Flexibility in Design

MoDOT's Approach to System Delivery

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Missouri Department of Transportation

Why be Flexible?

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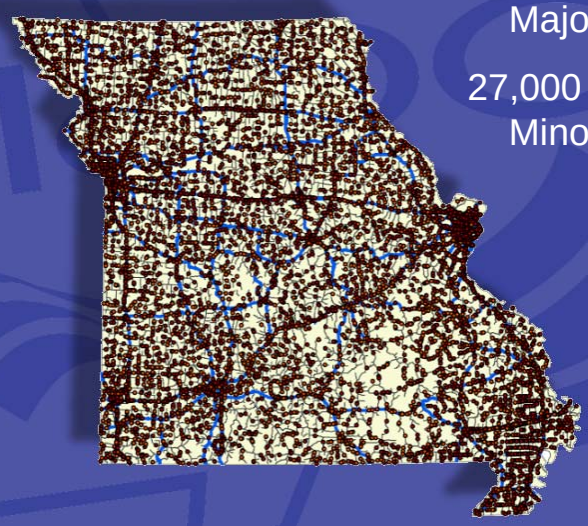
responsibility



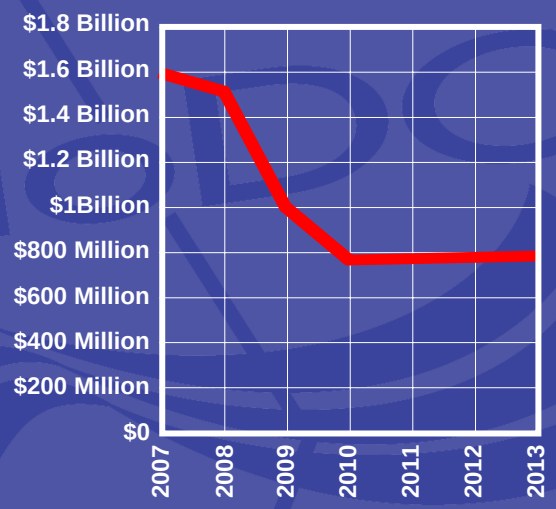
5,000 miles of Major Roads

27,000 miles of Minor Roads

10,000 Bridges

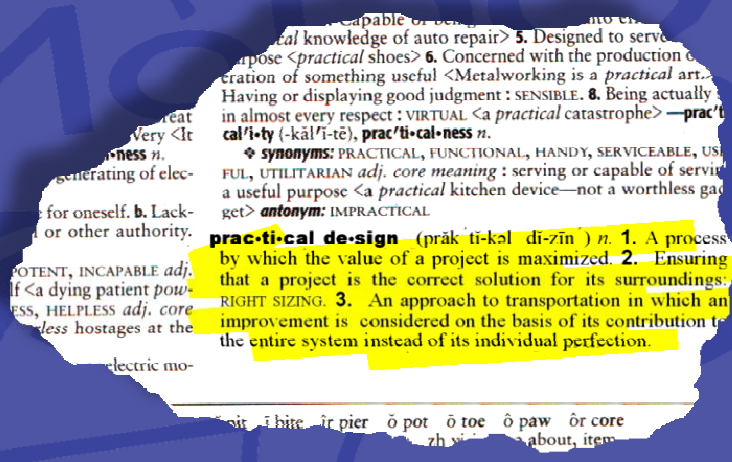
Why be Flexible?

budget



Practical Design = Flexibility

context sensitive solutions



knowledge of auto repair> **5.** Designed to serve
pose <*practical* shoes> **6.** Concerned with the production
ration of something useful <Metalworking is a *practical* art.
Having or displaying good judgment : SENSIBLE. **8.** Being actually
in almost every respect : VIRTUAL <a *practical* catastrophe> —**prac′ti**
cal′i•ty (-kăl′ĭ-tē), **prac′ti•cal•ness** *n.*

