

Chapter 3

Framework for Treatment Selection

From... Maintenance Technical
Advisory Guide (MTAG)

Introduction to Pavement Treatment Selection

- What is Treatment Selection?
- Why use Treatment Selection?

What is Treatment Selection?

A guide to assist maintenance personnel in making better and more informed decisions in selecting and applying maintenance treatments

In other words...

What do we do with this?



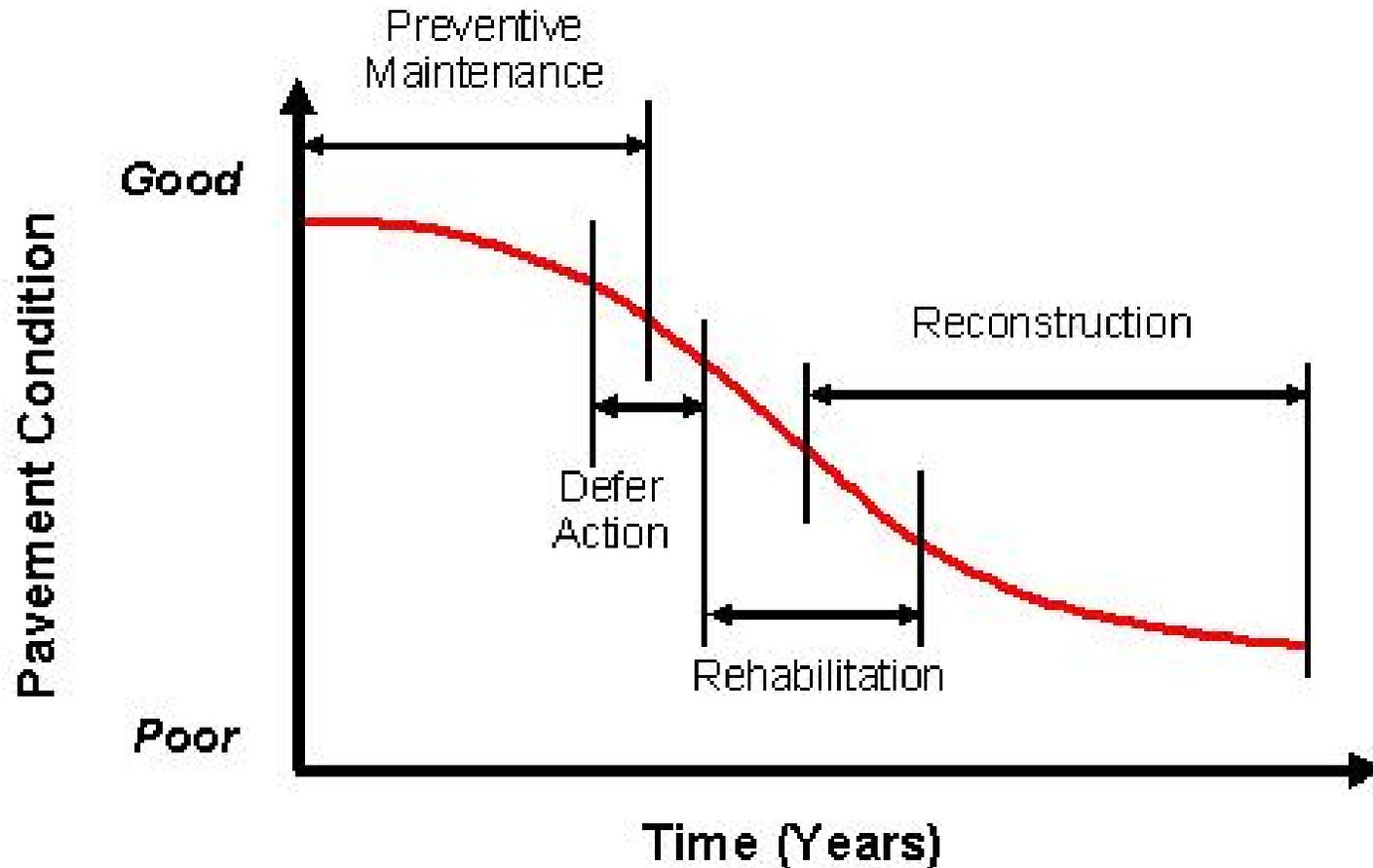
Treatment Selection Matrix

- Covers all the major treatment types currently used by Caltrans for flexible pavements and allows for inclusion of future strategies
- Treatment selection is a complex, yet important procedure to ensure a optimum pavement treatment

