




Schedules: Back to Basics

- I. CPM Scheduling Basics
- II. The Baseline Schedule
- III. The Schedule Update
- IV. Delay Analysis
- V. **Proving and Tracking Damages**


Proving and Tracking Damages



- A. Basic Approach
- B. Delay
- C. Disruption (Loss of Productivity - LOP)
- D. Cumulative Impact

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Proving Damages



Basic Approach for Delay and Disruption (LOP)

- Entitlement
 - Contract
 - Analysis
- Quantification
 - Contract
 - Methodology

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Proving Damages



Delay

- Entitlement
 - Contract
 - Allowable: No damage for delay
 - Notice provisions
 - Methodology specified
 - Analysis
 - Prospective
 - Retrospective

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Proving Damages



Delay

- Quantification
 - Contract
 - Allowable: FOOH, HOOH
 - Stipulated
 - Methodology
 - Daily Rate
 - Itemized

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Proving Damages

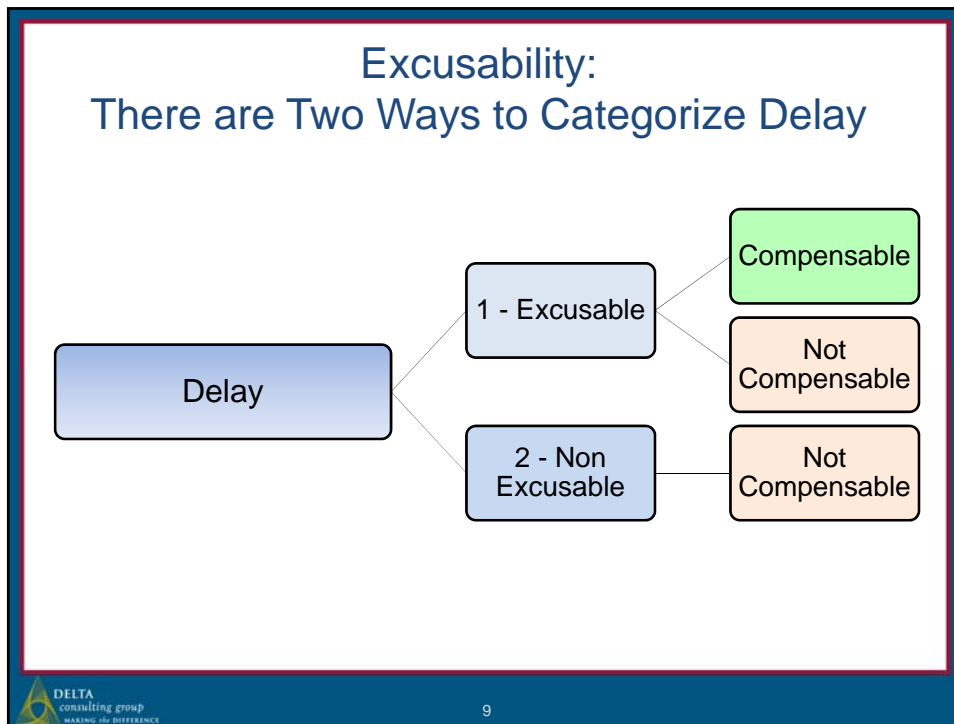


- Contractor must demonstrate that it has or will incur additional costs because of the delay
 - Potential damages might include:
 - Direct Costs (Escalation / Acceleration)
 - Increased labor costs
 - Increased material costs
 - Increased equipment costs
 - Indirect Costs (Time related/Escalation/Thickening)
 - Additional field overhead
 - Additional home office overhead

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1. Compensability
2. Excusability of a Delay
3. How is Compensable Delay Priced?
4. Costs and Rates
5. What Should a Schedule Expert Provide to the Damages Expert?



Types of Delay

<u>Contractor</u>	<u>Non Excusable</u>	<u>Excusable</u> <u>Not Compensable</u>	<u>Compensable</u>
Relief from Liquidated Damages	No	Yes	Yes
Additional Time	No	Yes	Yes
Additional Cost	No	No	Yes
<u>Owner</u>			
Liquidated Damages	Yes	No	No
Extend Project Duration	No	Yes	Yes


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Excusable vs. Non Excusable Delay



“Excusability exists where there is contractual or equitable justification in a claimants request for a contract time extension for relief from potential claims for liquidated/stipulated or actual delay damages. The showing of excusability does not necessarily mean that the claimant is also entitled to compensation for the delay. Conversely, delay is non-excusable when such justification does not exist.”



Source: AACE® International Recommended Practice No. 29R-03, page 98

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Compensable Delay



“Compensability or compensable delay exists where the claimant is entitled to recover not only a time extension but compensation for expenses associated with the extension of completion date or the prolongation of the duration of work. Excusability is a prerequisite to compensability. Therefore, where compensability can be established, excusability is assumed.”

Source: AACE® International Recommended Practice No. 29R-03, page 98

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Excusable and Compensable Delay (ECD)



“Each incremental delay along the as-built critical path should be independently quantified and the cause of the delay identified. The net Excusable & Compensable Delay (ECD) is the sum of the individual delays that: 1) were the responsibility of the owner, and 2) delayed the completion date of the project, and 3) were not concurrent with delays which were the responsibility of the contractor or *force majeure* events.”



Source: AACE® International Recommended Practice No. 29R-03, page 43

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What Costs are Delay Related?



