ASME Standards Technology, LLC
Request for Proposals

RFP-ASMEST-07-11
BPVC(#5) – Validate Creep-Buckling Rules

Date Posted: May 11, 2007
Proposal Due Date: June 15, 2007

1. Summary

ASME Standards Technology, LLC is soliciting proposals to perform a comparison and validation of creep-buckling analysis methods.

This project has resulted from ASME Pressure Technology Codes & Standards (PTCS) Standards Committee requests to identify, prioritize, and address technology gaps in current or new PTCS Codes, Standards and Guidelines. This project is one of several included for ASME FY08 funding and intended to establish and maintain the technical relevance of ASME codes & standards products. An overview of the annual ASME PTCS project selection process is included at http://files.asme.org/STLLC/10192.pdf.

2. Scope of Work

a. Scope Description

ASME Section VIII Division 1 and ASME Section II Part D provide design rules and data up to 1500°F. Information on effects of compression loading and buckling is provided in ASME Section II Part D, but is limited to low temperature (non-creep) behavior. The ASME IID compression loading charts need to be usable up to 1500°F.

The creep-buckling calculation in API 579 Section 10 is based on an elastic buckling calculation of a critical creep buckling strain. The critical time is a function of the buckling strain and the Ω_m parameter. With code factors of safety this calculation could be used to define allowable compression stresses based on geometry ratios D/t and D/L.

To validate this approach, comparisons of the following approaches will be made for shell structures under compression loading.

i) API 579 creep-buckling procedure.

ii) Griffin's equations, (see reference), (Table 1).

iii) Full inelastic analysis using the Ω creep law (with primary creep if the data is available). In this case the structure will be assumed to have an initial out-of round of 1%, representing typical manufacturing tolerances. The non-linear Abaqus package will be used which calculates and updates creep strains and rates, and deals with the non-linear geometrical changes leading to buckling and collapse.

These analyses will be performed for:

iv) A long cylindrical shell under external radial pressure loading.

v) A long cylindrical shell under axial loading.

vi) A long cylindrical shell pressure under radial and axial pressure loading.

vii) A spherical shell under pressure loading.

viii) In each case R/t=100 and R/t=20 will be analyzed.

Note that cases i) and iii) are mentioned separately because Griffin's equations do not cover case iii).

Table 1 - Classical Buckling Modified For Plasticity

Case	Buckling Stress
Cylinder – external pressure	$E_t/[4(1-\mu^2)](t/r)^2$
Sphere – external pressure	$½[E_tE_s/\{3(1-\mu^2)\}]^{1/2}t/r$
Cylinder – axial compression	$[E_tE_s/\{3(1-\mu^2)\}]^{1/2}t/r$

The report will give full information on analyses and results. This will consist of calculations of creep strain from Ω data, the implementation of the Ω creep law in an Abaqus user subroutine and the buckling calculations. The results will generally be tabular, and contour and displacement-time plots will be provided where helpful.

Reference D.S. Griffin "Temperature Limits for ASME Boiler and Pressure Vessel Code External pressure Charts", PVRC Report Submitted January 1994.

b. Deliverable

The project deliverable shall be a technical report provided as an electronic file in MS Word format. The report outline shall be approved by ASME ST-LLC. One peer review cycle is anticipated and modifications required to the report, as a result of the review cycle, are the responsibility of the contractor awarded the contract.

c. Schedule

Investigators shall submit a schedule with their proposal describing the major milestones and reporting schedule. ASME ST-LLC desires that the final deliverable be provided no later than June 30, 2008.

d. Reporting:

Progress reports shall be provided at ASME B&PVC code week meetings.

e. Travel Requirements

Current travel is anticipated to present project results to ASME C&S committees during ASME Boiler and Pressure Vessel Code (BPVC) code week meetings. Travel expenses shall be reimbursed, within the project budget, per the project Travel Policy.

f. Budget

The total budget is approximately $17,000.

3. Applicant Eligibility Requirements

ASME ST-LLC is seeking proposals from all qualified organizations including, but not limited to, engineering firms, consultants, academic institutions and Federally Funded Research and

Development Centers. In addition to relevant technical qualifications and experience, applicants must possess an understanding of relevant ASME Codes and Standards.

4. Basis for Selection and Award

Selection of a proposal by ASME ST-LLC will be achieved through a process of evaluating and comparing the relative merits of the applicant's complete responses. This process reflects ASME ST-LLC's desire to accept an application based on its potential in best achieving program objectives, rather than solely on evaluated technical merit or cost. Evaluation criteria includes, but is not limited to, the following:

- Technical capabilities
- Experience
- Price
- Schedule
- Agreement with Terms and Conditions

ASME ST-LLC reserves the right to award, in whole or in part, any, all, or none of the applications submitted in response to this solicitation.

5. Contract Terms and Conditions

A fixed-price contract is preferred, however labor hour and expenses-type proposals will also be considered. Draft terms and conditions are attached. The final contractual terms and conditions will be negotiated between ASME ST-LLC and the selected applicant(s) following award.

ASME ST-LLC shall provide required access to codes and standards and other technical references necessary for performance of the work.

6. Submission Requirements

a. Proposal Due Date: Proposals and amendments of proposals must be received by June 15, 2007. Applicants are encouraged to transmit their proposal well before the deadline.

b. Anticipated Selection and Award Date: It is anticipated that selection and award will be made within 2 weeks of the proposal due date.

c. Application Preparation Costs: This solicitation does not obligate ASME ST-LLC to pay any costs incurred in the preparation and submission of proposals or in making necessary studies or designs for the preparation thereof or to acquire, or contract for any services.

d. Application Clarification: ASME ST-LLC reserves the right to require proposals to be clarified or supplemented to the extent considered necessary. The award may be made after few or no exchanges, discussions or negotiations. Therefore, all applicants are advised to submit their most favorable application to ASME ST-LLC. ASME ST-LLC reserves the right, without qualification, to reject any or all proposals received in response to this solicitation and to select any proposal, in whole or in part, as a basis for negotiation and or award. ASME ST-LLC reserves the right to modify or cancel this solicitation. All questions relating to the solicitation must be submitted to the contact below. Any amendments to the solicitation will be posted on the ASME ST-LLC web site (http://stllc.asme.org/Requests_Proposals_RFPs.cfm).

e. Treatment of Proprietary Information: A proposal may include technical data and other data, including trade secrets and/or privileged or confidential commercial or financial information, which the applicant does not want disclosed to the public or used by ASME ST-LLC for any purpose other than proposal evaluation. To protect such data, the applicant should specifically identify the data to be protected.

f. Proposal Preparation and Submittal Instructions:

ASME ST-LLC may form a committee of subject matter experts to evaluate the technical qualifications of applicants. To help facilitate this evaluation, responses should include two separate documents, a Technical Proposal, and a Financial Proposal.

1. Technical Proposal
   (a) Provide organization name and contact information.
   (b) Provide evidence of technical capabilities: the credentials, qualifications, capabilities, and experience of individuals and the organization.
   (c) Describe approach to accomplishment of the Scope of Work.
   (d) Confirm agreement with the Scope of Work for the specified task(s)
2. Financial Proposal
   (a) Provide a fixed price quotation or an hourly billing rate quotation and estimated project maximum.
   (b) Confirm agreement with the draft Terms and Conditions, or state any specific exceptions.
3. Submit Technical and Financial Proposals via e-mail to the ASME ST-LLC contact below.
4. Responses must be received on or before the deadline.

7. ASME Standards Technology, LLC Contact Information:

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