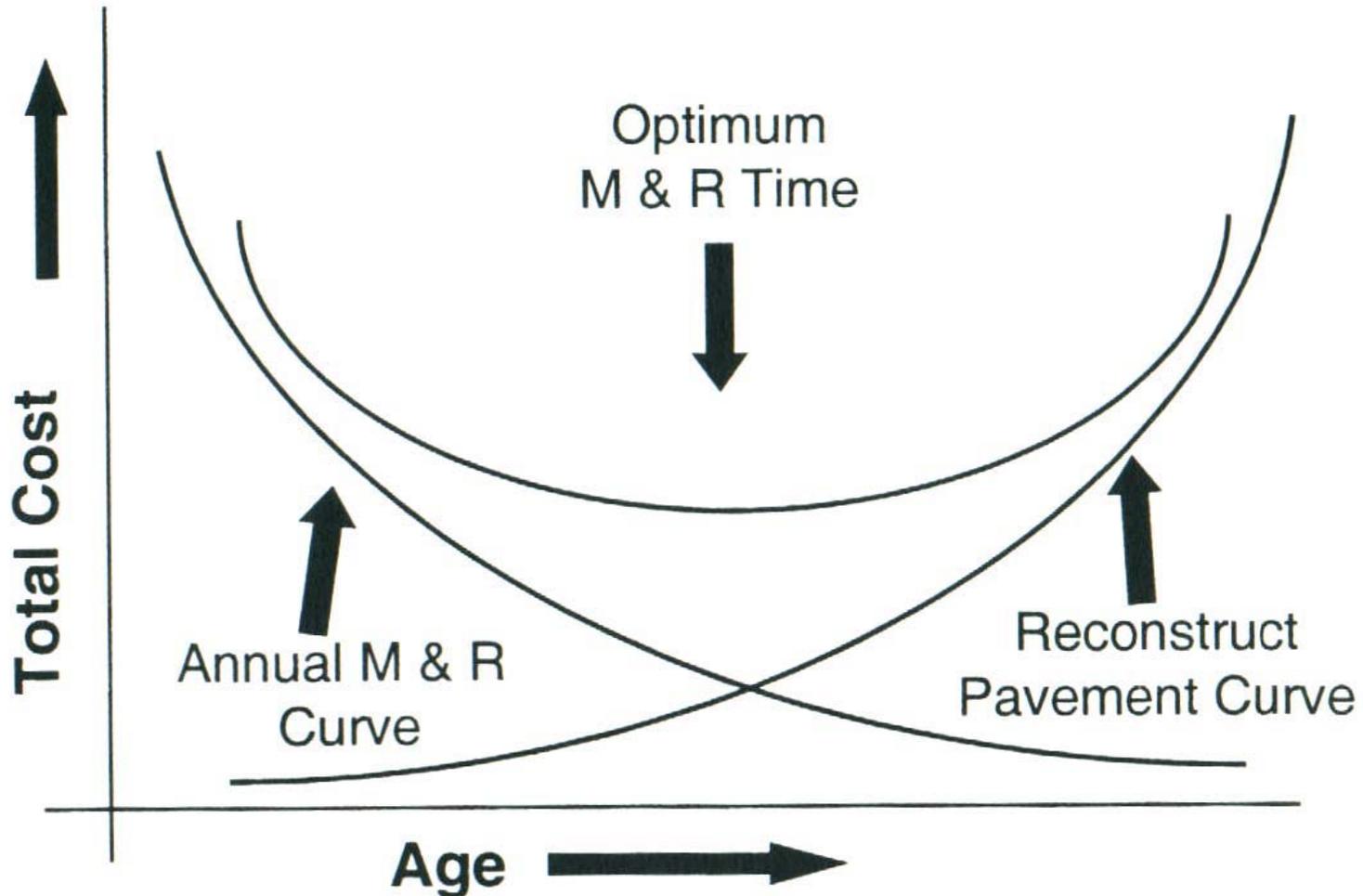
Factors Affecting Treatment Selection

- Pavement age, condition
- Climate
- Traffic levels, expected future plans
- Available funding
- Agency policy

Treatment Selection Based on Pavement Condition



Treatment Selection based on Minimum Cost, Optimum Timing



Issues Treatment Selection Addresses

- Will the treatment address the distresses present? (i.e., Will it work?)
- Can the required preparation for the treatment be carried out?
- Is the treatment cost effective?
- Will the treatment be performed before the situation being addressed changes?

Treatment Selection Training Modules Available

1. Treatment Selection Matrix
2. Life Cycle Cost Analysis

Module 3-1

Treatment Selection

From... Maintenance Technical
Advisory Guide (MTAG)

General Treatment Selection Process

- Factors to consider
- Pavement performance curves
- Selection of appropriate treatments, including cost effectiveness
- Timing of the treatment

Typical Caltrans Treatments

AC

- Seals (Fog, Slurry, Chip)
- Crack Seal/Fill
- Micro-Surfacing
- Thin HMA Overlays
- Bonded Wearing Course
- Chip Seal with Interlayers
- Surface Recycling

