Changes in ASME Boiler Pressure Vessel Code Section V Regarding Leak Testing

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Leak Testing Specialists, Incorporated (LTS) was established in 1995 by Gary Elder. In 2013, Tony Heinz (Gary’s first employee) purchased the company.

LTS’s primary focus is:

• Leak testing consultation
• Leak test training (compliant with CP-105)
• Leak test inspections involving nuclear containment; typically DOT Type B packaging, Commercial Nuclear Dry Fuel Storage, National laboratory Glovebox assemblies
• Clients include many national laboratories, commercial nuclear plants (some international), shipyards and fabricators contracted by these organizations.
LTS mainly uses the following leak testing techniques for effort:

- Helium Mass Spectrometer Leak Testing (MSLT): Hood, Evacuated Envelope, Detector Probe and Tracer Probe
- Pressure Change Measurement (PCMT or PCLT): Pressure Decay and Rate of Rise
- Bubble Testing (BT): Vacuum Box and Immersion Bubble Testing
LTS’s effort Involves working with several Codes and Standards:

- ANSI N14.5
- American Glovebox Society, AGS-G001, AGS-G004, and AGS-G006
- ASME BPVC Sec V Article 10
- ASTM E493, E498, E499, E515, E1603, E2930
LTS employees sit on the following Code/Standard committees:

- ANSI N14.5
- American Glovebox Society Leak Testing
- ASME BPVC Section V Committee
- ASME BPVC Section V Surface Inspection Subcommittee
- ASTM Committee for Leak Testing
- ASNT Standards Development and Central Management Council Committees
- ISO TC-135 and SC-6, Leak Testing
- ASNT Leak Test Committee
Summary of Recent Changes to ASME Boiler Pressure Vessel Code Section V Article 10 For Leak Testing And Preview of Future Anticipated Changes
Reservoir and Non-Reservoir Leak Standards titles replace Permeation and Capillary terminology

Refining System Calibration (Stability) Tolerance

Addition of New Mandatory Appendix Regarding the Evacuated Envelope Technique

Controls on MSLD Mode and Range Lock
Reservoir and Non-Reservoir Leak Standard titles replace the old Permeation and Capillary Leak Standard terms
Refining System Calibration (Stability) Tolerance:
System Calibration in a Hood Test

$M_1$ – Signal with Calibrated Leak admitted.
$M_2$ – Signal with no known helium source.
$M_3$ – Signal with helium on one side of boundary being tested.
$M_4$ – Signal with helium on one side of boundary, AND Calibrated Leak admitted to the system.

\[
PSCF = \frac{CL}{M_1 - M_2} \quad \text{and} \quad FSCF = \frac{CL}{M_4 - M_3}
\]
System Stability: $0.77 \leq PSCF/FSCF \leq 1.42$

Leakage Rate (LR) = $FSCF \times (M_3 - M_2) \times (100 \div \% \text{Tracer Gas})$
System Calibration in a Hood Test (cont’d)

What we get:

- Amplitude Calibration (PSCF and FSCF)
- Evidence based Test Dwell Time determination (ANSI N14.5), in each test – self qualifying
- Evidence in each test that the test system is sensing helium at the time of the test measurement
- Evidence in each test that the test system is sensing all the way to furthest portion of the part at the time of test.
- A Test Quality Factor (system stability) for test evaluation and confidence
Refining System Calibration (Stability) Tolerance:

The Pre-test system calibration (PSCF) comparison to the Post-test system calibration (FSCF) validates adequate function of leak detector, vacuum conditioning of test article, conductance communication to all portions of test volume.

Tolerance changed from 35% uni-directional to the new bi-lateral tolerance of +/- 30%
Addition of New Mandatory Appendix Regarding the Evacuated Envelope Technique
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• This method involves testing an article that already is filled with a tracer gas.

• A vacuum chamber (e.g., a cup) with a calibrated leak standard attached is placed over the inspection area of interest.

• The vacuum chamber is, in turn, attached to the leak detector.
Evacuated Envelope Technique

PSCF = CL / (R1 - R2) : Pre-test calibration

FSCF = CL / (R3 - R2) : Post-test calibration

System Stability: 0.77 ≤ PSCF/FSCF ≤ 1.42

Leakage Rate (LR) = R2 * FSCF
Controls on MSLD Mode and Range Lock

Single Mode vs Multi-Mode

Golden Nugget Hotel, Las Vegas, NV  February 12-14, 2019
Future Changes Being Considered:

- Improved system stability controls for PCMT (including additions to thermal stability verification)
- Addressing elements of automated PCMT techniques
Improved system stability controls for PCMT (including additions to thermal stability verification)
Addressing elements of automated PCMT techniques
Sub-Topic: Understanding extra effort involved with committee membership

Company participants are typically engineers or scientist

Following summarizes a couple examples of time involvement required
ASME BPVC Committee participation:

- 4 meetings per year, various locations in North America (attendance is expected to be 75% per year).
- Typically takes 3 to 5 years to be voted onto a committee (continued attendance and contributions).
- Meetings run all week long – Monday thru Thursday (Sunday thru Friday for others).
- Must contribute at meetings, from specific topic discussions and project management of items.
- After hour work – all year long voting on items, reviewing various documents and emails (average 2 hours/week).
ASNT SDC (Standards Development Committee) and CMC (Certification Management Council):

- 4 meetings per year as well – Spring and Fall conferences and 2 other meetings as well (attendance is expected to be 75% per year).
- Typically takes 1 to 3 years to be considered for committee
- Meetings start on Sunday for SDC (travel Saturday), and run thru Wednesday for CMC.
- Must contribute at meetings, from specific topic discussions and project management of items.
- After hour work – all year long voting on items and reviewing various documents (average 1 to 2 hours per week).
Rewards for Participation: Priceless

• Accountability – Fixing or improving standards that affect your company’s specialty
• Exchange of ideas with peers
• Staying current with Industry Practices, Trends, Experts
• Understanding Industry direction in your company’s specialty
• Potential Joint Ventures on future effort
• Other intrinsic advantages