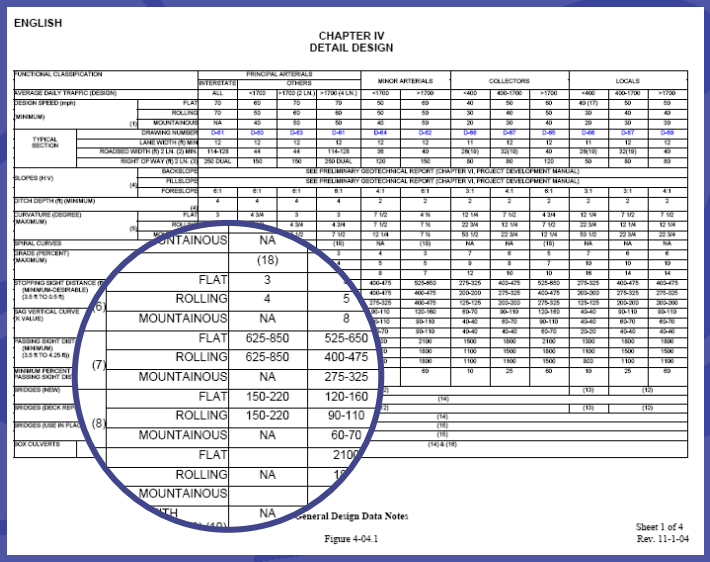
❖ ***synonyms:*** PRACTICAL, FUNCTIONAL, HANDY, SERVICEABLE, USE
FUL, UTILITARIAN *adj. core meaning* : serving or capable of servi
a useful purpose <a *practical* kitchen device—not a worthless ga
get> ***antonym:*** IMPRACTICAL

prac•ti•cal de•sign (prăk′ tĭ-kəl dĭ-zīn′) *n.* **1.** A process
by which the value of a project is maximized. **2.** Ensuring
that a project is the correct solution for its surroundings:
RIGHT SIZING. **3.** An approach to transportation in which an
improvement is considered on the basis of its contribution t
the entire system instead of its individual perfection.