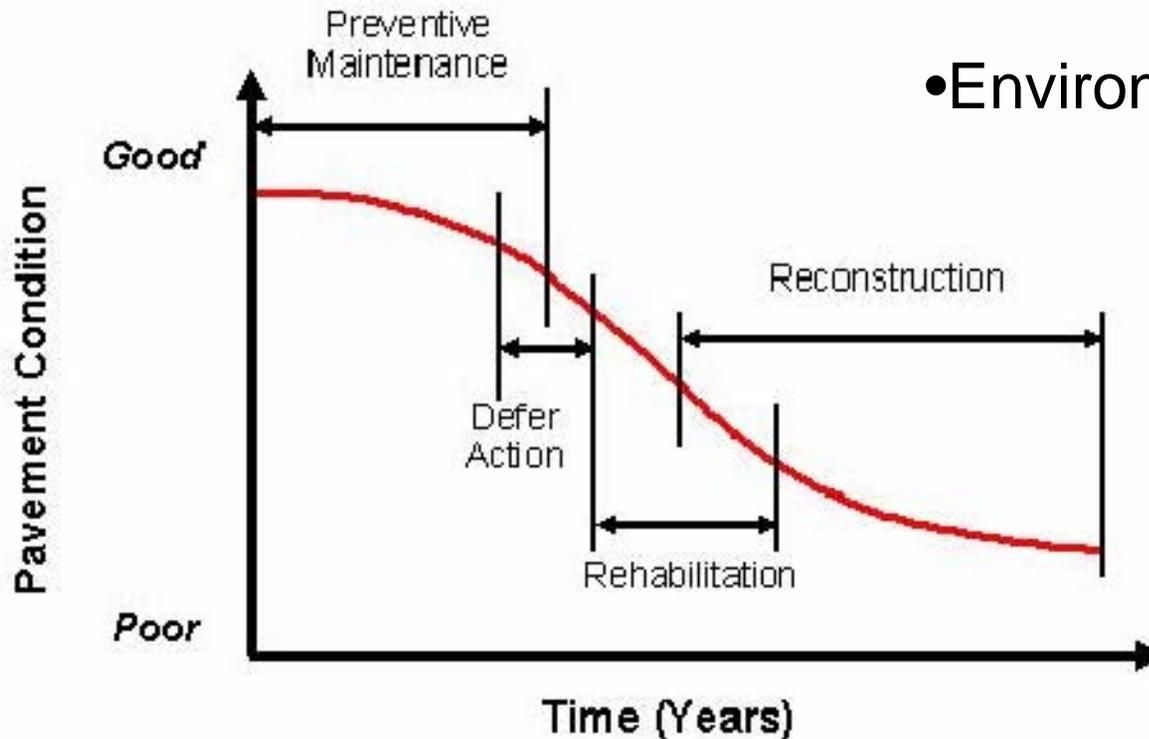
PCC

- Crack & Joint Re-Seal
- Partial & Full Depth Repair
- Dowel Bar Retrofit
- Diamond Grinding & Grooving

www.dot.ca.gov/hq/maint/MTA_guide.htm

Treatment Selection Based on Pavement Condition

- Traffic
- Environment



Caltrans Approach to Selecting Maintenance Treatments

- Assess Existing Pavement Conditions
- Determine the Feasible Treatment Options
- Analyze and Compare the Feasible Options

Caltrans Approach to Selecting Maintenance Treatments

- **Assess Existing Pavement Conditions**
 - Conduct visual site inspection and/or review project information
 - Perform testing on the existing pavement, as conditions require
 - Define the performance requirements for the treatment

2006 Maintenance Directive

- Basis for Caltrans Maintenance Program
 - Annual contract maintenance program
 - Evaluate applicability of various treatments
 - Comparison based upon pavement condition environmental factors
 - Evaluates applicability based upon type of distress condition as well as extent of cracking

Maintenance Selection – Detailed Example

Preventive Treatments	Raveling	Oxidation	Bleeding	Rutting	
				<1/2"	>1/2"
Crack/Joint Seal					
Emulsion	N	N	N	N	N
Modified (Rubber)	N	N	N	N	N
Seal Coats					
Fog Seal (See note 1)	F	G	N	N	N
Rejuvenator (See note 1)	G	G	N	N	N
Scrub Seal (See Note 4)	G	G	N	N	N
Slurry Seals					
Type II (See note 1)	F	G	N	N	N
Type III	G	G	N	F	N
REAS	G	G	N	F	N
Microsurfacing					
Type II	G	G	N ¹⁹	G	F
Type III	G	G	N	G	G

