

- LCCA will be done for pavement projects greater than 1 mile in length for which initial traffic is greater than 10000 vehicles per day (vpd) and which are either reconstruction or are located on new location. Expansion of use of LCCA to rehabilitation projects will require additional outreach to industry to determine future treatments and their timing.
- A Present Worth Analysis with a 45 year analysis period is used. The discount rate shall be the 30-year Real Treasury Interest Rate as provided in the Office of Management and Budget (OMB) Circular A-94 Appendix C. The average rate will be updated after the beginning of year OMB adjustment and that rate will be used throughout the calendar year. The value for 2014 is 1.9% (up from 1.1% at the end of 2013).
- A 30-year design life will be used for the initial design for both flexible and rigid pavements. Subsequent treatments are identified in the tables below.
- Flexible pavement alternates will include full depth asphalt, asphalt over dense graded aggregate (ABC) and asphalt over cement treated aggregate base course (CTABC).
- For Average Daily Truck Traffic (ADTT) > 2000 vehicles per day, concrete pavement alternatives will include jointed concrete pavement with tied concrete shoulders and jointed concrete pavement with widened (13') outside lane with flexible shoulders. High truck volume concrete pavements will include a 3 inch drainage layer and a 1.25" asphalt separator layer.
- For pavements with less than 2000 trucks per day, the concrete pavement will be placed on 6" of dense graded ABC. These will use a 12 foot lane width and asphalt shoulders.
- Subgrade Stabilization will be required when recommended by the Geotechnical Engineering Unit.
- Where the life of a treatment extends beyond the end of the analysis period, a salvage (remaining life) value equal to the unused fraction of the expected life is subtracted at the end of the analysis period. For example, for flexible pavement, additional thickness is added at year 34 to provide an additional 20 years of life. At the end of the analysis period, this treatment will have 45% (9/20) of the value of the year 34 treatment as a salvage value.
- User costs will be calculated using FHWA software, Real Cost, to include user delay costs and the increase in vehicle operating costs associated with work zone delays. User costs will be discounted and a Present Worth Analysis will be conducted. User costs will be separate from the agency costs and user costs for alternate pavement designs that are within 20% of each other will be considered equal. Calculation of user cost is new for NCDOT, will require additional training and will be implemented by June 30, 2015.
- Agency cost LCCA will be considered equal between alternatives if the LCCA's are within 10 percent.

- Selection criteria:

Regardless of the difference in LCCs, urban constructability will also be considered and will include the impacts of utilities, curb and gutter, sidewalks, maintenance of traffic, etc.

1. If the calculated LCCs are within 10%, alternate bids may be considered. We will consider adjacent pavement types with a goal of maintenance consistency for 5-mile segments. Impacts to the public and to businesses will also be considered. Issues still remain with regard to FHWA Technical Guidance on Alternate Bidding and NCDOT will not resume alternate bids until FHWA concurs with our process.
2. If the difference in the LCCs is between 10% and 15%, we will consider division preference in concurrence with the Chief Engineer. User costs will be considered if the user costs are different by more than 20%. Note that the implementation date for user costs is June 30, 2015.
3. If the difference in the LCCs is greater than 15%, we will use the lowest LCC alternative unless construction issues preclude its use. Issues will be documented in the project design file.

Costs included in Life Cycle Cost Analysis

Time to Treatment	Flexible Pavements	Rigid Pavement
0	Initial construction with 30 year design	Initial construction with 30 year design.
12 years	Cost to mill and replace 1.5" of surface course and to fog seal shoulders.	
17 years		Cost to saw and reseal joints and patch 1% of travel lanes. Fog seal asphalt shoulders with 1% patching if asphalt shoulders are present.
23 years	Cost to mill and replace 1.5" of surface course, including shoulders.	
30 years		1% patching. Overlay with ultrathin bonded wearing course (10 year life)
34 years	Cost to mill 3" and add structure to achieve 20 more years of life. For high volume, replace milling with intermediate course and overlay with 2 lifts of surface. For lower volume, replace milling with intermediate course and overlay with 1 lift of surface course.	

	For curb and gutter, 5% full depth patching, mill 3" and replace with surface course.	
40 years		Cost for 5.5" Asphalt Overlay with life of 20 years.
45 years	Salvage value of 45% of year 34 treatment.	Salvage value of 75% of year 40 treatment.