

# **The Cost of Poor Specifications**

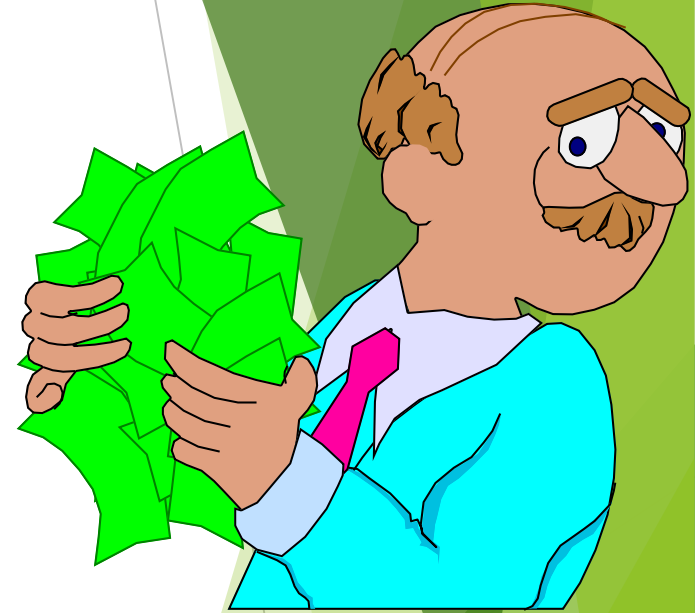
**Ervin L. Dukatz, Jr., PH.D., P.E.**

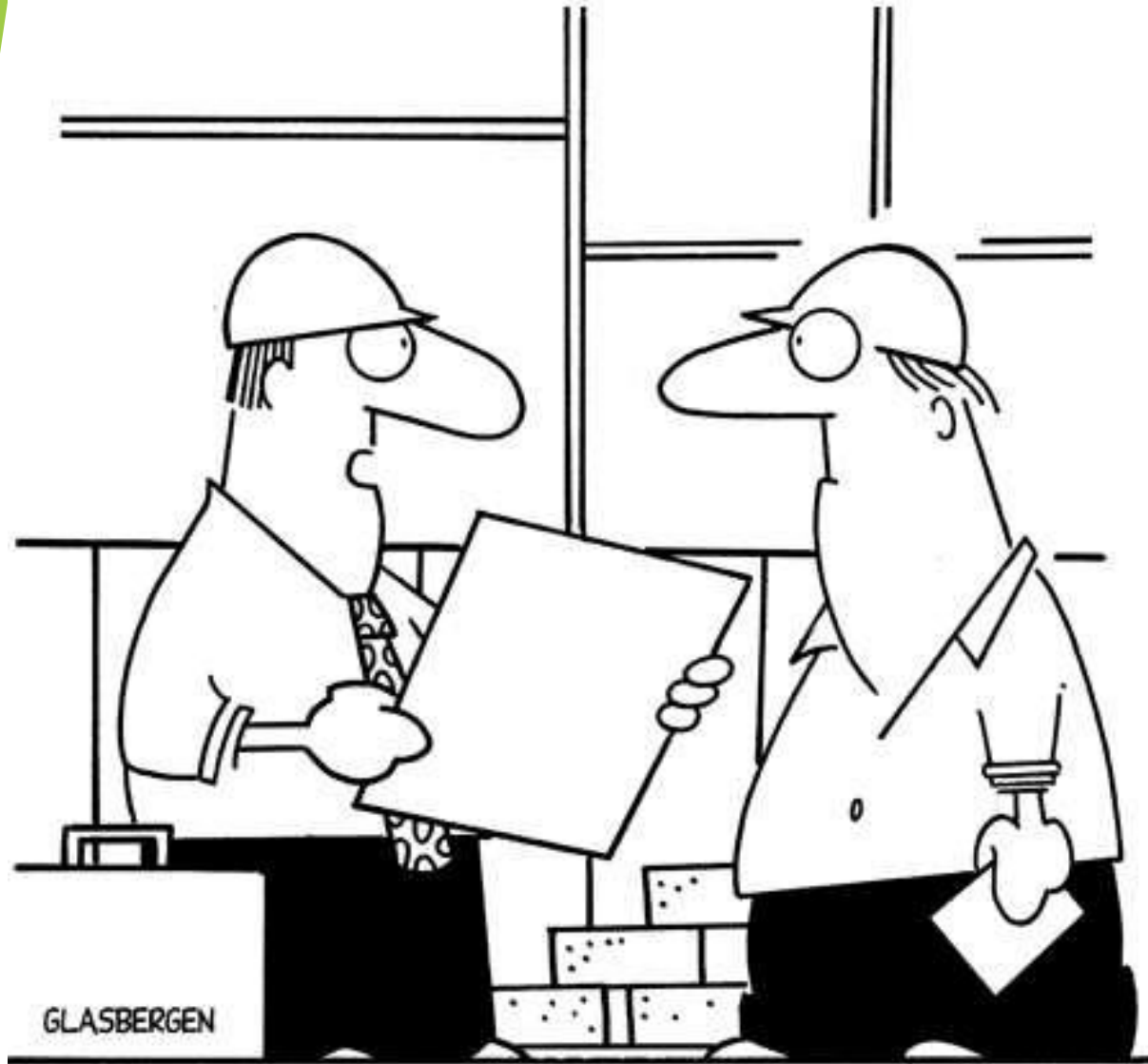
**VP – Materials and Research  
Mathy Construction Co.**