Maintenance Selection on Cracks - Overview

GENERAL GUIDELINES FOR EFFECTIVE MAINTENANCE TREATMENTS ON CRACKS

Criteria	Type of Cracking														
	Alligator "A"			Alligator "B"			Alligator "C"			Longitudinal/Transverse			Edge		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Width	<1/4"	>1/4", <1/2"	>1/2"	<1/4"	>1/4", <1/2"	>1/2"	<1/4"	>1/4", <1/2"	>1/2"	<1/4"	>1/4", <1/2"	>1/2"	No	>0%, <10%	>10%
Area	<10%	>10%, <20%	>20%, <30%	<10%	>10%, <20%	>20%, <30%	<10%	>10%, <20%	>20%, <30%				Material	Material	Material
Preventive Treatment															
Crack/Joint Seal (See Note 5)															
Emulsion	N	F	N	N	P	N	N	N	N	G	F	N	G	P	P
Modified (Rubber)	N	G	P	N	P	N	N	P	N	P	G	F	P	P	P
Fog Seal (See note 1)	G	P	N	G	N	N	F	N	N	F	N	N	F	P	P
Rejuvenator (See note 1)	G	N	N	G	N	N	F	N	N	F	N	N	F	P	P
Scrub Seals	G	F	N	G	F (See Note 4)	N	G	P (See Note 4)	N	F	P	P	F	P	P
Slurry Seals															
Type II (See note 1)	F	N	N	F	N	N	F	N	N	F	N	N	F	P	P
Type III	F	P	N	F	P	N	F	P	N	F	P	N	F	P	P
Microsurfacing															
Type II (See note 2)	G	N	N	F	P	N	F	P	N	F	N	N	P	P	P
Type III	G	P	N	F	P	N	F	P	N	F	N	N	P	P	P
Chip Seal															
PME - Med. Fine	G	P	N	G	F (See Note 4)	N	G	P (See Note 4)	N	P	P	N	P	P	P
PME - Medium	G	P	N	G	F (See Note 4)	N	G	P (See Note 4)	N	P	P	N	P	P	P
PMA - Medium (See Note 3.)	G	P	P	G	F (See Note 4)	P	G	P (See Note 4)	P	P	P	N	P	P	P
PMA - Coarse (See Note 3.)	G	P	P	G	F (See Note 4)	P	G	P (See Note 4)	P	P	P	N	P	P	P
AR - Medium	G	G	F	G	G	F	G	F (See Note 4)	F	P	F	F	P	P	P
AR - Coarse	G	G	F	G	G	F	G	F (See Note 4)	F	P	F	F	P	P	P
PM Alternative > 30,000 ADT															
PBA OGAC	G	F	N	G	F (See Note 4)	N	G	F (See Note 4)	N	G	F	P	P	P	P
RAC-O	G	G	F	G	G	F (See Note 4)	G	G	F	G	F	P	P	P	P
RAC-O High Binder (HB)	G	G	F	G	G	F (See Note 4)	G	G	F	G	F	P	F	F	F
