七、課程回顧與期末專題之選定

◎ 期末專題報告之相關工作

1. 報告之題目與摘要(期中考前)
   請列舉出所欲探討之內容與預期成果。

2. 期末報告之初稿(期末考前一週)
   書面內容至少必須包含：
   (a)摘要。
   (b)前言(本研究之背景、重要性)。
   (c)研究目的。
   (d)研究方法與進行步驟。
   (e)研究項目與具體成果。
   (f)結論與建議。
   (g)參考文獻(作者、書名、出版者、年份)。

3. 期末報告之定稿(期末考)
   含上臺作專題報告(Oral Presentation)與簡報之製作(幻燈片)。

八、 Types of Overlays and Their Functions

◎ Resurfacing

※ Some common overlay design problems ：

1. Use minimum overlay thickness, inadequate
2. lack of pre-overlay repairs
3. lack of reflection cracking consideration

※ Scope ：(four parts)

Types & functions, overlays design for PCC, overlays design for AC, reflection cracking

◎ Types and Functions

Types, functions, timing, advantages / disadvantages

◎ Functional and Structural Deficiencies

※ Functional Deficiencies:

surface polishing /decreased friction resistance, roughness, poor cross slope / surface drainage, climate-related deterioration (blocking cracking, trans. / longit. cracking, raveling and weathering) ==> overlay + cold milling / surface recycling

OVERLAY TYPE	EXISTING PAVEMENT	REASONS FOR FEASIBILITY
AC	AC (all types)	• Structural or functional deficiency • Fatigue/alligator cracking exists • Rutting (AC overlay in conjunction with cold milling) • Swelling soil exists • Shorter service life of overlay is acceptable
AC	PCC	• Structural deficiency exists • Functional deficiency exists • Swelling soil exists • Shorter service life of overlay is acceptable
AC	Cracked/Seated PCC	• Good subgrade support exists • Existing pavement: JPCP (not JRCP) • Substantial cracking
PCC	AC	• Existing pavement in poor condition • Structural deficiency exists • Heavy traffic loadings • Adequate traffic control for construction • Adequate vertical clearances • Long service life of overlay desired
Bonded PCC	PCC	• Existing pavement in fair/good condition • Extensive amount of full-depth repair not needed • Structural deficiency exists • Sound PCC, no "D" cracking or reactive aggregate • Heavy traffic loadings • Adequate traffic control for construction
Unbonded PCC	PCC	• Existing pavement in poor condition • Structural deficiency exists • Heavy traffic loadings • Adequate traffic control for construction • Adequate vertical clearances • Long service life of overlay desired

Figure 2. Feasible Overlay Recommendations.

※ Structural Deficiencies:
AC (alligator cracking, rutting, patches); AC/PCC (reflection cracking); JCP (corner breaks, trans. cracking, patches); CRCP (punchouts, patches)

◎ Types of Overlays

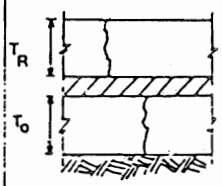
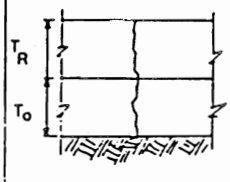
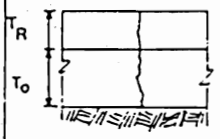
※ AC Overlays ： AC/AC, AC/PCC

※ PCC Overlays ：

1. PCC / PCC ：(Figure 16)
JPCP or JRCP (unbonded, partially, and fully bonded); CRCP (unbonded only); bonded plain concrete overlays; others (fibrous or pre-stressed concrete overlays)
2. PCC / AC ：
JPCP or JRCP; CRCP; others (fibrous or pre-stressed concrete overlays)

◎ Pre-overlay Treatment / Repair

※ Factors to consider in determining the extent of overlay repairs ： overlay types, structural adequacy, distress types, future traffic, various constraints (e.g., traffic control), overall costs

