

# Methodology

An Engineering Peer Review (EPR) otherwise known as an independent design verification, is a focused, in-depth technical review by a Professional Engineer. The purpose of an EPR is to add value and reduce risk through expert knowledge infusion, confirmation of approach, and specific recommendations. An EPR provides a penetrating examination of design, analysis, manufacturing, test and operational details, drawings, processes and data. PSI will review all relevant design documents, including all:

- Design inputs
  - Performance criteria
  - Service conditions
  - Working fluids
  - Boundaries for Pressures, Temperatures, and Flows
- Process Flow Diagram (PFD), and/or Piping and Instrumentation Diagram (P&ID)
  - Diagrams showing all system pressure and control components
  - Illustrates the control ties between components
  - Provides summary of major mechanical items (e.g., vessels, pumps, heaters, chillers, etc.)
- Material Take-Offs (MTO)/Bills of Material (BOM)
  - Identification of components and subassemblies
- Vendor Cutsheets
  - Vendor information for purchased components
- Detail design drawings
  - Materials of Construction (MOC)
  - Sizes and thicknesses
- Calculations
  - Electrical loads
  - Pressure components
- Specifications
  - Performance-based requirements for purchased components (e.g., “vessels shall be suitable for 100 psig operation at 250°F with LPG”)
  - Compliance-based requirements for purchased or fabricated components (e.g., “vessels shall be type 304L stainless steel, 3 inch outside diameter with 0.188 inch wall thickness, fabricated in accordance with ASME Boiler and Pressure Vessel Code Section VIII Division 1”)
- Procedures
  - Quality Assurance (governing QA Plan, if any)
  - Fabrication procedures (welding, examination, testing)
  - Material traceability (control of items before, during, after fab)
  - Configuration control (verification item conforms to design)
- Codes and standards
  - Governing Codes or Standards, if any

- Factory Acceptance Tests (FAT)
  - Test plan
  - Test documentation
  - 3<sup>rd</sup> Party testing or certification (ETL/UL)
- Other relevant design documents used during the design process

The appropriate governing codes are selected based upon the service conditions provided by the equipment manufacturer. Each code is then analyzed for specific requirements. The equipment is then compared to the code requirements as an assembled unit and on an individual component level. Once the equipment has been analyzed in accordance with the governing codes, any deficiencies are reported as either Findings or Observations.

A Finding is defined as anything that could adversely affect safety as related to products, persons or property; or impact the usability of the product. An Observation is defined as a recommendation for process or design improvements, but does not adversely affect safety of the system. Any unresolved Findings described in this report will need to be resolved either through testing (by others) or replacement of affected components (by others) for the equipment to be considered safe for use.

# EPR Contents

Equipment Description

OEM Manual and Warning Labels

Facility Installation Requirements

Code Analysis

Pressure Relief Valve Analysis

Structure Analysis

Process Hazard Analysis

Fabricated Component Analysis

Thermal Analysis

Fabrication and Testing Analysis

Component Compliance Matrix

Process Flow Diagram (or Piping & Instrumentation Diagram)

Findings

Observations

Appendix A – Equipment Photographs

Appendix B – OEM Manual