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## Steel Bridge Fabrication

**Course Number:** ST-02-202

**PDH:** 3

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## Module 1: Introduction

### Learning Objectives

By the end of this section, you will be able to:

- **Identify** the foundational industry standards that govern the fabrication of steel bridge structures.
- **Evaluate** the necessity of fabrication knowledge during both the design phase and the long-term asset management of a bridge.
- **Analyze** how variability in fabricator methodologies influences engineer-to-fabricator communication.

*Executive Summary:* This section establishes that while bridge fabrication methods are highly variable across different firms, successful project delivery requires a unified understanding of AASHTO/NSBA standards to facilitate clear communication throughout the structure's entire life cycle.

### Design and Life Cycle Fundamentals

The primary objective of this course is to detail the technical concepts essential for **fabricating steel bridge structures**. This content acts as a critical reference for the Licensed Professional Engineer during two specific stages:

- **Initial Design:** Providing essential resource material while the engineer is preparing the structural design.
- **Asset Management:** Serving as a technical reference point throughout the **entire life cycle of the bridge**.

### Industry Standards and Collaboration

Professional Engineers utilizing this guide are expected to maintain familiarity with established industry benchmarks. These governing documents include:

- **AASHTO/NSBA S2.1:** Steel Bridge Fabrication Guide Specification.
- **AASHTO/NSBA G12.1:** Guidelines for Constructability.

### Operational Variability

It is vital to recognize that the methods used in bridge fabrication are not rigid; they are as **variable as the structures themselves**. Practitioners should apply the following insights to their design and oversight roles:

- **General Application:** The procedures and terms provided in this manual are general in nature and do not represent the specific proprietary processes of any single firm.



- **Unique Methodologies:** Each fabricator maintains their own distinct approach to solving technical problems associated with individual structures.
- **Communication Optimization:** The core purpose of mastering these concepts is to improve **fabricator/engineer communication**.

💡 **Design Tip:** Because each fabricator has its own way of solving problems, early coordination with potential fabricators can help optimize your design for their specific shop capabilities and equipment.

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### *Checkpoint Quiz*

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**1. According to the text, for whom is this fabrication resource intended to serve as a reference throughout the life cycle of the bridge?**

- a) Only the fabricator's shop foreman.
- b) The engineer preparing the design and managing the asset.
- c) Only the owner's inspection representative.
- d) The shipping and hauling contractor.

**Answer:** (b). Source text states it is intended for the engineer during design and as a reference throughout the life cycle.

**2. Why are the terms and procedures in this text considered "general"?**

- a) Because they have not yet been approved by AASHTO.
- b) They are only applicable to simple, non-redundant bridges.
- c) They do not reflect any single firm's specific process, acknowledging that each fabricator solves problems differently.
- d) To allow engineers to bypass the Steel Bridge Fabrication Guide Specification.

**Answer:** (c). The text explicitly notes that procedures are general because each fabricator has their own ways of solving problems



## Module 2: Governing Specifications

### Learning Objectives

By the end of this section, you will be able to:

- **Identify** the primary governing bodies and documents that regulate steel bridge fabrication and material quality.
- **Distinguish** between the roles of AASHTO, ASTM, AWS, and SSPC in the bridge construction lifecycle.
- **Evaluate** the hierarchy of project documents, specifically how owner specifications interact with national standards.

*Executive Summary:* Steel bridge fabrication is regulated by a hierarchy of certifications and specifications. While national standards from AASHTO, ASTM, and AWS provide the technical baseline for design, materials, and welding, individual Owner Specifications maintain the authority to augment or supersede these documents.

### Fabricator Certification

The **American Institute of Steel Construction (AISC)** serves as the governing body responsible for certifying fabricators. Certification is categorized into multiple levels based on project complexity:

- **Simple Bridges:** Entry-level certification for basic structures.
- **Complex Bridges:** Advanced certification required for intricate designs.
- **Specialized Endorsements:** Includes **fracture critical** endorsements and sophisticated **paint endorsements**.

### Primary Design and Construction Standards

**AASHTO** (American Association of Highway Transportation Officials) adopts the controlling specifications for the design, construction, and tolerances of steel bridges. Key documents include:

- **AASHTO Standard Specifications for Highway Bridges.**
- **AASHTO LRFD Bridge Design Specifications.**
- **AASHTO LRFD Construction Specifications.**

### Material and Process Control

Specific aspects of fabrication are governed by specialized organizations to ensure material acceptability and structural integrity:



- **ASTM (American Society of Testing and Materials):** Provides guidelines for the **acceptability of purchased material**, covering chemical compositions, dimensional tolerances, and tensile/yield strengths.
- **AASHTO/AWS D1.5:** This document is the primary control for **welding, testing, and quality assurance** of the superstructure. It also details tolerances for fabricated members and the **Fracture Control Plan** for non-redundant members.
- **SSPC (Society for Protective Coatings):** Produces the standards applicable to **surface preparation** and the coating of steel superstructures.

### Specification Hierarchy

Engineers must remain cognizant of the document hierarchy during design and oversight:

- **Owner Specifications:** These documents are critical as they **augment and/or supersede** national standards.
- **AASHTO/NSBA Steel Bridge Collaboration Documents:** These offer supplemental information regarding state-of-the-art principles and best practices.

⚠ **Safety Constraint:** The **AASHTO/AWS D1.5** Fracture Control Plan must be strictly followed for all non-redundant members to ensure structural safety and compliance.

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### *Checkpoint Quiz*

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1. **Which organization is responsible for issuing fracture critical and sophisticated paint endorsements to fabricators?**
  - a) ASTM
  - b) AASHTO
  - c) AISC
  - d) SSPC

**Answer:** (c). AISC is the governing body that certifies fabricators and provides these specific endorsements.

2. **If an Owner Specification conflicts with an AASHTO Construction Specification, which document generally takes precedence?**
  - a) The AASHTO document, as it is a national standard.
  - b) The Owner Specification.
  - c) Neither; the fabricator chooses the most economical option.
  - d) The AASHTO/NSBA Collaboration documents.



**Answer:** (b). Owner Specifications are explicitly noted to augment or supersede the other referenced documents.

**3. Which document governs the specific chemical composition and yield strength requirements for the raw steel purchased for a project?**

- a) AASHTO/AWS D1.5
- b) SSPC Systems and Specifications
- c) ASTM guidelines
- d) AASHTO LRFD Bridge Design Specifications

**Answer:** (c). ASTM provide guidelines for material acceptability, including chemical composition and strengths.



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