- What are the contract terms?
 - The contract terms and conditions are the ultimate authority and may specifically establish compensable costs
- General Rule – Time Related Costs
 - Additional cost that are going to be incurred should the project start late or the duration be extended

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Typical Cost Categories



<p><u>“Sticks & Bricks”</u> <u>“LEMSO”</u></p> <p>Labor Equipment Material Subcontract Other</p>	<p><u>On-Site expenses</u> <u>“FOOH”</u></p> <p>Management Supervision Safety “Field” Office</p>	<p><u>Off-Site expenses</u> <u>“HOOH”</u></p> <p>Executives Marketing Accounting “Home” office</p>
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Cost Categories – Inconsistent Terminology



<p>Direct Costs</p>	<p>Direct Costs Indirect Costs Field Indirect Costs General Conditions</p>	<p>Indirect Costs Home Office costs General & Administrative</p>
<p><u>“Sticks & Bricks”</u> <u>“LEMSO”</u></p> <p>Labor Equipment Material Subcontract Other</p>	<p><u>On-site expenses</u> <u>“FOOH”</u></p> <p>Management Supervision Safety “Field” Office</p>	<p><u>Off-Site expenses</u> <u>“HOOH”</u></p> <p>Executives Marketing Accounting “Home” office</p>

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What Costs are Delay Related? LEMSO




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<ul style="list-style-type: none"> • L = Labor • E = Equipment • M = Material • S = Subcontractors • O = Other 	<p>Typically not a direct delay damage but subject to escalation</p> <p>Potentially subject to daily delay and escalation</p> <p>Generally not a direct delay damage but subject to escalation</p> <p>Subs will likely have pass-thru delay damages in similar categories to the Prime GC</p> <p>Misc. costs</p>
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What Costs are Delay Related? FOOH



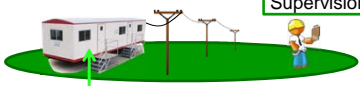
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A Field Office Costs Supports A Project

Trailer

Utilities

Office Staff & Field Supervision



Supplies & Equipment

Typical Costs

- Supervision (Project Manager and Superintendents not associated with a labor crew)
- Project Engineer
- Administrative Staff
- Field Office Trailer
- Field Office Equipment
- Field Office Utilities
- Field Office Supplies

FOOH costs are typically Time-related and compensable

Non-Time related FOOH costs would include one-time costs such as Mobilization/Demobilization, certain Insurance/Bond costs

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How to Quantify Delay Damages FOOH – Daily Rate



- Daily rate should capture the time-related costs incurred as a result of the compensable delay
- What time period?
 - Should correspond with the time of compensable delay
 - For example, If delay occurred at the beginning of the project, the daily rate should be restricted to this period, and not include costs from the rest of the project.
 - If delay occurred throughout the project, using time-related costs for the entire project may be appropriate.

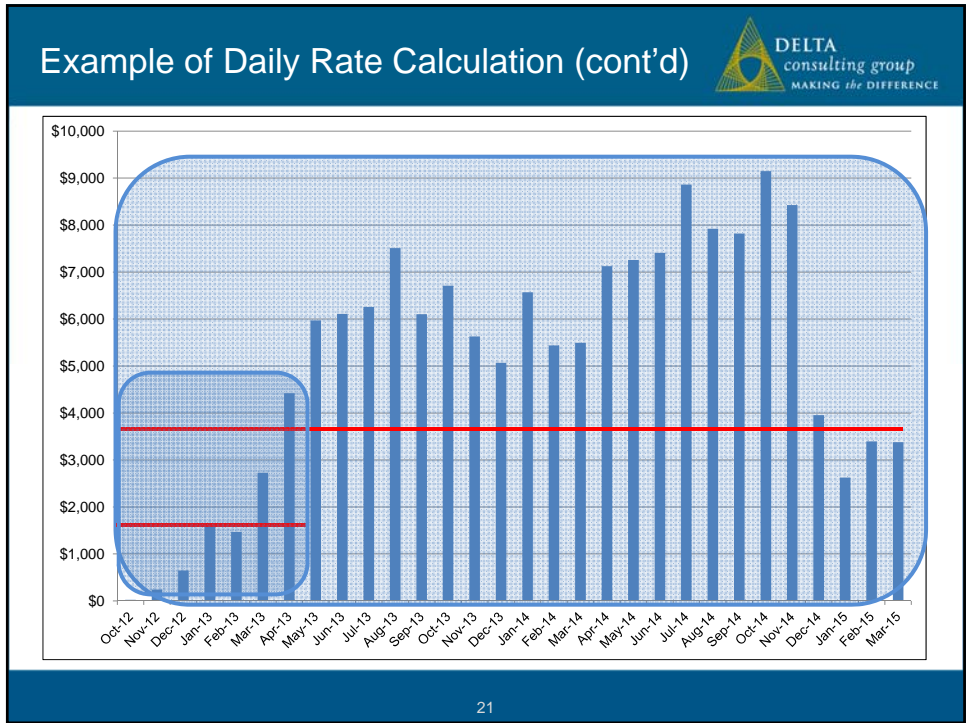
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How to Quantify Delay Damages FOOH – Daily Rate



- Daily rate should not be calculated daily, due to potential variations due to timing.
 - Generally capture costs for each month and divide by the number of days to arrive at a daily rate.
- Markups, bond, insurance are usually not included, but refer to contract terms.
- In general, capture the total time-related costs during the delay period, and divide it by the number of days in the period, to calculate a daily rate.