RAC-G	G	G	G	G	G	F (See Note 4)	G	G	G	G	F	P	G	G	G
Thin Bonded Wearing Course Rubber (BWCR)	G	G	G	G	F (See Note 4)	F (See Note 4)	G	F (See Note 4)	F	F	F	P	P	P	P
Maintenance Treatments															
Conventional	G	G	F	G	G (See Note 4)	P (See Note 4)	G	G	F	P	F	F	N	F	F
PBA	G	G	G	G	G (See Note 4)	P (See Note 4)	G	G	G	P	F	F	N	F	F
RAC	G	F	P	F	P (See Note 4)	P	G	F	P	P	P	F	N	F	F
BWC															
Digouts	N	N	F	N	N	G	N	N	G	N	F	F	N	F	G

Guidelines for Effective Treatments on Cracks – Detailed Example

Criteria	Alligator "C"			Longitudinal/Transverse		
	Low	Medium	High	Low	Medium	High
Width	<1/4"	>1/4", <1/2"	>1/2"	<1/4"	>1/4", <1/2"	>1/2"
	or	or	or			
Area	<10%	>10%, <20%	>20%, <30%			
Treatment						
Microsurfacing						
Type II (See note 2)	F	P	N	F	N	N
Type III	F	P	N	F	N	N
PM Alternative >30,000 ADT						
OGAC	G	F (Note 4)	N	G	F	P
RAC-O	G	G	F	G	F	P
RAC-O High Binder (HB)	G	G	F	G	F	P
RAC-G	G	G	G	G	F	P

Caltrans Approach to Selecting Maintenance Treatments

- Analyze and Compare the Feasible Options
 - Several treatments may be feasible
 - Cost and life of the treatments vary
 - Effect of the treatment on the life extension of the existing pavement
 - Other factors to consider: cost effectiveness, treatment timing, traffic level, and constructability

Estimated Life of Treatments

Treatment	Good Condition (5% Crack)	Fair Condition (15% Crack)	Poor Condition (25% Crack)
Fog Seal	3 - 5	1 - 3	1 - 2
Chip Seal	7 - 10	3 - 5	1 - 3
Slurry Seal	7 - 10	3 - 5	1 - 3
Micro-surfacing	8 - 12	5 - 7	2 - 4
Thin HMA	10 - 12	5 - 7	2 - 4

Approach for Selecting Maintenance Treatments

- Cost Effectiveness
 - Equivalent Annual Cost
 - Life Cycle Cost Analysis
- Selection of Maintenance Treatments
 - Performance and constructability
 - Customer satisfaction
 - Ranking of selected treatments by rating overall importance