			UNBONDED OR SEPARATED OVERLAY	PARTIALLY BONDED OR DIRECT OVERLAY	BONDED OR MONOLITHIC OVERLAY
TYPE OF OVERLAY					
PROCEDURE			CLEAN SURFACE DEBRIS AND EXCESS JOINT SEAL PLACE SEPARATION COURSE- PLACE OVERLAY CONCRETE	CLEAN SURFACE DEBRIS AND EXCESS JOINT SEAL AND REMOVE EXCESSIVE OIL AND RUBBER- PLACE OVERLAY CONCRETE	SCARIFY ALL LOOSE CONCRETE. CLEAN JOINT. CLEAN AND ACID ETCH SURFACE- PLACE BONDING GROUT AND OVERLAY CONCRETE
MATCHING OF JOINTS IN OVERLAY PAVEMENT	LOCATION		NOT NECESSARY	REQUIRED	REQUIRED
	TYPE		NOT NECESSARY	NOT NECESSARY	REQUIRED
REFLECTION OF UNDERLYING CRACKS TO BE EXPECTED			NOT NORMALLY	USUALLY	YES
REQUIREMENT FOR STEEL REINFORCEMENT			REQUIREMENT IS INDEPENDENT OF THE STEEL IN EXISTING PAVEMENT. OR CONDITION OF EXISTING PAVEMENT	REQUIREMENT IS INDEPENDENT OF THE STEEL IN EXISTING PAVEMENT. STEEL MAY BE USED TO CONTROL CRACKING WHICH MAY BE CAUSED BY LIMITED NON-STRUCTURAL DEFECTS IN PAVEMENT	NORMALLY NOT USED IN THIN OVERLAYS. IN THICKER OVERLAY STEEL MAY BE USED TO SUPPLEMENT STEEL IN EXISTING PAVEMENT.
T_R SHOULD BE BASED ON THE FLEXURAL STRENGTH OF			OVERLAY CONCRETE	OVERLAY CONCRETE	EXISTING CONCRETE
MINIMUM THICKNESS			6"	5"	1"
APPLICABILITY OF VARIOUS OVERLAY TYPES	STRUCTURAL CONDITION OF EXISTING PAVEMENT	NO STRUCTURAL DEFECTS C=1.0 *	YES	YES	YES
		LIMITED STRUCTURAL DEFECTS C=0.75 *	YES	ONLY IF DEFECTS CAN BE REPAIRED	ONLY IF DEFECTS CAN BE REPAIRED
		SEVERE STRUCTURAL DEFECTS C =0.35 *	YES	NO	NO
	SURFACE CRACKS SCALLING, SPALLING AND SHRINKAGE CRACKS	NEGLIGIBLE	YES	YES	YES
		LIMITED	YES	YES	YES
		EXTENSIVE	YES	NO	YES

* C VALUES APPLY TO STRUCTURAL CONDITION ONLY AND SHOULD NOT BE INFLUENCED BY SURFACE DEFECTS

Figure 16. Summary of Concrete Overlay on Existing Pavements (1).

