

# PRESSURE EQUIPMENT REPAIR AND ALTERATION

PROVIDING EXTENSIVE EXPERIENCE  
IN POST-CONSTRUCTION REPAIR  
OF PRESSURIZED EQUIPMENT



www.EquityEng.com

## INDUSTRY EXPERIENCE

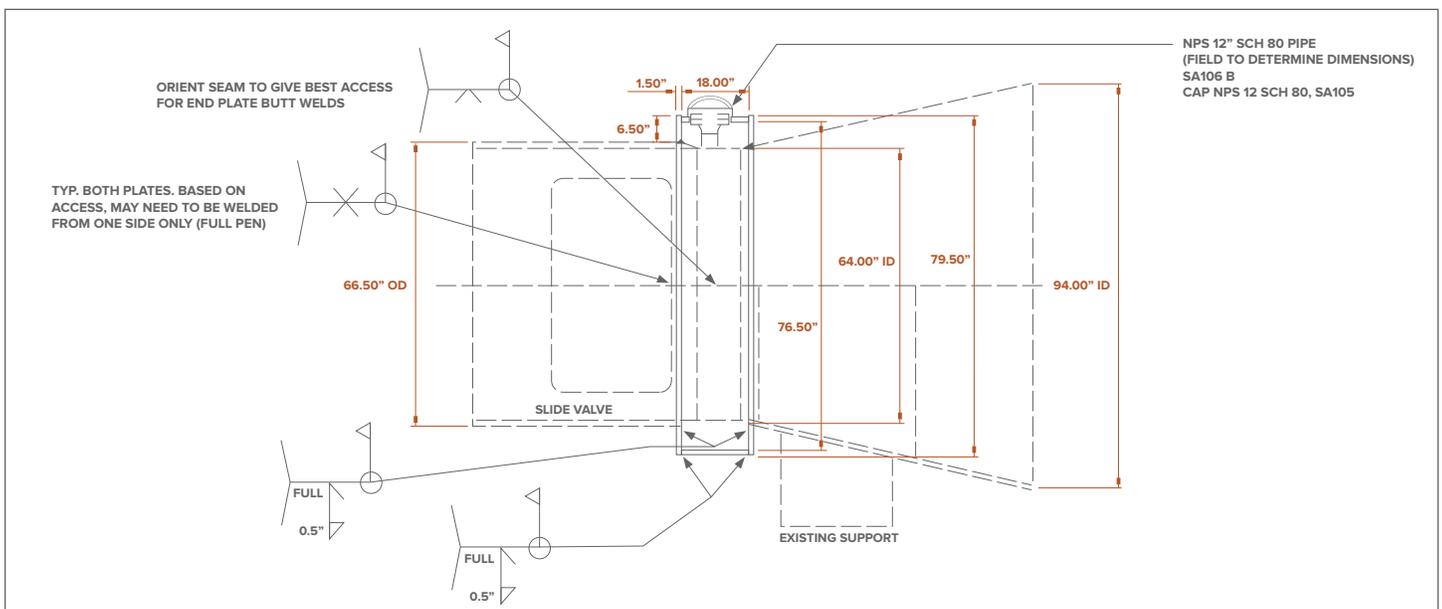
E<sup>2</sup>G|The Equity Engineering Group, Inc. has extensive experience in post-construction repair of pressurized equipment. Our engineers regularly provide consulting on repair scoping and optimization, in addition to detailed design for both temporary and permanent repairs of pressurized

fixed equipment items such as pressure vessels, piping, heat exchangers, furnaces, and storage tanks. We balance detailed engineering with practical experience in order to provide valuable solutions that maximize the overall effectiveness of a repair, considering all aspects of the equipment life-cycle.

## TEMPORARY AND PERMANENT REPAIRS

E<sup>2</sup>G is intimately familiar with all applicable post-construction codes and standards associated with repairs of pressurized equipment. We can provide detailed repair scopes that leverage state-of-the-art technology to supplement the guidance that is offered in codes and standards such as API 579 (*Fitness-For-Service*), NBIC (*National Board Inspection Code*), API

510 (*Pressure Vessel Inspection Code: In-Service Inspection, Rating, Repair, and Alteration*), API 570 (*Piping Inspection Code: Inspection Repair, Alteration, and Rerating of In-service Piping Systems*), API 653 (*Tank Inspection, Repair, Alteration, and Reconstruction*), and ASME PCC-2 (*Repair of Pressure Equipment and Piping*).