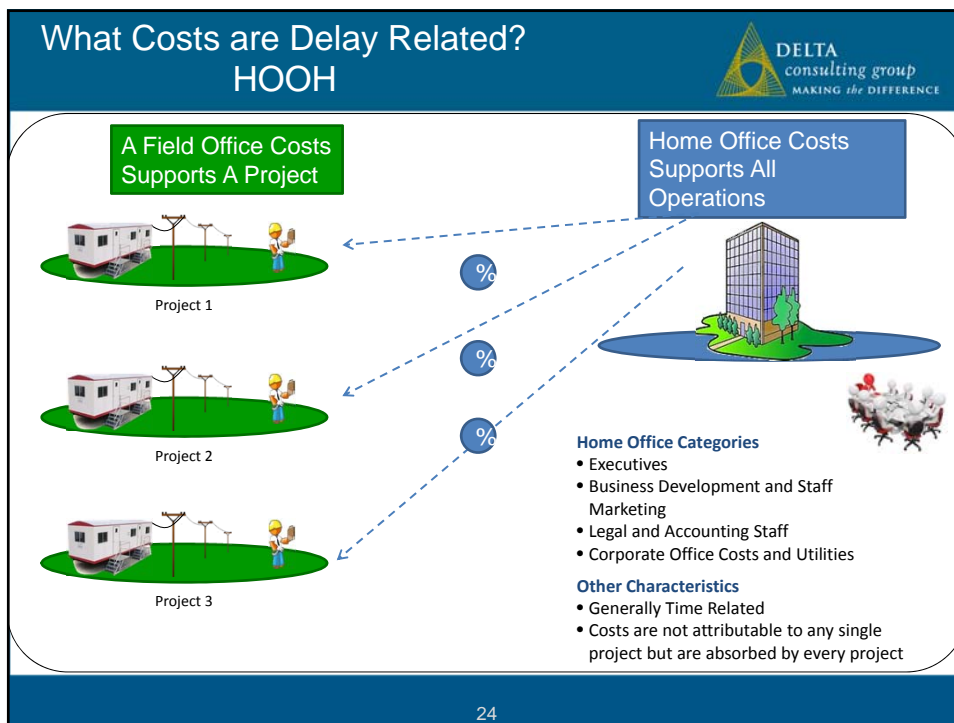
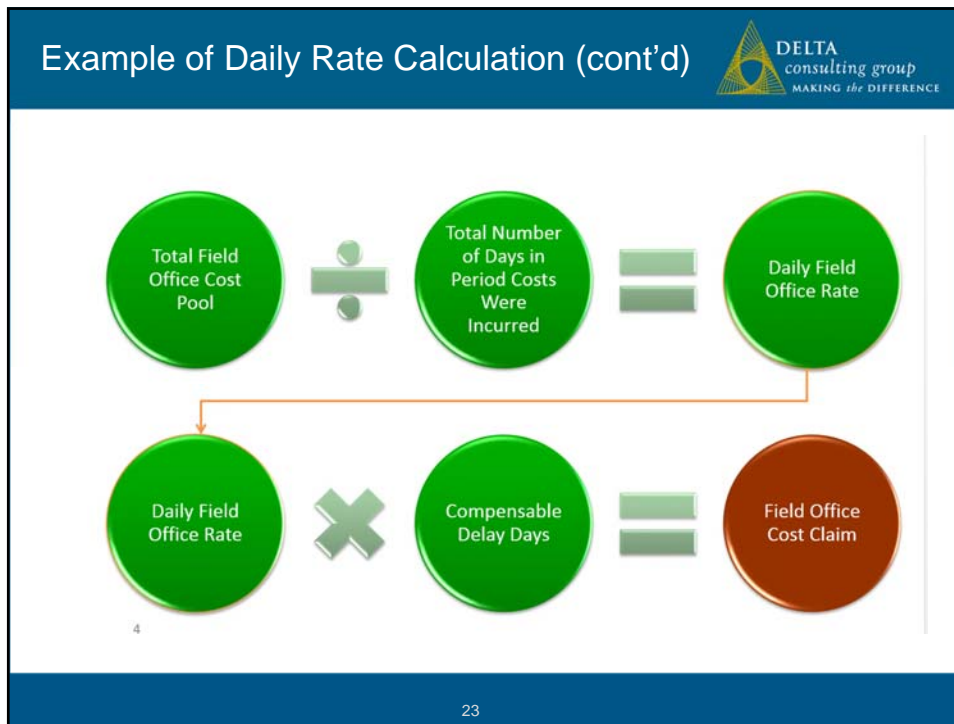
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Example of Daily Rate Calculation (cont'd)

Month	a Time Related Costs	b=5.774% x a Bond, Liab. Ins. Gen Excise Tax 5.774%	c Days per Month	d=(a+b)/c Time Related Daily Rate	e Daily Crane Labor, Mat. & Equip
Oct-12	\$652	\$38	31	\$22	
Nov-12	6,902	399	30	243	
Dec-12	18,994	1,097	31	648	
Jan-13	48,335	2,791	31	1,649	
Feb-13	38,873	2,245	28	1,468	
Mar-13	79,903	4,614	31	2,726	\$1,395
Apr-13	125,362	7,238	30	4,420	1,395
May-13	174,984	10,104	31	5,971	1,395
Jun-13	173,255	10,004	30	6,109	1,395
Jul-13	183,333	10,586	31	6,255	1,395
Aug-13	220,120	12,710	31	7,511	1,395
Sep-13	173,082	9,994	30	6,103	1,395
Oct-13	196,627	11,353	31	6,709	1,395
Nov-13	159,675	9,220	30	5,630	1,395
Dec-13	148,548	8,577	31	5,069	1,395
Jan-14	192,531	11,117	31	6,569	1,395
Feb-14	143,968	8,313	28	5,439	1,395
Mar-14	161,003	9,296	31	5,494	1,395
Apr-14	202,037	11,666	30	7,123	1,395
May-14	212,719	12,282	31	7,258	1,395
Jun-14	210,061	12,129	30	7,406	
Jul-14	259,714	14,996	31	8,862	
Aug-14	232,135	13,403	31	7,921	
Sep-14	221,750	12,804	30	7,818	
Oct-14	268,124	15,481	31	9,149	
Nov-14	238,948	13,797	30	8,425	
Dec-14	115,839	6,689	31	3,953	
Jan-15	76,936	4,442	31	2,625	
Feb-15	89,907	5,191	28	3,396	
Mar-15	98,998	5,716	31	3,378	

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What Costs are Delay Related? HOOH




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- Common Methods for Calculating
 - Eichleay Formula
 - Percentage Mark Up on Costs
 - Specific Allocation
 - Carteret or Allegheny Methods
 - Manshul Method

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Eichleay Formula



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Contract Billings / Total Billings for Actual Contract Period

×

Total Contractor's Home Office Overhead Costs for Actual Contract Period

=

Home Office Overhead Allocated to Project

Home Office Overhead Allocated to Project

÷

Actual Contract Period

=

Daily Home Office Overhead for Project

Daily Home Office Overhead for Project

×

Days of Delay

=

Home Office Overhead Damages for Project

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What Costs are Delay Related? HOOH



- Major Categories of Costs Excluded from the Pool
 - Bad Debts
 - Contributions or Donations
 - Entertainment Costs
 - Interest on Borrowing
 - Losses on Contracts
 - Certain Public Relations and Advertising Costs

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Disruption Damages

Generally referred to as:

