

CWI Services Case Study: 003

Penstock Fabrication Quality Management System

1 Background

Chen Welding Integrity (CWI) Services was the consultant for the development of the penstock fabrication quality management system for the EPC contractor (AG Investment) of the Divune Hydropower Project (DHPP). The quality management system was developed to manage the quality of the entire fabrication and installation process of the 2km steel penstock to convey 90m head pressure.

The quality management system was developed to include the elements of quality control of fabrication processes and traceability control.

2 Approach

2.1 Overview

CWI Services deployed an experienced and certified International Welding Engineer (CertIWE) to develop the penstock fabrication quality management system. The CertIWE of CWI Services involved in the entire cycle of the system development which from planning to implementation. The penstock quality management system is summarised in Figure 1.

2.2 Planning

The quality management system developed by the certified international welding engineer of CWI Services was based on the quality control and traceability management requirements of ISO 3834-2. The welding fabrication quality control best practices e.g inspection and test plan (ITP) was also adopted in the development process.

The CWI Services CertIWE worked with the engineering team to understand the design of the penstock and the fabrication quality requirements e.g welding specification, dimension tolerances, inspection specification, painting specification etc. Furthermore, dialogue with the construction team was also conducted to understand the fabrication process, fabrication facilities, fabrication and project site conditions. The dialogue was conducted to ensure the quality management system and methodology to be implemented are practical and implementable, also the expected results are achievable at both workshop and site environment.

2.3 Development

The quality management system adopted industrial widely used ITP methodology as a primary control document. The ITP's for penstock was derived in accordance with the specific project requirements and industrial best practices. The ITP's for the penstock fabrication outline the quality control activities in fabrication process sequence, reference procedure and acceptance criteria, quality record and responsible personnel.

In order to establish the traceability of every weld joint, a specific weld identity system was developed. The weld identity system provides the information of welding location, type of weld joint, penstock section number and penstock component. The weld identity of each weld joint was used in all the quality control activities from material inspection, non-destructive tests and dimension control.

In term of during fabrication control, a weld matrix system was developed to provide the real time information each weld joint related to material, weld identity, welder, welding procedure and quality control status and results. Weld matrix was also designed to be printed on penstock sections during fabrication so that relevant information can be collected for producing quality records.

The acceptance criteria for each quality control activities were derived from the applicable standards, e.g ASME Section VIII prior to start of fabrication. This is to ensure the same acceptance criteria would be applied to assess the quality control results in both workshop fabrication and site installation stages.

In order to ensure quality of the quality records, record templates for all the quality control activities were derived prior to start of fabrication in accordance with the record requirements of the applicable standards e.g ASME Section V for non-destructive testing. The quality records were developed to include traceability mechanism for different perspective.

For summarising quality control results of each penstock section, weld map system was developed to record the quality control results, material identity, welder identity and reference welding procedure of each weld joint. The weld map report was developed based on the concept of material mill certificate to present the information of quality control and fabrication information of penstock sections.

2.4 Implementation

During the workshop fabrication stage, the CertIWE of CWI services provided in-situ implementation support to the fabrication contractor. During the implementation support, the fabrication contractor was coached to derive weld identity, produce weld matrix, use of quality control acceptance criteria, use of quality record templates for the production of quality records. Support related to manage of quality records was also provided to ensure the quality records comply with the manufacturing data record compilation and traceability requirements.

Furthermore, regular dialogue was conducted to follow up the implementation status and provide practical solutions to resolve issues faced in the implementation process. The CertIWE of CWI Services also reviewed the quality records regularly to ensure the traceability and quality requirements of the quality records and implementation process are complied with philosophy of the penstock fabrication quality management system.

3 Outcomes

The quality management system developed by CWI Services assisted the EPC Contractor to comply with the quality requirements of the project specification and applicable standards during the fabrication and installation process of the 2km steel penstock.

The quality records produced under the requirements of the penstock fabrication quality management system are inter-traceable from different quality records. The welding and quality control information e.g material, weld joint, personnel, quality results and quality record can be easily obtained by following the traceable route embedded in the penstock fabrication quality management system.



Figure 1 Penstock fabrication quality management system

Contact us

Further information related to the quality management support, please visit www.cwi-services.com
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