Fabrication & Erection Post-Northridge

Robert Hazleton – Vice President, The Herrick Corporation

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This presentation will cover…

- Post-Northridge publications
- Raw Materials
- Welding
  - Consumables
  - Parameters
  - Procedure and Welder Qualifications
- Steel Construction Details
- The Birth of Proprietary Stuff
- Testing and Inspection
- Misunderstood and misapplied

SAC/FEMA Publications

- SAC 95-01, Advisory No. 3, February 1995
- FEMA 267, 267A & 267B, Interim Guidelines, August 1995, March 1997 and May 1999
- FEMA 288, Background Reports, March 1997
- **FEMA 350, Recommended Seismic Design Criteria for New Steel Moment-Frame Building, July 2000**
- **FEMA 353, Recommended Specifications and Quality Assurance Guidelines for Steel Moment-Frame Construction for Seismic Applications, July 2000**

AWS Publications

- AWS D1.1-96
- AWS D1.1-98
- AWS D1.1-2000
- AWS D1.1-2002
- AWS D1.8-2005

AISC Publications

- AISC 341-Seismic Provisions for Structural Steel Buildings
- AISC 358-Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications
- AISC 360-Specification for Structural Steel Buildings

Raw Materials – ASTM A992

- AISC Technical Bulletin 3 – March 1997
  A572-50 shapes w/special requirements
  - Revise limitations for Copper, Manganese, Phosphorous, Sulfur, and Carbon Equivalents
  - Establish upper yield limit of 65 ksi and a maximum yield to tensile ratio of .85
  - Added optional supplementary requirements
- In the year 2000
  - ASTM A992 Standard Specification published
  - ASTM A992 recognized as prequalified base metal in D1.1

Raw Materials

- Engineers and Fabricators need to identify members that participate in the lateral force resisting system
- Secondary and tertiary testing makes its way into specifications to ensure notch toughness
- Heavy plate and A354BD anchor bolts are a challenge
- Drift limit restrictions result in heavier moment frame beams and columns as a result. Also Grade 65 columns

Welding Consumables

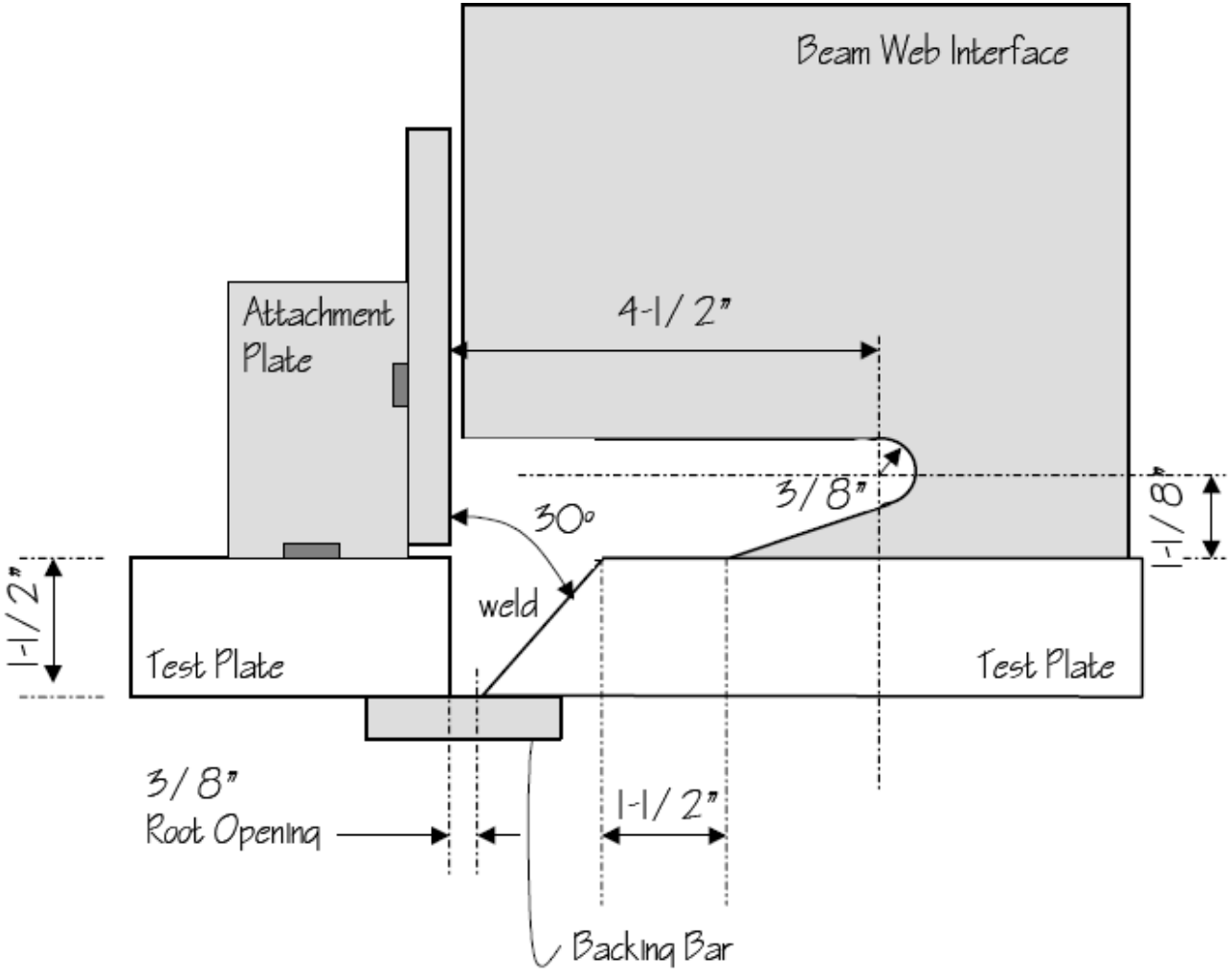
- FEMA 353
  - Ultra low hydrogen and special packaging
  - Exposure limits
  - Lot testing to ensure compliance with prescribed mechanical values
  - Demand/Consequence Tables
- AWS D1.8
  - Same as above except lot testing replaced by certification at point of manufacturer and Demand/Consequence Table transitions to Demand Critical welding