Rating Evaluation Worksheet

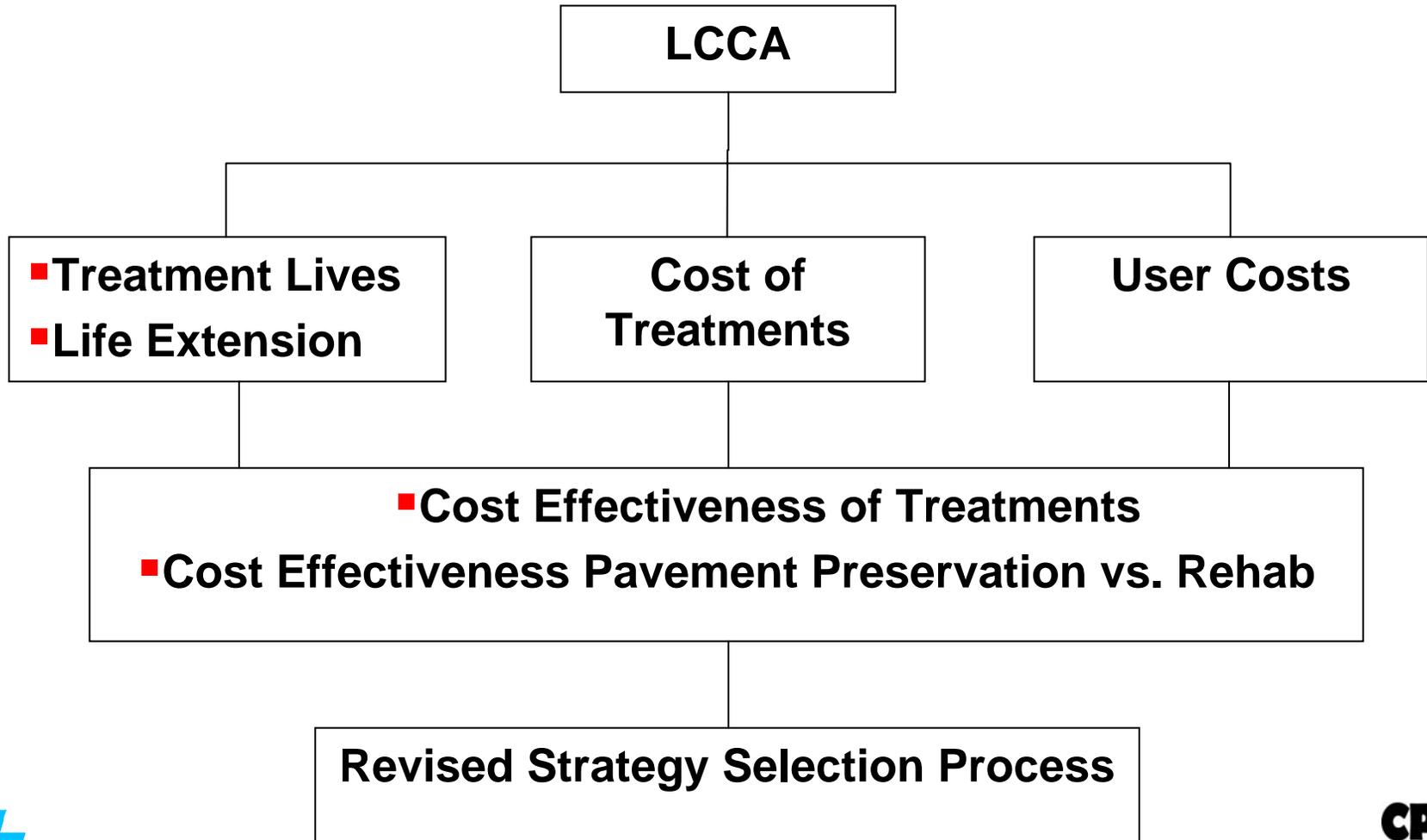
<u>RATING FACTOR</u>	<u>SCORING FACTOR</u>	<u>RATING FACTOR</u>	<u>TOTAL SCORE</u>
PERFORMANCE EVALUATION ATTRIBUTES			
	<u>CHIP</u>	<u>MICRO</u>	
% Expected Life	_____ _____	_____ × _____ = _____	_____ _____
% Seasonal Effects	_____ _____	_____ × _____ = _____	_____ _____
% Pavement Structure Influence	_____ _____	_____ × _____ = _____	_____ _____
% Influence of Existing Pavement Condition	_____ _____	_____ × _____ = _____	_____ _____
CONSTRUCTABILITY ATTRIBUTES			
% Cost Effectiveness (EAC)	_____ _____	_____ × _____ = _____	_____ _____
% Availability of Quality Contractors	_____ _____	_____ × _____ = _____	_____ _____
% Availability of Quality Materials	_____ _____	_____ × _____ = _____	_____ _____
% Weather Limits	_____ _____	_____ × _____ = _____	_____ _____
CUSTOMER SATISFACTION ATTRIBUTES			
% Traffic Disruption	_____ _____	_____ × _____ = _____	_____ _____
% Noise	_____ _____	_____ × _____ = _____	_____ _____
% Surface Friction	_____ _____	_____ × _____ = _____	_____ _____
100 %		Total	
RATING FACTOR: PERCENT OF IMPACT ON TREATMENT DECISION (total must = 100%) SCORING FACTOR: 5 = Very important 4 = Important 3 = Some importance 2 = Little importance 1 = Not important			