ō pot ō toe ô paw ôr core
about, item

The Dangers of Rigid Standards

the way things were



ENGLISH

CHAPTER IV
DETAIL DESIGN

FUNCTIONAL CLASSIFICATION		PRINCIPAL ARTERIALS INTERSTATE	PRINCIPAL ARTERIALS OTHERS			MINOR ARTERIALS		COLLECTORS			LOCALS		
AVERAGE DAILY TRAFFIC (DESIGN)		ALL	<1700	>1700 (2 LN.)	>1700 (4 LN.)	<1700	>1700	<400	400-1700	>1700	<400	400-1700	>1700
DESIGN SPEED (mph) (MINIMUM) (1)	FLAT	70	60	70	70	50	60	40	50	50	40 (17)	50	50
	ROLLING	70	50	60	60	50	50	30	40	50	30	40	40
	MOUNTAINOUS	NA	40	50	50	40	50	30	30	40	20	30	30
TYPICAL SECTION	DRAWING NUMBER	D-61	D-60	D-63	D-61	D-64	D-62	D-66	D-67	D-65	D-66	D-67	D-65
	LANE WIDTH (ft) MIN	12	12	12	12	12	12	11	12	12	11	12	12
	ROADBED WIDTH (ft) 2 LN. (2) MIN.	114-128	44	44	114-128	36	40	28(19)	32(19)	40	28(19)	32(19)	40
	RIGHT OF WAY (ft) 2 LN. (3)	250 DUAL	150	150	250 DUAL	120	150	80	80	120	50	50	50
SLOPES (H:V) (4)	BACKSLOPE	SEE PRELIMINARY GEOTECHNICAL REPORT (CHAPTER VI, PROJECT DEVELOPMENT MANUAL)											
	FILLSLOPE	SEE PRELIMINARY GEOTECHNICAL REPORT (CHAPTER VI, PROJECT DEVELOPMENT MANUAL)											
	FORESLOPE	6:1	6:1	6:1	6:1	4:1	6:1	3:1	4:1	6:1	3:1	3:1	4:1
DITCH DEPTH (ft) (MINIMUM)		4	4	4	4	2	2	2	2	2	2	2	2
CURVATURE (DEGREE) (MAXIMUM) (5)	FLAT	3	4 3/4	3	3	7 1/2	4 ½	12 1/4	7 1/2	4 3/4	12 1/4	7 1/2	7 1/2
	ROLLING			4 3/4	4 3/4	7 1/2	7 ½	22 3/4	12 1/4	7 1/2	22 3/4	12 1/4	12 1/4
	MOUNTAINOUS			7 1/2	7 1/2	12 1/4	7 ½	53 1/2	22 3/4	12 1/4	53 1/2	22 3/4	22 3/4
SPIRAL CURVES					(16)	NA	(16)	NA	NA	(16)	NA	NA	NA
GRADE (PERCENT) (MAXIMUM) (6)	FLAT	3			3	4	3	7	6	5	7	6	6
	ROLLING	4			5	5	5	9	8	7	10	10	10
	MOUNTAINOUS	NA			8	6	7	12	10	10	16	14	14
STOPPING SIGHT DISTANCE (ft) (MINIMUM-DESIRABLE) (3.5 ft TO 0.5 ft) (7)	FLAT	625-850			525-650	400-475	525-650	275-325	400-475	525-650	275-325	400-475	400-475
	ROLLING	625-850			400-475	400-475	400-475	200-220	275-325	400-475	200-260	275-325	275-325
	MOUNTAINOUS	NA			275-325	275-325	400-475	125-125	200-200	275-325	125-125	200-200	200-200
SAG VERTICAL CURVE (K VALUE) (8)	FLAT	150-220			120-160	90-110	120-160	60-70	90-110	120-160	40-40	90-110	90-110
	ROLLING	150-220			90-110	60-70	90-110	40-40	60-70	90-110	40-40	60-70	60-70
	MOUNTAINOUS	NA			60-70	40-40	60-70	30-30	40-40	60-70	30-30	40-40	40-40
PASSING SIGHT DIST. (ft) (MINIMUM) (3.5 ft TO 4.25 ft)	FLAT				2100	1500	2100	1500	1800	2100	1500	1800	1800
	ROLLING	NA			1800	1100	1500	1100	1500	1800	1100	1500	1500
	MOUNTAINOUS				1100	1100	1100	1100	1100	1500	800	1100	1100
MINIMUM PERCENT PASSING SIGHT DIST.					60	10	25	50			10	25	60
BRIDGES (NBW)		(12)									(13)	(12)	
BRIDGES (DECK REP.)		(12)				(14)					(13)	(12)	
BRIDGES (USE IN PLACE)						(15)							
BOX CULVERTS						(14) & (16)							