Qualifying procedures & welders

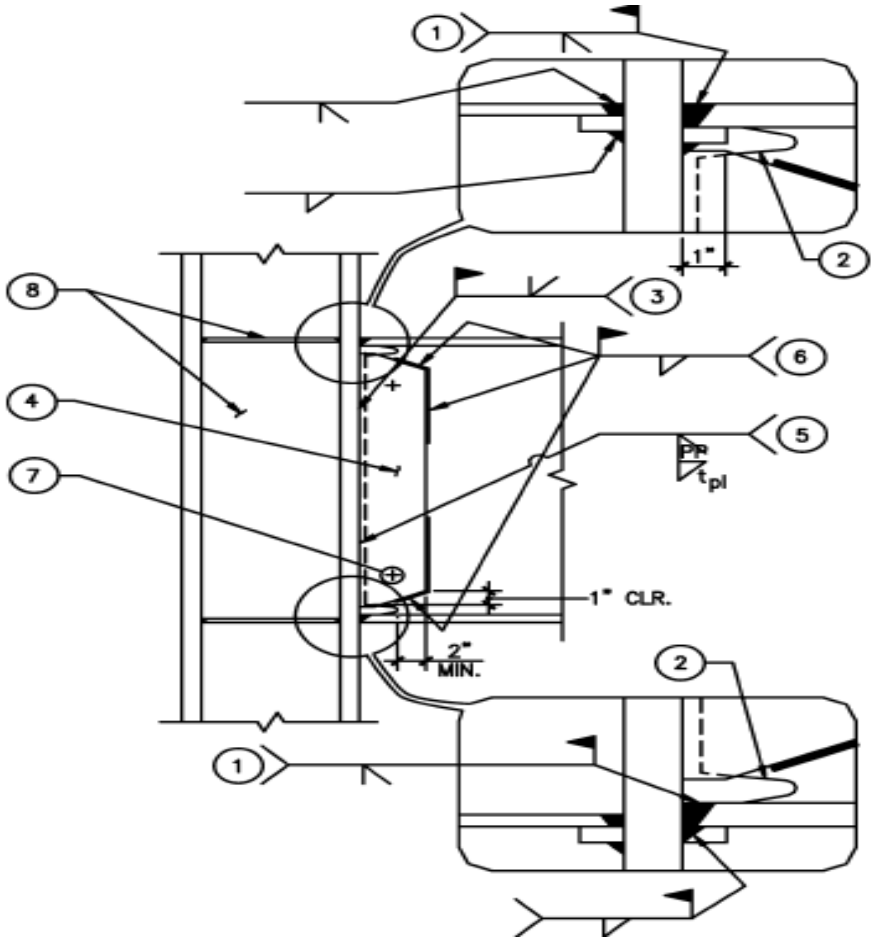
- Procedure Qualifications
  - High and low heat input restrictions
  - Brand names become an essential variable
  - Lowest anticipated service temperature

- Welder Qualifications
  - Restricted access test plates to ensure competence with web interference at bottom flange weld

Restricted Access Test Plate



Post-Northridge RBS Connection



FEMA 353 Checklist

- Removal of backing bars
- Placement of reinforcing fillets
- Removal and finishing of runoff tabs
- Presence and welding of doubler plates
- Configuration and finish of access holes
- Frame beam bottom flange bracing
- Review framing and other trades for attachments in the protected zone

Common Issues

- Applying D1.8 alternate geometry weld access holes to RBS connections and column splices
- Applying moment frame requirements to brace frames
- Applying multiple, at times conflicting, references from FEMA, AWS and AISC

Major Differences

- Fabricators need to understand the “why”; not just the “what”.
- New Systems
  - Proprietary Moment Frames
  - Buckling Restrained Braces
  - Isolation
  - Dampening
- Fractures and Fatigue
  - FEM modeling
  - Stiffer Structures
  - Grinding and Finishing