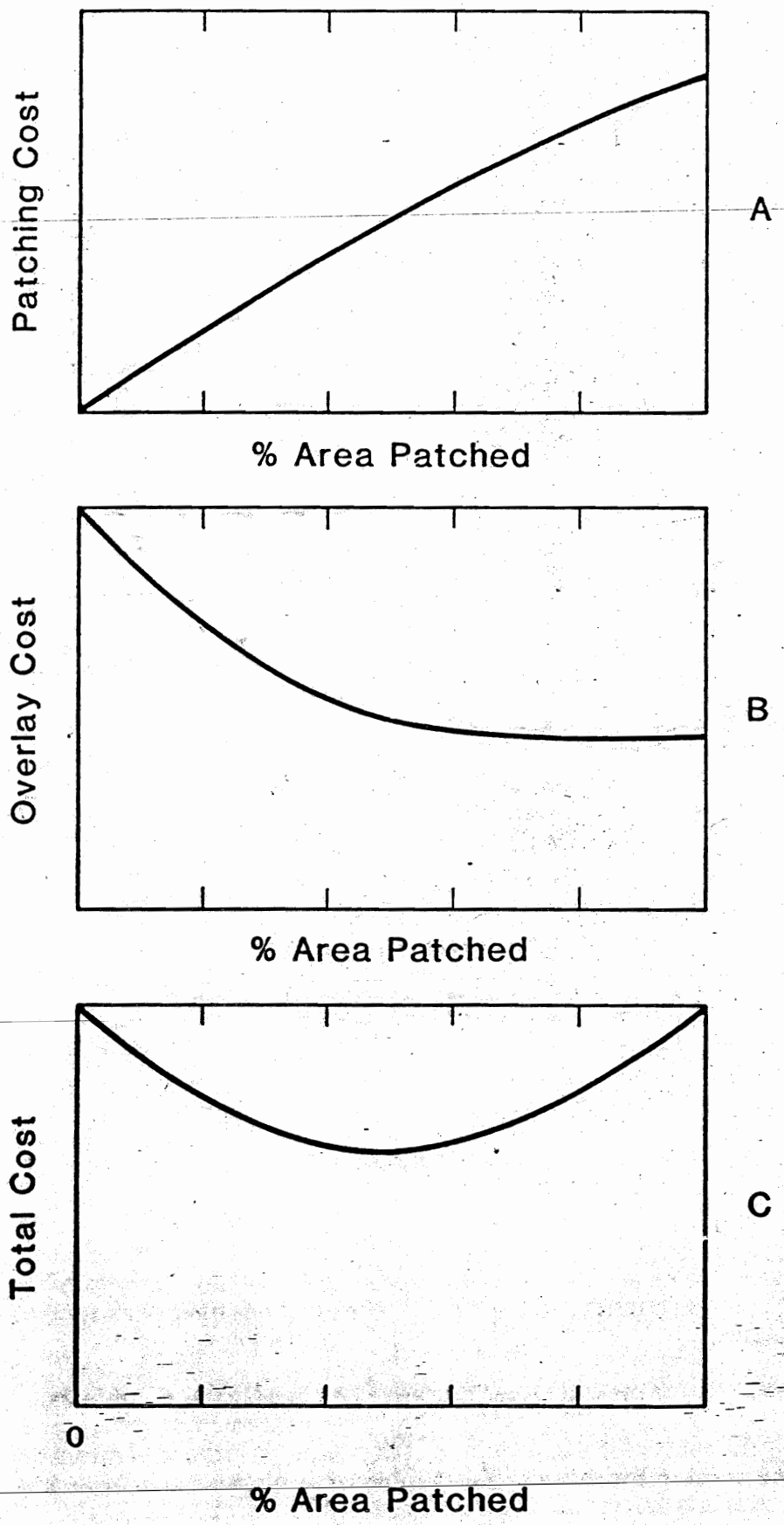


Figure 1. Patching, Overlay and Total Cost vs. Percent Area Patched.

※ Two Approaches:

1. repair deteriorated areas prior to overlaying
2. place a thicker overlay (greater rutting potential under heavy traffic, N/G)

※ Related Works:

localized repair, surface leveling, loss of support under rigid pavements, poor load transfer across joints and cracks

◎ Most Feasible and Cost-effective Overlay Types

※ Factors to Consider: (Figure 2)

existing type and design, existing pavement condition, structural adequacy, materials deterioration, future traffic, climatic, subdrainage adequacy, presence of swelling soils

◎ Advantages / Disadvantages of Alternative Overlays ：

traffic control, overhead vertical clearances or elevation changes, successive AC overlays, reflection cracking, rutting

◎ Timing of Resurfacing

consequences when overlay is deferred, cost and benefit between rehabilitation strategies (Figures 3 ~ 7)

