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VDOT

Pavement Type Selection in Virginia

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Pavement Type Selection Procedures:

- Pavement Design
- Initial Cost Estimate
- Life Cycle Cost Analysis (LCCA)
- Justifications

Pavement Design

a. Design Considerations
b. Design Method
c. Input Parameters
d. Output Parameters

Design Considerations

1. Pavement Performance
2. Traffic
3. Subgrade
4. Materials of Construction
5. Environment
6. Drainage
7. LCCA

Design Methods

1. **Virginia Method**

   a) Used for flexible pavements only and is based on the AASHO road test, with modifications to meet Virginia's Conditions

2. **AASHTO 93 Method**

   a) An empirical method used for both flexible and rigid pavement designs; this design procedure is used mainly for high volume roadways

Input Parameters

1. **Virginia Method**
   - California Bearing Ratio (CBR)
   - Resiliency Factor
   - Traffic in terms of the Equivalent Single Axle Loads (ESAL's)
   - Thickness Equivalency Factor, which is a relative index of strength the material contributes per inch of pavement thickness. This parameter yields a structural number or total thickness of the pavement.

2. AASHTO Method

- Flexible Pavements
  - Resilient modulus
  - Cumulative ESAL's
  - Drainage coefficient of unbound materials
  - Reliability level
  - Overall standard deviation
  - Serviceability

- Rigid Pavements
  - Modulus of subgrade reaction
  - Elastic modulus of concrete
  - Modulus of rupture of concrete
  - Load transfer factor

Output Parameters

- The Virginia Method and AASHTO both yield a structural number for the total pavement and the individual layer thickness

Initial Cost Estimates of Paving Materials

- **Planning Estimating System (PES)**
  - Quantity
  - Location
  - Production Rate

Life Cycle Cost Analysis

LCCA is an economic method used to compare alternatives that satisfy a need in order to determine the lowest cost.

Factors include the following:

a) Initial cost

b) Maintenance

c) Rehab

d) User cost

e) Reconstruction cost / Salvage Value

Justifications

- A combination of LCCA and engineering judgment are documented to finalize the pavement type selection. When the net present worth of both types of pavements is within 10%, other factors are examined such as:

- Traffic
- Soil characteristics
- Weather
- Construction consideration
- Recycling
- Cost comparison
- Performance of similar pavements in the area
- Adjacent existing pavement
- Conservation of materials and energy
- Municipal preference
- Local government preference
- Local industry

Life Cycle Cost Analysis Example

AC Construction/Reconstruction Option							
Total Travel Lanes Width =	**24**	**Feet**					
Inside Shoulder Width =	**10**	**Feet**					
Outside Shoulder Width =	**12**	**Feet**					
Mainline Area =	**126720**	**Square Feet**					
Inside Shoulder Area =	**52800**	**Square Feet**					
Outside Shoulder Area =	**63360**	**Square Feet**					
Analysis Year	**Calendar Year**	**Activity**	**Thick (inches)**	**Quantity**	**Unit**	**Unit Cost**	**Total**
0	2002	Mainline - AC Surface	1.5	1,156.32	Tons	$ 40.00	$ 46,253
		Mainline - AC Intermediate	3	2,312.64	Tons	$ 34.00	$ 78,630
		Mainline - AC Base	8	6,462.72	Tons	$ 31.00	$ 200,344
		Mainline - CTA	6	4,752.00	Tons	$ 21.00	$ 99,792
		Mainline - 21A	0	0.00	Tons	$ 18.00	$ -
		Mainline - 21B	0	0.00	Tons	$ 18.00	$ -
		Mainline - Type 1 Aggregate	0	0.00	Tons	$ 15.00	$ -
		Mainline and Shoulder - Stabilized Drainage Layer	1.5	2,216.28	Tons	$ 25.00	$ 55,407
		Shoulder - AC Surface	1.5	1,059.96	Tons	$ 40.00	$ 42,398
		Shoulder - AC Intermediate	3	2,119.92	Tons	$ 34.00	$ 72,077
		Shoulder - AC Base	8	5,924.16	Tons	$ 31.00	$ 183,649
		Shoulder - CTA	6	4,356.00	Tons	$ 21.00	$ 91,476
		Shoulder - 21A	0	0.00	Tons	$ 18.00	$ -
		Shoulder - 21B	0	0.00	Tons	$ 18.00	$ -
		Shoulder - Type 1 Aggregate	0	0.00	Tons	$ 15.00	$ -
						Cost Estimate	$ 870,027

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GUIDELINES FOR PAVEMENT LIFE CYCLE COST ANALYSIS

Virginia Department of Transportation

Materials Division
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