### Corporate Headquarters

20600 Chagrin Boulevard, Suite 1200  
Shaker Heights, OH 44122  
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### For More Information:

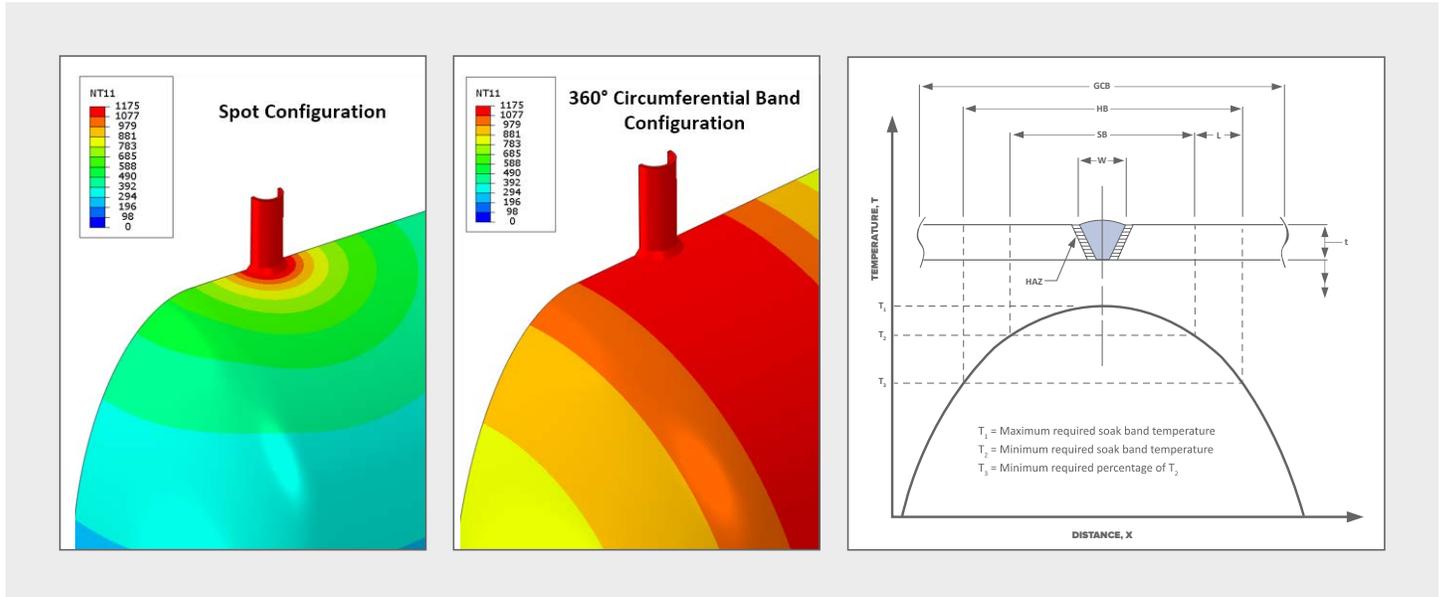
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## PWHT EVALUATIONS AND OPTIMIZATION

It is not uncommon for owner-users to perform local post-weld heat treatment (PWHT) operations following weld repairs to minimize weld residual stress and mitigate various damage mechanisms. Unfortunately, it is also not uncommon for local spot bullseye (or even some local circumferential band) heating to result in distortion or cracking. E<sup>2</sup>G can provide detailed engineering assessments, including advanced FEA

if needed, to optimize PWHT arrangements and thermal gradients that will prevent detrimental distortion, cracking, or excessive residual stress. Additionally, our engineers can perform structural stability evaluations in order to determine whether supplemental support is necessary during the PWHT operation.



## API 510 AND NBIC R-STAMP RERATES

E<sup>2</sup>G actively maintains an ASME R-Stamp and performs numerous API 510 and NBIC certification evaluations for fixed equipment, including modification and certification of ASME Section VIII Division 2 User's Design Specifications (UDS) and Manufacturer's Design Reports (MDR). Rerates may be used to increase design pressure, increase design temperature, decrease MDMT, or increase corrosion allowance of pressurized equipment. If the vessel operates within the established rating, E<sup>2</sup>G can R-Stamp

a vessel if no physical modifications required. As documented in our Quality Control System approved by The National Board of Boiler and Pressure Vessel Inspectors, our certifications include alterations without physical modifications. In the event physical modifications are necessary, E<sup>2</sup>G can provide the design calculations and all applicable documents to the appropriate vendor responsible for the physical modification and application of the R-Stamp nameplate.



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### API 653 TANK HYDROTEST EXEMPTIONS

Per API 653 Paragraph 12.3.2.2, hydrostatic testing of a tank is not required when a repair has been reviewed and approved by an engineer experienced in storage tank design and a Fitness-For-Service (FFS) evaluation is completed. The intent of the FFS evaluation is to determine the critical flaw size(s) at repair locations in order to ensure detectability is feasible with mandatory Non-Destructive Examination (NDE). E<sup>2</sup>G is fully qualified and experienced in performing hydrotest exemption evaluations for storage tanks.

### WELDING SUPPORT AND HOT TAP EVALUATIONS

E<sup>2</sup>G has a staff of engineers and field specialists that can provide support for welding related issues such as the following:

- Welding Procedures and Specifications
- Weld Repair Packages
- Vendor Surveillance
- Training and Supervision
- Field Supervision
- Explicit Weld Residual Stress Simulation

### ADDITIONAL ENGINEERING EVALUATIONS

Additionally, we routinely perform engineering evaluations (including implementation of Battelle Memorial Institute’s Investigation and Prediction of Cooling Rates during Pipeline Maintenance Welding) and optimize weld parameter ranges to minimize the risk for potential burn-through and heat affected zone (HAZ) cracking during in-service welding or hot taps.