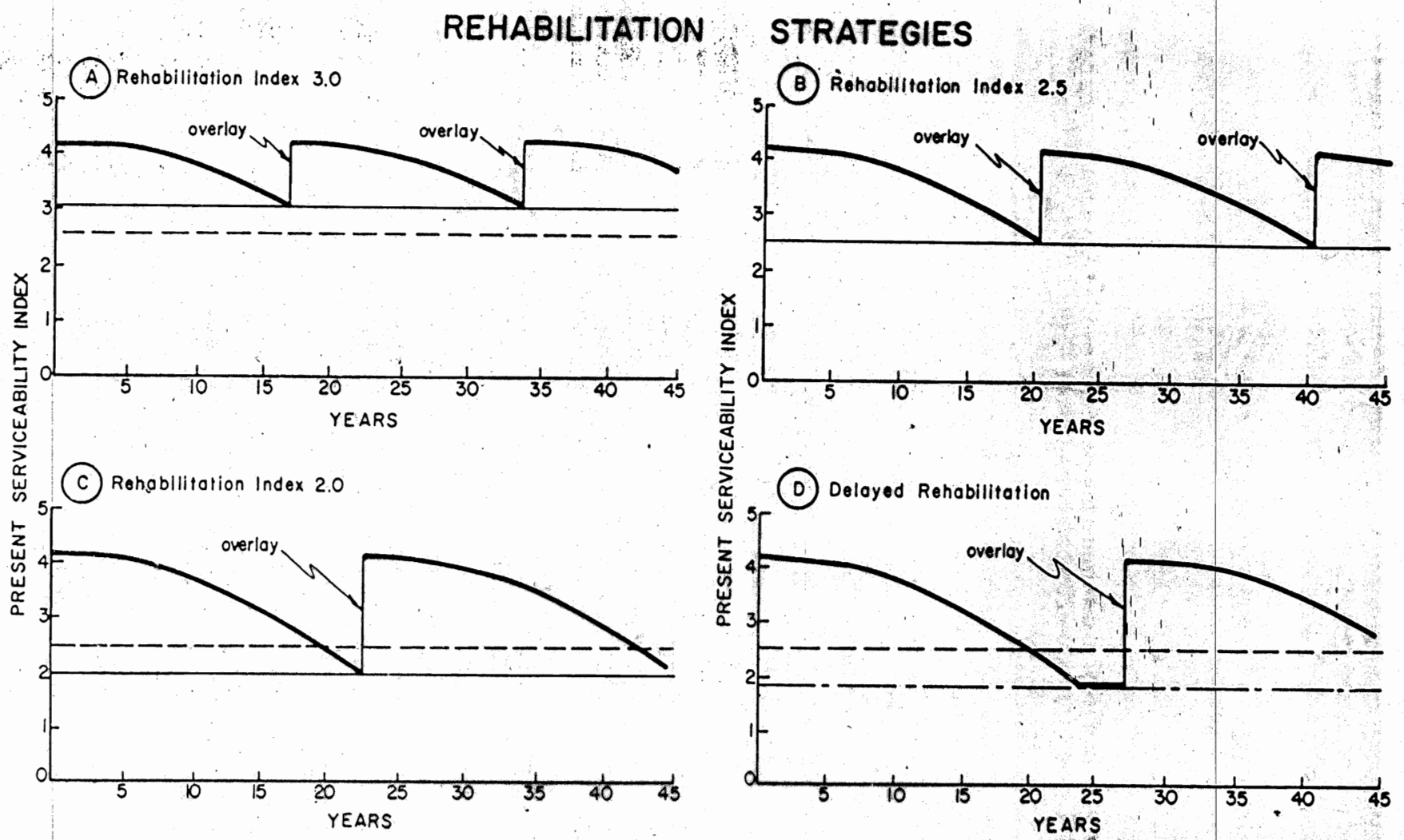


Figure 3. Utah Rehabilitation Strategies (11).

ANNUAL COST SUMMARY, UTAH DOT (1977)

SYSTEM	STRATEGY	ANNUAL COSTS IN MILLIONS DOLLARS		
		SURFACING	MAINTENANCE	TOTAL
PRIMARY	A	4.94	1.35	6.29
	B	6.44	1.59	8.03
	C	7.92	1.67	9.59
	D	8.85	1.76	10.61
SECONDARY	A	5.23	2.71	7.94
	B	7.78	3.17	10.95
	C	9.81	3.34	13.15
	D	10.37	3.50	13.87
URBAN	A	2.53	0.82	3.35
	B	3.24	0.96	4.20
	C	3.97	1.01	4.98
	D	4.33	1.06	5.39
TOTAL	A	12.70	4.88	17.58
	B	17.46	5.72	23.18
	C	21.70	6.02	27.72
	D	23.55	6.32	29.87
	COMBINATION A-PRIMARY B-SECONDARY B-URBAN	15.96	5.48	21.44

Figure 4. Utah Rehabilitation Annual Cost Summary (11).

BLOCK 5 --- RESURFACING

1. Some common overlay design problems:
   - use minimum overlay thickness, inadequate
   - lack of preoverlay repairs
   - lack of reflection cracking consideration

2. Four Parts:
   - Types functions
   - Overlays design for PCC
   - Overlay design for AC
   - Reflection cracking

Module 5A -- Types of overlays and their functions

1. Types, functions, timing, advantages/disadvantages

2. Functional and Structural Deficiencies
   p. 609 - 610

3. Types of overlays
   - Asphaltic overlays:
     a. AC oerlays on flexible pavements
     b. AC overlays on PCC pavements

   - PCC overlays
     a. PCC on existing PCC surface
        - JPCP or JRCP (unbonded, partially, and fully bonded)
        - CRCP (unbonded only)
        - Bonded plain concrete overlays
        - Others: Fibrous concrete overlays, Prestressed concrete overlays

     b. PCC on flexible pavements
        - JPCP or JRCP
        - CRCP
        - Others: Fibrous concrete overlays, Prestressed concrete overlays

4. Preoverlay Treatment/Repair
   - Factors to consider in determing the extent of preoverlay repairs
     pp. 611- 612
   - Two approaches:
     a. repair deteriorated areas prior to overlaying
     b. place a thicker overlay (N/G)

etc.