Loss of Productivity or Loss of Efficiency

Typically Craft Related damages

Potential for Equipment and Material Damages

Productivity Loss



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Productivity Articles



J. Mark Dungan



Tong Zhao, Ph.D., PE, PSP


Delta Authored Productivity Articles



<p><i>Determining the Measured Mile for Lost Productivity Claims</i> AACE 2015 Tong Zhao and Mark Dungan</p> <p><i>Calculating Lost Labor Productivity: Is There A Better Way?</i> ABA, Construction Lawyer, 2015 Daniel Toomey, Joshua Marks, Tong Zhao, Mark Dungan</p> <p><i>Lost Productivity – Finding the Missing Puzzle Pieces and Contract Bars</i> AACE 2014 Tong Zhao and Mark Dungan</p>	<p><i>Avoiding the Pitfalls in Implementing the Measured Mile Method</i> AACE 2014 Tong Zhao and Mark Dungan</p> <p><i>Proving Lost Productivity in International Construction Claims</i> FL Bar 2014 Tong Zhao and Mark Dungan</p> <p><i>Improved Baseline Method to Calculate Lost Construction Productivity</i> ASCE 2014 Tong Zhao and Mark Dungan (peer-reviewed article)</p> <p><i>Proving Engineering Productivity Loss</i> AACE 2012 Tong Zhao and Mark Dungan</p>
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Proving Damages




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Disruption

- Entitlement
 - Contract
 - Allowable
 - Notice provisions
 - Analysis
 - Research
 - Presentation of findings

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Proving Damages




Disruption

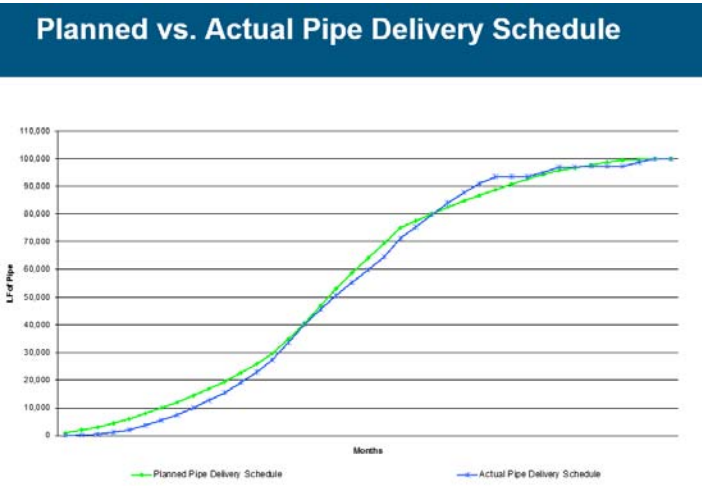
- Quantification
 - Contract
 - Methodology
 - Measured-Mile
 - Industry studies

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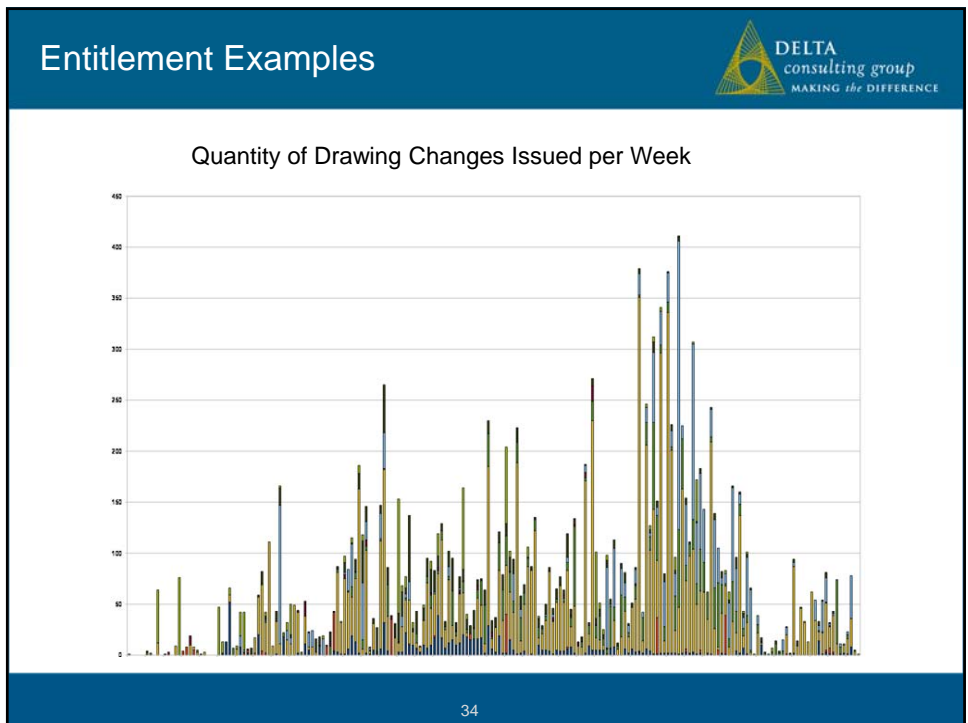
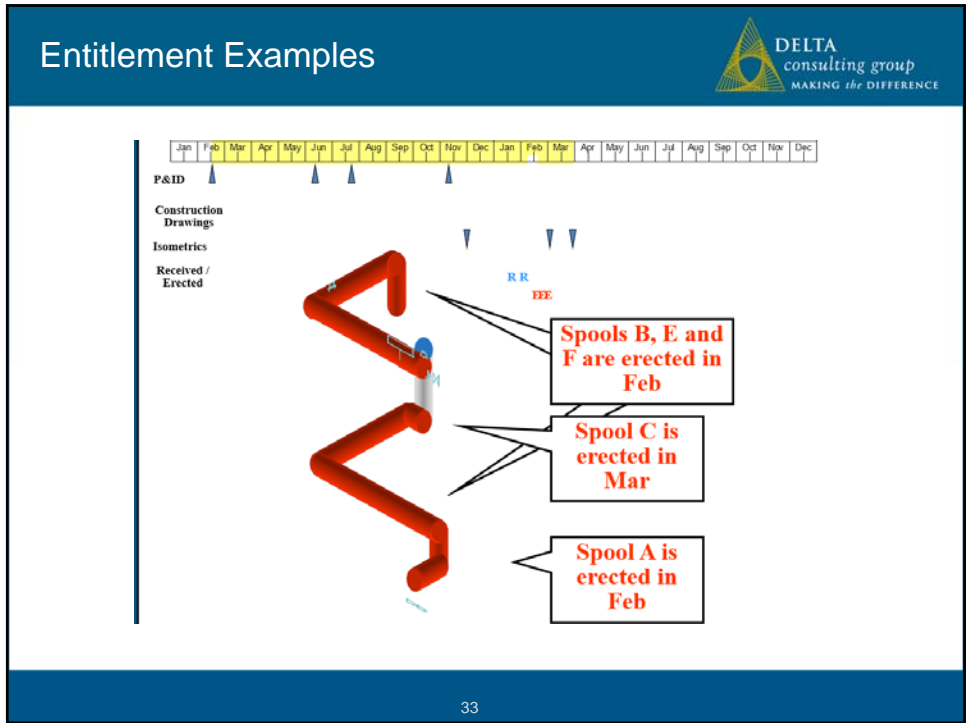
Entitlement Examples