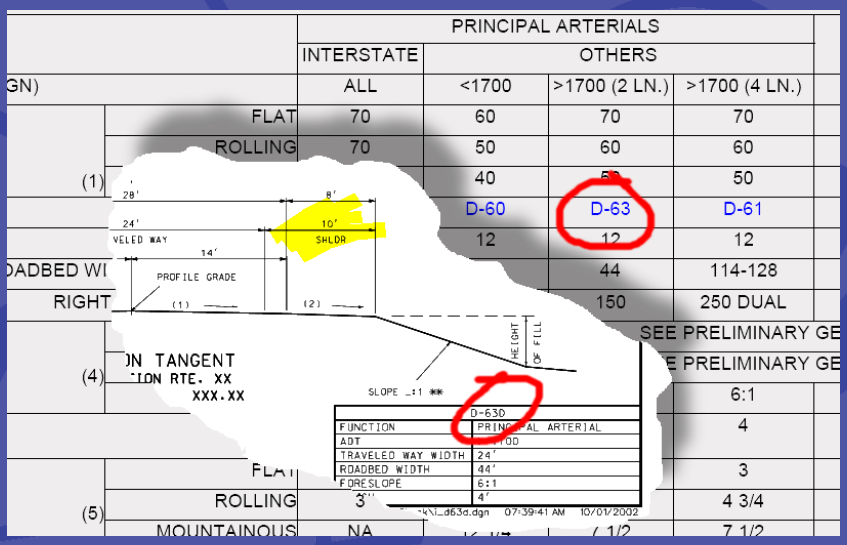
General Design Data Notes

Figure 4-04.1

Sheet 1 of 4
Rev: 11-1-04

The Dangers of Rigid Standards

the way things were



		PRINCIPAL ARTERIALS			
		INTERSTATE	OTHERS		
GN)		ALL	<1700	>1700 (2 LN.)	>1700 (4 LN.)
	FLAT	70	60	70	70
	ROLLING	70	50	60	60
(1)			40	50	50
			D-60	D-63	D-61
			12	12	12
DADBED WI				44	114-128
RIGHT				150	250 DUAL
					SEE PRELIMINARY GE
(4)					E PRELIMINARY GE
					6:1
					4
	FLAT				3
(5)	ROLLING	3			4 3/4
	MOUNTAINOUS	NA			7 1/2

The Dangers of Rigid Standards

the way things were

The Dangers of Rigid Standards

the way things were

Something Had to Change

implementation - *the road to success*

- **Spring 2002** – Performance Spec.s written
- **December 2004** – Practical Design concept pitched to Commission
- **Spring 2005** – Districts challenged to cut STIP 10%
- **Fall 2005** – First Practical Design Policy written
- **December 2006** – *Engineering Policy Guide* is launched

The Road to Success

overcoming roadblocks – the ground rules

- **Safety -** Every project must get safer. There is no room for compromise where safety is concerned.
- **Communication -** There is collaboration in developing every practical solution.
- **Quality -** The practical solution must function properly and cannot leave a legacy of maintenance challenges.

The Road to Success

overcoming roadblocks – the ground rules

The Road to Success

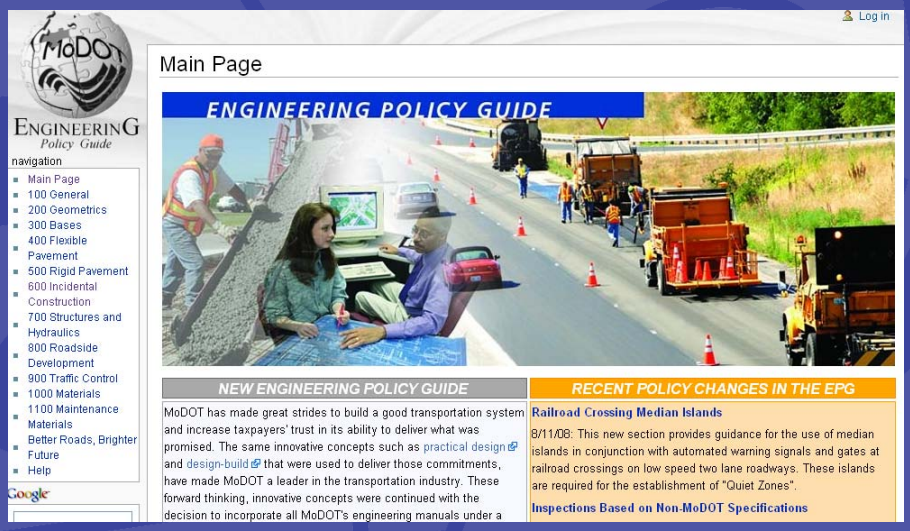
overcoming roadblocks – the ground rules

