956 Cu. Meters				83,600	