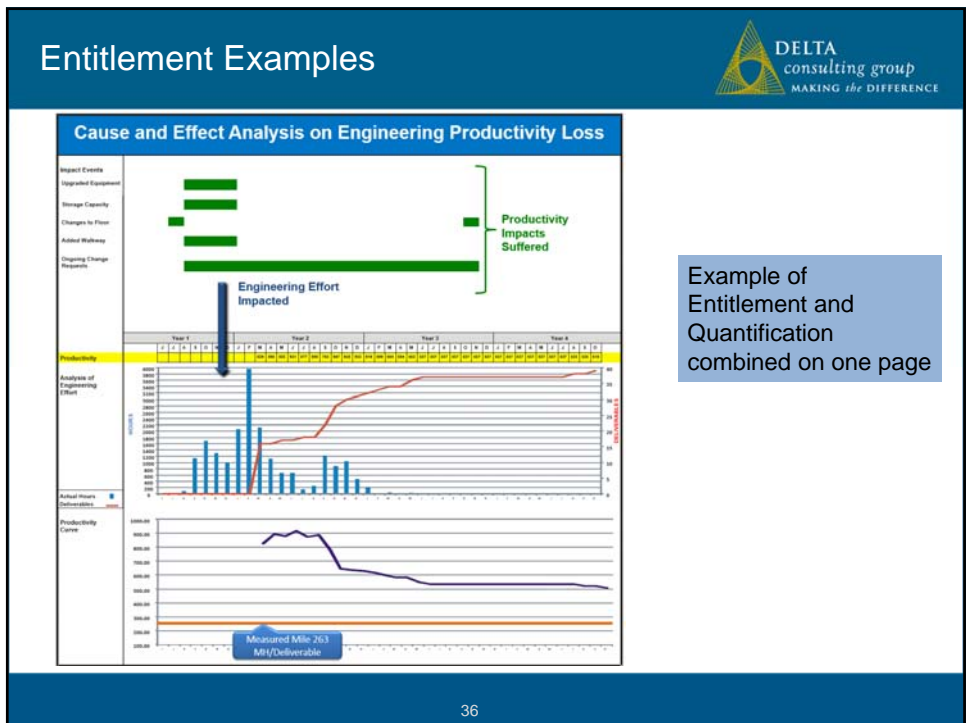
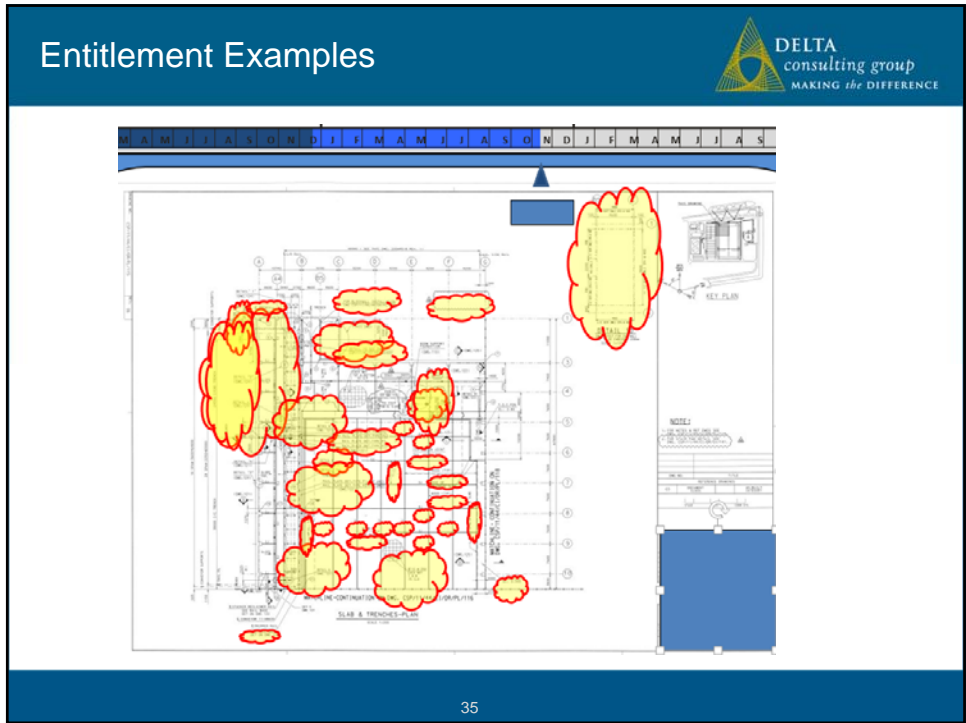


