Virtual Assembly Technology: 
Laser Steel Bridge Fabrication System

AASHTO Subcommittee on Bridges and Structures 
General Session 
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Overview

• **What benefits does the system provide?**
  - Fabricate bridges at a lower cost
  - Provide a better quality end-product with full certifiable, traceable record

• **How does the system work?**

• **Implementation example**
Virtual Assembly System
Virtual Assembly

*Eliminate lay downs*

*Fabricate bridges with lower costs*
Lay Down Process
Virtual Assembly: Girder Pair

Virtual Assembly of Girder Pair

Combined camber diagram

Custom splice plate
Virtual Assembly: Entire Line

Camber, Line 1 (Top of Web)

Measured

Shop
QA\QC Documentation
Digital certifiable, traceable record
Make improved measurements
Provide data that has not been available
Conventional Measurements
Documentation

Conventional Paper Record

Digital Record
Certifiable
Traceable
Permanent
Camber Measurement

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![Graph showing camber measurement over girder length](image-url)
Identify Fabrication Issues

CAD model (shop drawing)

Measurements different than CAD are identified

Measured stiffener

Stiffener location matches CAD
Conventional Web Measurements
System Overview
System Process Overview

- Shop Drawing
- 3D CAD Model
- Measurement Planning
- Data Collection
- Processed Data
- Documentation
  - Virtual Assembly
  - Splice Plate DXF
Laser System Characteristics

Very Accurate Measurements
0.0040 - 0.0197 in

Very Large Volume
≤ 328 ft diameter

Direct Surface Measurements
No Targets
Operation in Shop
Implementation Example
Shop Integration

Hirschfeld Industries
Abingdon, VA
Test Area
Tennessee Bridge

6 Girders per Line

Line 1 and 2
Large Complex Structure

830 ft
Fabrication Process

After Stiffener Fit: Girder Fully Fabricated

Full-Sized Holes
Measure Girder Pair

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Virtual Assembly Software
Lay Down Verification

TF

Web

BF

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Lay Down Verification

Camber inspection with State DOT

Ruler measure to stringline

Stringline
Specifications / Codes

- Encourage implementation
- Take advantage of additional information provided by the virtual assembly system
Pooled-Fund Study: TPF-5(226)

• Project Goals
  – Develop a system for fabrication measurements
  – Develop virtual fit-up tools for complex structures
  – Pilot-program implementation
  – Demonstrate on a real bridge job

• Participants
  – Virginia (lead), New York, Iowa, Texas, FHWA

• Fabrication Partner
  – Hirschfeld Industries

• Additional Project Team
  – Steve Chase (University of Virginia)
  – Bill Wright (Wright Structural LLC)