Construction Time-lapse Photography
Educating and Training
For Designers, Contractors, and Inspectors

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Purdue Road School: March 08, 2016
Introduction and Motivation

Virtual Inspection

EDUCATION & TRAINING

- Emphasis on Education

Education in the Classroom

- Visualization
- Big-Picture Understanding

Training in the Field

- Proper Construction Techniques
- Standards and Specifications Compliance
Methodology

We’ve Been All Over the Map

• Construction Sites Monitored
  – Carmel, IN: US 31 Project
  – Lafayette, IN: Co. Rd. 800S Bridge
  – West Lafayette: Purdue University Airport
  – I-65 NB: Tree Removal and Deck Epoxy
  – Cedar Grove, IN: Bridge Demolition
  – Indianapolis, IN: South Split
  – Indianapolis, IN: I-70 Bridge

• 8,747 Miles Driven Since May 2015
• 5.3 Million Pictures Collected To Date
• 3.89 Terabytes of Data Storage
Methodology

How Time-Lapse Photography Works

• Images taken at specified interval
  – We use 1 picture/minute

• Camera Output: Images
  – 10,000 images/week

• Video Production
  – Standard Video: 30 frames/second
  – Alter video speed as necessary

How can we use Time-Lapse Photography?

<table>
<thead>
<tr>
<th>Individual Pictures</th>
<th>Detailed Video</th>
<th>Video Overview</th>
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Methodology

How can we use time-lapse photography?

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- Individual Pictures
- Detailed Video
- Video Overview
Methodology

Detailed Video
Methodology

How can we use time-lapse photography?

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Video Overview
Virtual Inspection
- Project Conception
- Emphasis on Education

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In the Classroom

Improve Visualization Skills – From Plans to Product
In the Classroom

Improve Visualization Skills – From Plans to Product
Developing Big-Picture Understanding

- Process Involved in Constructing a Roundabout
  - Remove existing facilities
  - Earthwork
  - Soil Stabilization
  - Pavement Placement
  - Drainage Structure Installation
  - Concrete Medians and Truck Apron
  - Stripes and Signage

- Goal: Understand Constructability Implications of Designs
  - We don’t want to design something that can’t be constructed
  - Implies the need to know construction techniques
  - Communication is critical
In the Classroom

Developing Big-Picture Understanding: Remove Existing Facilities

Roundabout Construction
2015-06-25
In the Classroom

Developing Big-Picture Understanding: Earthwork

Roundabout Construction
2015-07-06
In the Classroom

Developing Big-Picture Understanding: Soil Stabilization

Roundabout Construction
2015-07-15
In the Classroom

Developing Big-Picture Understanding: Pavement Placement

Roundabout Construction
2015-07-30
In the Classroom

Developing Big-Picture Understanding: Concrete Placement

Roundabout Construction
2015-08-26
In the Classroom

Developing Big-Picture Understanding: Striping and Signage

Roundabout Construction
2015-09-28
Virtual Inspection
• Project Conception
• Emphasis on Education

Education in the Classroom
• Visualization
• Big-Picture Understanding

Training in the Field
• Proper Construction Techniques
• Standards and Specifications Compliance
In the Field

Who Benefits, and How?

- Contractors and Inspectors
- Enforce Good Practice
- INDOT Standards and Specifications

Case Study: MSE Wall Construction

MSE Wall Construction Guidelines for Inspectors and Contractors

INDIANA

DEPARTMENT OF TRANSPORTATION

STANDARD SPECIFICATIONS

2016
Earthwork
Mechanically Stabilized Earth Walls

Backfill Should NOT be Pushed Against the Wall

WARNING: This will compromise the integrity of the wall.
Panels could be pushed out of alignment, straps could break, and the structure will not last the minimum 75 year design life.
Earthwork
Mechanically Stabilized Earth Walls

3’ Minimum

Push Backfill Parallel with Wall – Keep a minimum of 3’ From Wall
Roller is too close to the wall. During compaction, roller must not get any closer than 3 feet to the wall. Damage to straps or wall is possible.
5 Passes of Plate Compactor within 3 Feet of Wall
This is proper compaction within 3 feet of the wall. A minimum of 5 passes should be made to make 95% compaction.
Conclusion

How to Effectively Use Time-Lapse Images

- Education in the Classroom
- Training in the Field

Who Will Benefit?

- Engineers
- Designers
- State DOT & Inspectors
- Contractors

General Public