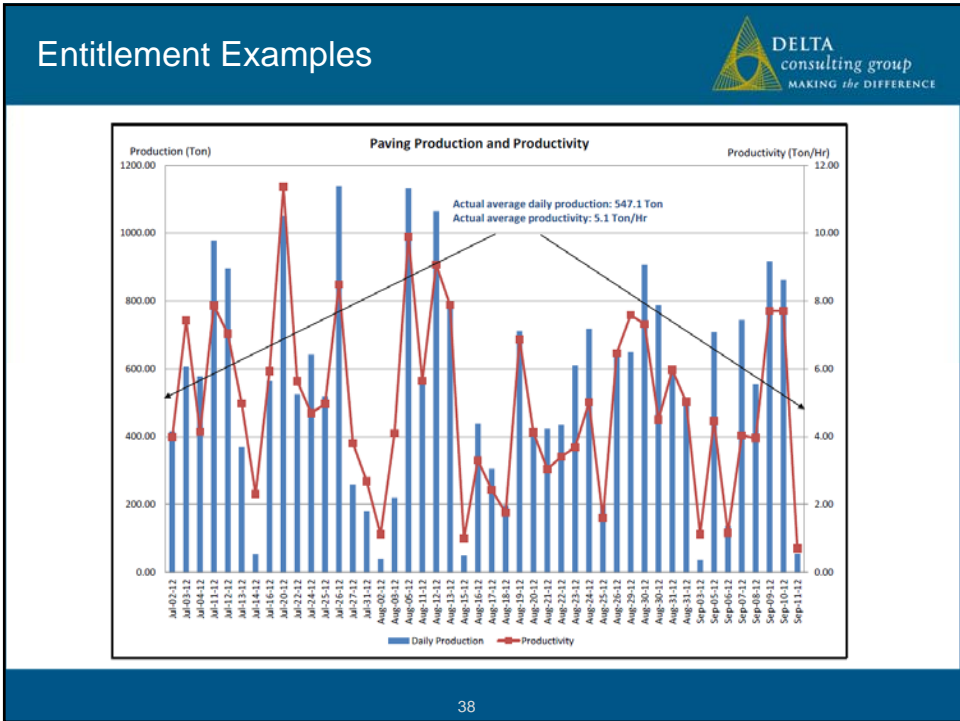
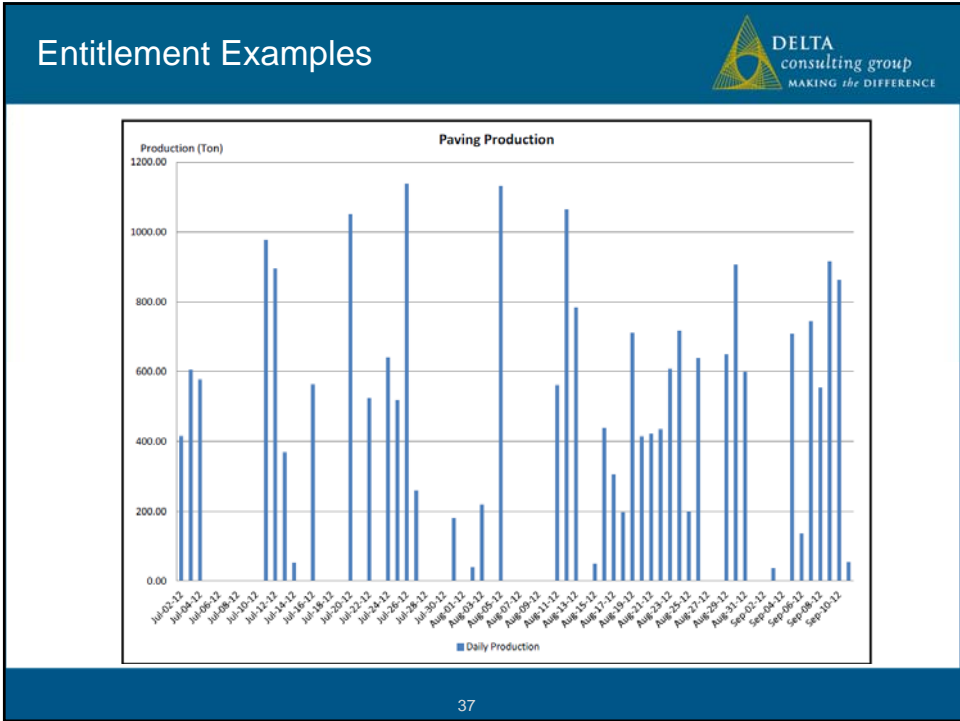
Planned vs. Actual Pipe Delivery Schedule