Midwest Pavement Preservation Partnership  
Madison, WI Nov. 7, 2018

# *The Cost of Poor Specifications*

- ▶ “DIA’s Failure to review pavement specs led to cracking, costing extra \$2.9 million” - Denver Post 7/20/17.
- ▶ “Poor Paving Specifications Costs R-Millions” - Leading Architecture & Design 6-27-14.
- ▶ “The testing costs more than the materials....” - private conversations with the author





**“Does ‘high-rise’ refer to the building or the budget?”**

Approximately 50% of product defects originate in the requirements (specifications).

80% of rework can be traced to the requirements defects.

“What Are the Consequences of Poor Requirement Specifications  
<http://www.tecnova.com/blog/consequences-requirements-specification>

# *The Cost of Poor Specifications*

- ▶ The estimated cost to US software businesses in 2007 was:

**\$30,000,000,000/year**

Marasco, J., “What is the Cost of a Requirement Error?”,  
<https://stickyminds.com/article/what-cost-requirement-error>.

# *The Cost of Poor Specifications*

## *Specification, n*

1. The act or process of specifying.
2. A detailed precise presentation of a plan or proposal for something.
3. A statement of legal particulars (... of contract terms).

# ***The Cost of Poor Specifications***

## ***Poor Specification, n***

1. Increases project cost and/or
2. Time
3. Has unintended consequences which result in increased costs.

# ***The Cost of Poor Specifications***

## ***Specification Ethics,***

- 1. Ethical Egoism-20<sup>th</sup> Century Ayn Rand**
- 2. Utilitarianism-18/19<sup>th</sup> Century  
J. Bentham/John Mill**

# ***The Cost of Poor Specifications***

## *Types of Specifications,*

### 1. Prescriptive

- a. Who, what, when, where and how
- b. Owners risk high

### 2. Performance

- a. Goal based
- b. Reduced owners risk
- c. Innovation



# ***The Cost of Poor Specifications***

## *Types of Specification failures,*

### 1. Application

- a. Product in the wrong application
- b. Focus on wrong metric

### 2. Materials

- a. Wrong metric for application

### 3. Risk

- a. Testing doesn't match project size and risk

# *The Cost of Poor Specifications*

## *Types of Specification failures,*

### 3. Risk - examples

#### a) Air field trench project

- i. HMA - \$650 (6.5 T)
- ii. Total testing cost - \$25,000

#### b) Air field paving - 7 x 770 ft. lanes

- i. HMA ~ 800 T/lane
- ii. 4 - mix tests/lift
- iii. 114 density (mainline and joint) tests/lift

# The Cost of Poor Specifications

## Types of Specification failures

4. Statistics - Small sample size paradigm,  $n < 20$ 
  - a. when bad becomes good.

$G_{mm}$							Testing Tolerance	
Split Sample Number	Contractor	Agency	Difference (Xd)	$X_d$ Mean	0.006	Degree of Freedom	3	0.12
1	2.546	2.539	0.007	$S_d$	0.001	Prob. $\alpha$	1%	
2	2.548	2.542	0.006	$t_{pair}$	22.52	$t_{critical}$	5.841	
3	2.545	2.539	0.006	Split Sample Results:		fail t-Test		
4	2.547	2.540	0.007	Test differences within testing tolerance.				
ave.	2.547	2.540						