Rating Evaluation Example

<u>RATING FACTOR</u>			<u>SCORING FACTOR</u>		<u>RATING FACTOR</u>		<u>TOTAL SCORE</u>
PERFORMANCE EVALUATION ATTRIBUTES							
			<u>CHIP</u>	<u>MICRO</u>			<u>CHIP</u> <u>MICRO</u>
15	%	Expected Life	3	4	×	0.15	= 0.45 0.60
10	%	Seasonal Effects	2	3	×	0.10	= 0.20 0.30
5	%	Pavement Structure Influence	3	3	×	0.05	= 0.15 0.15
5	%	Influence of Existing Pavement Condition	4	2	×	0.05	= 0.20 0.10
CONSTRUCTABILITY ATTRIBUTES							
10	%	Cost Effectiveness (EAC)	5	4	×	0.10	= 0.50 0.40
5	%	Availability of Quality Contractors	4	3	×	0.05	= 0.20 0.15
10	%	Availability of Quality Materials	3	2	×	0.10	= 0.30 0.20
5	%	Weather Limits	3	4	×	0.05	= 0.15 0.20
CUSTOMER SATISFACTION ATTRIBUTES							
20	%	Traffic Disruption	1	5	×	0.20	= 0.20 1.00
5	%	Noise	1	4	×	0.05	= 0.05 0.15
10	%	Surface Friction	5	3	×	0.10	= 0.50 0.30
100	%					<i>Total</i>	<i>2.90</i> <i>3.55</i>
RATING FACTOR:		PERCENT OF IMPACT ON TREATMENT DECISION (total must = 100%)					
SCORING FACTOR:		5 = Very important					
		4 = Important					
		3 = Some importance					
		2 = Little importance					
		1 = Not important					



Proposed LCCA Analysis



LCCA Elements for Pavements

- Type and life of maintenance and rehabilitation treatments, including life extension
- Agency costs
- User costs (auto repairs, safety, delays)
- Salvage value
- Time value of money (present net value vs. annual cost)

Proposed Additions to the Treatment Selection Process

- Selected updates to the Matrix for Flexible Pavements (estimated treatment lives and costs)
- Quantify effect of pavement condition, traffic and Climate on treatment lives, and life extension

Discussion of Process

- Guidelines for Selection of Pavement Preservation Treatments
- Inclusion of LCCA and Treatments for Concrete Pavements Preservation
- Peer Reviewed (PPTG, FHWA, Caltrans PST)

Summary

- Caltrans developed the MTAG, a dynamic, flexible document that is updated as needed
- The treatment selection process is now a standard practice for use by maintenance personnel

MTAG – www.dot.ca.gov/hq/maint/MTA_guide.htm

Thank You

Questions?