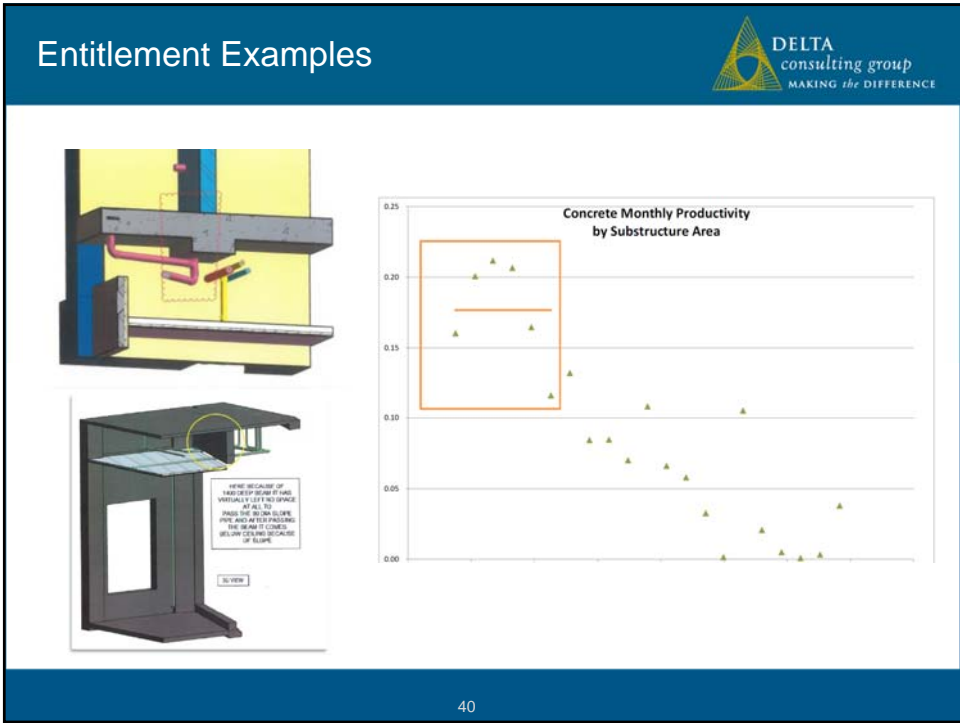
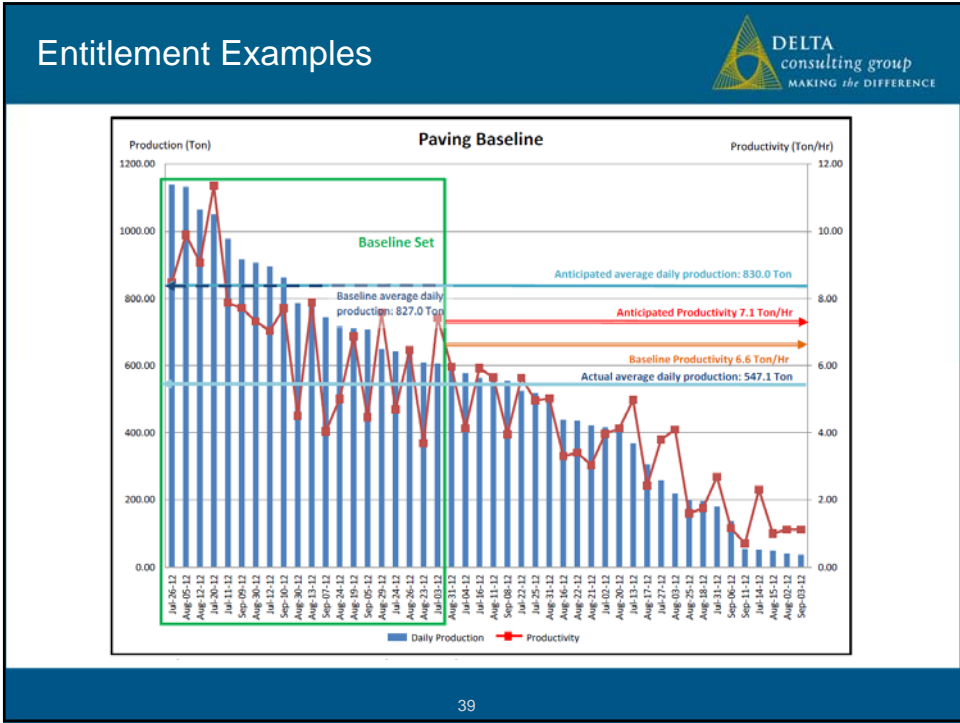


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Productivity Data

$$\frac{\text{Output}}{\text{Input}} \quad \text{OR} \quad \frac{\text{Input}}{\text{Output}}$$

$$\frac{\text{Quantity}}{\text{Hours}}$$

Traditional
Productivity

$$\frac{\text{Earnings}}{\text{Hours}}$$

Earned Value
Productivity

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Methodologies

- **Project Specific Studies**
 - Measured Mile Study
 - Earned Value Analysis
 - Work Sampling Method
 - Craftsmen Questionnaire Sampling Method
- **Project Comparison Studies**
 - Comparable Work Study
 - Comparable Project Study
- **Specialty Industry Studies**
 - Acceleration
 - Changes, Cumulative Impact and Rework
 - Learning Curve
 - Overtime and Shift Work
 - Project Characteristics
 - Project Management
 - Weather
- **General Industry Studies**
 - U.S. Army Corps of Engineers Modification Impact Evaluation Guide
 - Mechanical Contractor's Association of America
 - National Electrical Contractor's Association
 - Estimating Guides
- **Cost Basis**
 - Total Unit Cost Method
 - Modified Total Labor Cost Method
 - Total Labor Cost Method
- **Productivity Impact on Schedule**
 - Schedule Impact Analysis

AACE International Recommended Practice No. 25R-03

**ESTIMATING LOST LABOR PRODUCTIVITY
IN CONSTRUCTION CLAIMS**

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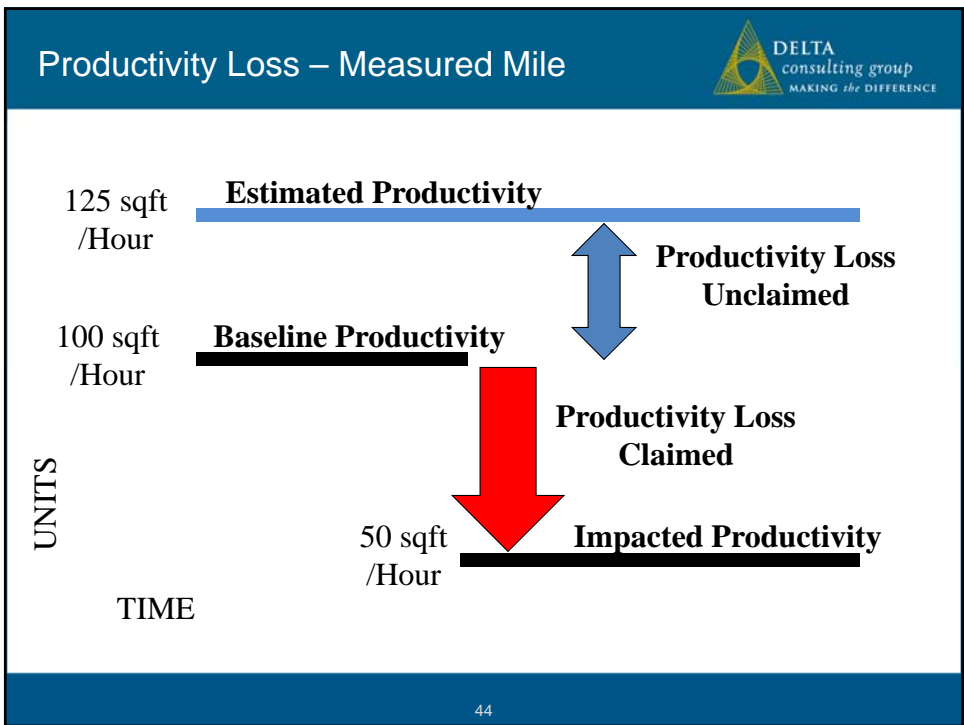
Productivity Loss – Measured Mile 