# The Cost of Poor Specifications

## Types of Specification failures

4. Statistics - Small sample size paradigm
  - b. when bad becomes good.

								<i>Testing Tolerance</i>
$G_{mb}$								
<b>Split Sample Number</b>	<b>Contractor</b>	<b>Agency</b>	<b>Difference (Xd)</b>	$X_d$ Mean	<b>0.026</b>	Degree of Freedom	3	<b>0.02</b>
1	2.398	2.407	0.009	$S_d$	0.013	Prob. $\alpha$	1%	
2	2.444	2.404	0.040	$t_{pair}$	<b>4.06</b>	$t_{critical}$	5.841	
3	2.454	2.424	0.030	<b>Split Sample Results:</b>		<b>pass t-Test</b>		
4	2.442	2.416	0.026	<i>Test differences exceed testing tolerance.</i>				
ave.	2.435	2.413						

# The Cost of Poor Specifications

## Types of Specification failures

4. Statistics - Small sample size paradigm
  - c. when two bads make a right.

								Testing Tolerance
$V_a$								
Split Sample Number	Contractor	Agency	Difference (Xd)	$X_d$ Mean	0.92	Degree of Freedom	3	1.0
1	5.8	5.2	0.614	$S_d$	0.32	Prob. $\alpha$	1%	
2	4.1	5.4	1.347	$t_{pair}$	5.78	$t_{critical}$	5.84	
3	3.6	4.5	0.954	Split Sample Results:		Correlate		
4	4.1	4.9	0.759	Test differences within testing tolerance.				
ave.	4.4	5.0	Target = 4.5					

# ***The Cost of Poor Specifications***

***Key Question:***

Does the specification improve the product  
or  
just increase costs?

# ***Good Specifications***

## ***Key characteristics:***

1. Clear expectations/objectives
2. Partnering with stakeholders
3. Performance based metric(s)
  - a) Measurable
  - b) Repeatable
  - c) Transparent

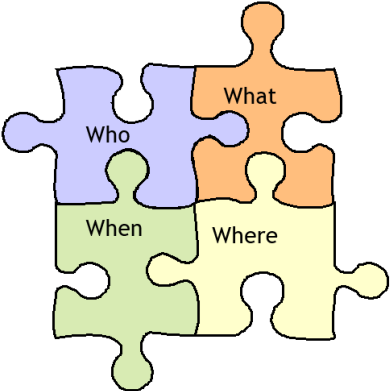
# Specifications

Performance

Partnering



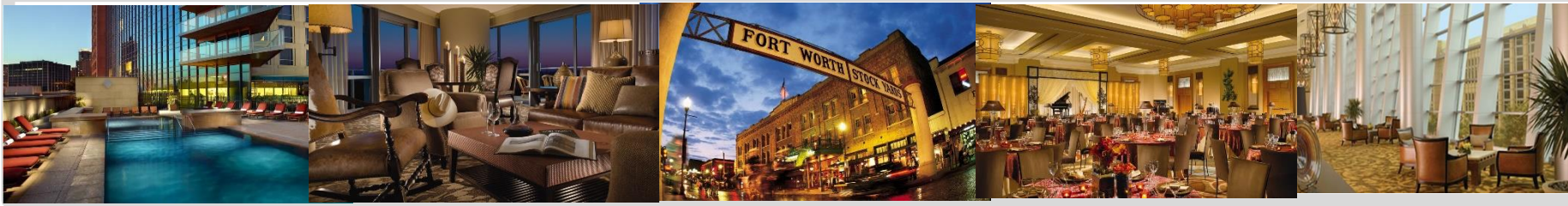
Prescriptive





“You can pay me now,  
or pay me more later.” – Fram Oil filters (1972)





# 94th AAPT Annual Meeting and Technical Sessions

The 2019 Annual Meeting will be held March 3-6, 2019  
OMNI Fort Worth, Fort Worth, Texas, USA



2019 Annual Meeting

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<http://asphalttechnology.org/annual-meeting.html>