The Road to Success

overcoming roadblocks – the ground rules

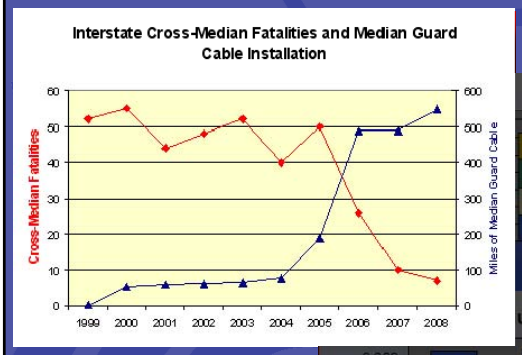
Everyday Flexibility

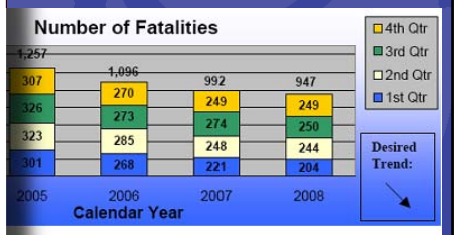
engineering policy guide

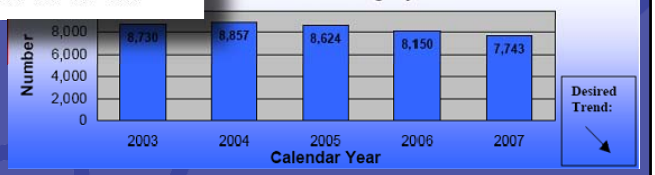


Has it Worked?

Safety







Has it Worked?

Quality

- Since 2002, MoDOT delivered a $7.0 Billion program 0.4% under budget.
- Pavement condition on major roads went from the 3rd worst to the 9th best.
- 83% of the state's major roads are now in good condition. That's up from 47% in 2004.

Has it Worked?

Communication

How to be Flexible

lessons learned

- Not everything has worked well, but…
- We've been able to learn from the experience. For example…

How to be Flexible

lessons learned

Bridge Approach Slabs

How to be Flexible

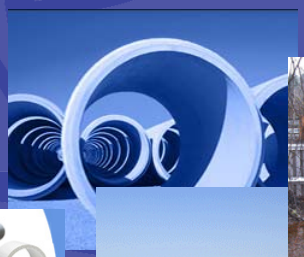
lessons learned

Cable Barrier Vegetation Control

How to be Flexible

what's worked well

- Alternate Bidding Pavements
- Alternate Technical Concepts



How to be Flexible

- **Top-Down Leadership**

Change of this magnitude must be a "top-down" undertaking. A radical change in everyday culture will not endure long at the grass roots level

- **Openness**

The organization must be completely open to collaboration, but willing to accept certain non-voluntary actions

How to be Flexible

- **Political Environment**

A radical cost control program should be accomplished hand-in-hand with state and federal government leaders, not in spite of them

- **Change**

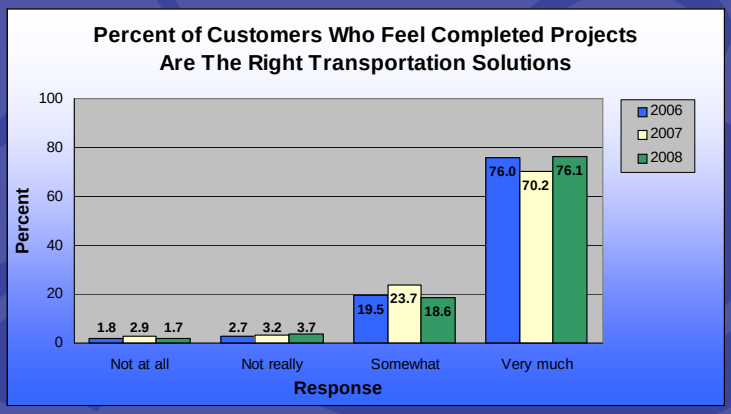
An organization must be completely open to whatever change is necessary to accomplish a radical departure from traditional philosophies

How to be Flexible

- **Focus on the system**

Deliver “good” projects everywhere, instead of “perfect” projects somewhere

- **Honor Commitments**

Projects must be flexible but the system must be unyielding. What has been promised to the public must be delivered

Is your Transportation System Great?