“Welding of steel penstocks is critical to the success of hydroelectric projects.”
• Welding requirements previously spread throughout 6 chapters
• Committee task was to compile into a single welding Chapter
  • Consolidated by removing redundancies and conflicts
• Welding design still based on ASME Section VIII, Division 1
Variety of Penstock configurations Overview
Welding Procedures and Practices

Utilize both ASME Sect. VIII or AWS D1.1
Welding Procedures comprised of 3 key documents

- Procedure Qualification Record (PQR)
- Welding Procedure Specification (WPS)
- Welder Performance Qualification (WPQ)
Welding Procedure Specification

Provides parameter ranges
Welder Performance Qualification

Documents a welder's ability to deposit sound welds
Longitudinal joints are generally full penetration butt joints (CJP).
Circumferential joints can be a butt weld or fillet weld (designer discretion).

Figure 11-1. Common Field-Welded Joints
Plug Welds have been added to this manual.

Less common joint type but often found beneficial to designers intending to increase joint strength.
Welding Processes

- FCAW (Flux Cored Arc Welding)
- GMAW (Gas Metal Arc Welding)
- SMAW (Shielded Metal Arc Welding)
- SAW (Submerged Arc Welding)
Assembly and Thermal Affects
Bifurcations and Joint Designs
Importance of Inspection

See Chapter 14
Question & Answer