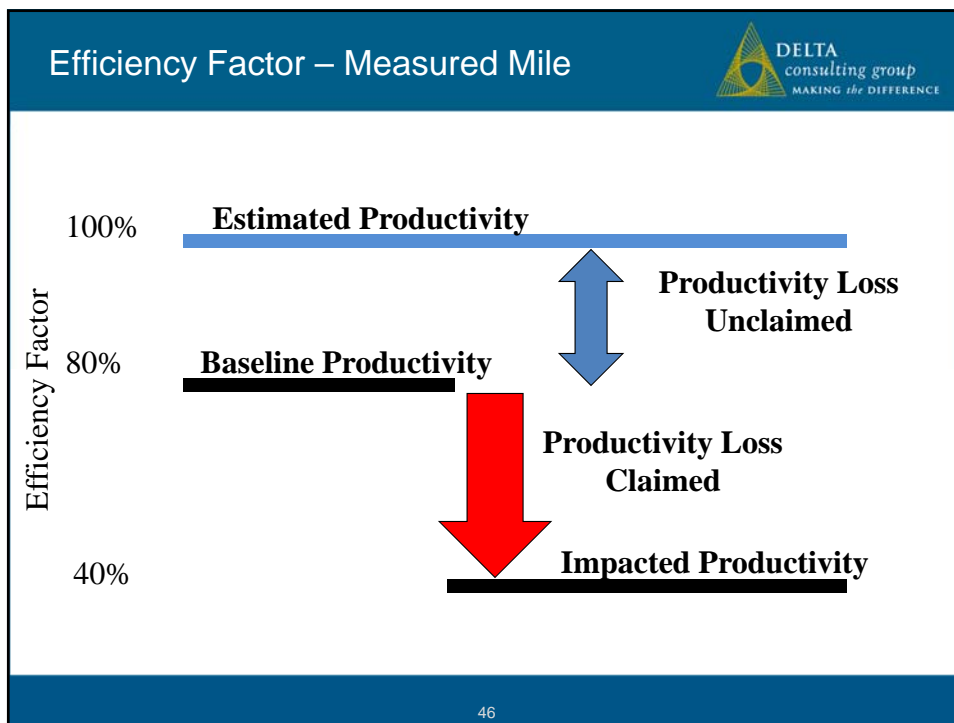
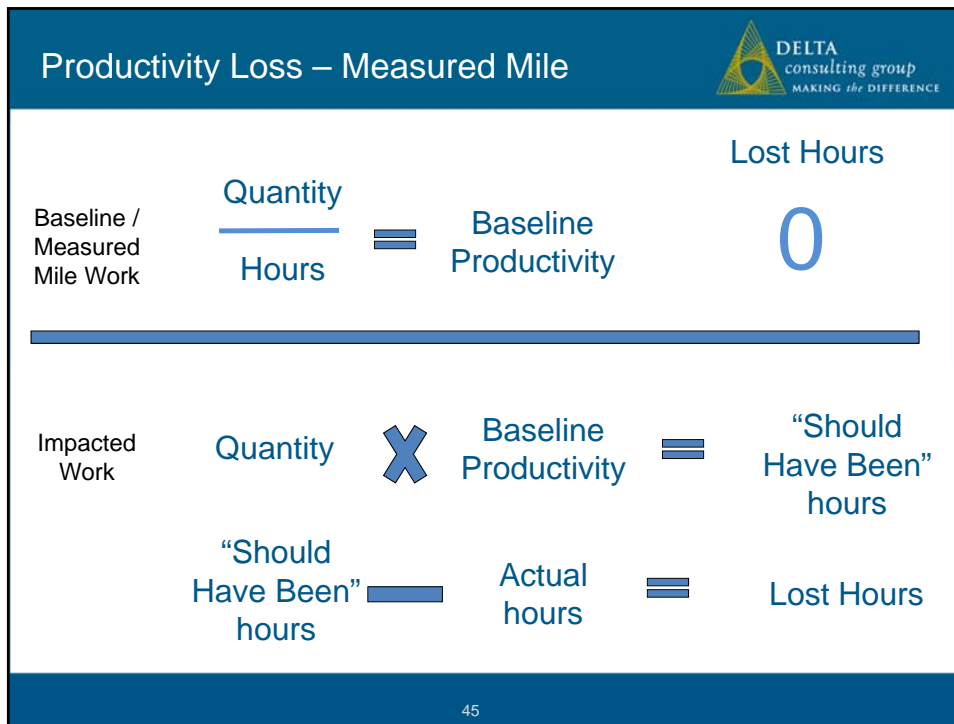
The Measured Mile methodology compares the actual productivity achieved on similar activities to determine a loss of productivity.


The Baseline productivity represents the best the contractor could achieve when operating under conditions it controlled or largely controlled.

The Impacted productivity is that achieved when operating under conditions largely out of its control

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Efficiency Factor – Measured Mile

Productivity Analysis on Concrete
Earned Value Analysis Based on Estimate

Location	Planned Qty	Planned Hrs	Planned Productivity	Actual Qty	Actual Hrs	Actual Productivity	Efficiency Factor	Baseline Productivity	Baseline Hrs	Lost Hrs
Substructure					388,941 296,448 306,879 659					
	83,556	81,090	1.030	80,856	992,927		0.081	12.654	4.633	363,550
Superstructure										
	6,493	33,030	0.197	8,378	197,454		0.042	4.633	4.633	197,454
	9,872	9,540	1.035	8,100	247,318		0.033	4.633	31,595	36,266
	8,152	8,440	0.966	8,429	137,711		0.061	15.780	4.633	40,431
	12,842	12,690	1.012	12,083	222,635		0.054	18.647	4.633	55,316
Total		144,790			1,798,045					693,017
										1,105,028
										Percentage of Loss 61%
										Other hours 301,400
										Loss in Other Hours 185,232
										Total Lost Formwork Hours 1,200,260

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