

**INSTRUCTIONS FOR COMPLETION OF
MECHANICAL PROPERTIES SAMPLE TESTING
FROM
EXISTING NATURAL GAS TRANSMISSION PIPELINES**

1. Scope

The purpose of the testing is to determine the pipe strength and collect mechanical property data for future use. Only apply this procedure to pipe taken out of service in preparation for hydro-testing. Do not use this procedure for any pipe removed for cause, i.e. any pipe that is suspected of having a weld defect or other defect or problem where more stringent chain of custody and testing procedures will apply, or removed at the direction of the NTSB or CPUC. The mechanical testing will comply with the ANSI/API 5L, 44th Edition, effective October 2008 (“5L”). The methods will include:

- 1.1. Tensile tests from the Pipe body and Seam weld.
- 1.2. Charpy V-Notch (CVN) tests from the pipe body and seam weld. Weld heat affected zone properties are not needed except for ERW pipe.
- 1.3. Hardness testing of the pipe body and weld.
- 1.4. Pipe chemical composition

2. Sample Coupon Process

- 2.1. Two coupons will be cut from each pipe segment required to have mechanical property evaluations. The identification of the sample will include the expected 5L pipe grade for property comparison.
- 2.2. The coupon locations will be from:
 - 2.2.1. Transverse centered on the weld
 - 2.2.2. Transverse 90 degrees from the weld, CVN coupon for pipe body
 - 2.2.3. Transverse 180 degrees from the weld, Tensile coupon for pipe body
 - 2.2.4. Per 5L, pipe of 8 inch size (8-5/8” diameter) and smaller will have axial orientation tensile test, one only.

Note: Radiographic Testing (RT) will be used to identify the best locations to cut out coupons by avoiding longitudinal seam defects. RT results will be documented in an ATS report. The RT report number will be referenced in the mechanical testing report. The acceptance criteria from ANSI/API 5L will be applied to determine acceptance of the weld region in coupon. If unacceptable per 5L the report shall indicate if acceptance is permitted using the John Kiefner white paper, “Effects of Rounded Inclusions on the Integrity of Submerged-Arc-Welded Seams”. Weld indication not meeting the acceptance criteria will be identified in the RT report. The indications location will be marked on the pipe and a photograph of the location will be included in the RT report. The RT report will be sent to Ben Campbell [bcc3], the project owner, for disposition and distribution of information, including reporting the finding to the CPUC.

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3. Mechanical Testing

- 3.1. Mechanical Tests shall be performed to API 5L.
- 3.2. Mechanical Testing of the pipe body
 - 3.2.1. Tensile Test to measure yield, tensile, reduction in area, and elongation
 - 3.2.1.1. One test specimen from the 180 Transverse coupon
 - 3.2.1.2. Data to be collected: tensile strength, yield strength, elongation and reduction in area. Load-extension plot shall be included in the report.
 - 3.2.2. CVN Testing at +32 F and at +50 F. Specimen orientation shall be T-L to replicate an axial running crack.
 - 3.2.2.1. 6 test specimens from the 90 degree Transverse coupon. Three for each temperature.
 - 3.2.2.2. Data to be collected: energy absorbed, lateral expansion, and % shear.
- 3.3. Mechanical Tests of the Seam weld
 - 3.3.1. Seam Weld Tensile Test
 - 3.3.1.1. One test specimen from the Transverse centered on the weld coupon
 - 3.3.1.2. Data to be collected: tensile strength, yield strength, elongation and reduction in area. Load-extension plot shall be included.
 - 3.3.2. CVN testing at +32F and +50 F. Specimen orientation shall be identical to T-L to replicate an axial running crack.
 - 3.3.2.1. 6 test specimens from the Transverse centered on the weld coupon with the V-notch located on the weld. Three for each temperature.
 - 3.3.2.2. Data to be collected: energy absorbed , lateral expansion, % shear
- 3.4. Test coupons will be cut per ASME A 370, in accordance with API 5L
- 3.5. Hardness tests of the pipe body and weld materials will be performed on a portion of the sample that has not been straightened. .
- 3.6. ATS will manage the mechanical properties testing and data reports.
 - 3.6.1. The mechanical testing associated with this program will be conducted by a third party laboratory. ATS will be managing the sampling, data evaluation, and report writing.
- 3.7. The data report will be sent to GT (job packet), archived in the ATS database, and sent with sample back to the designated PG&E facility to be maintained with the original pieces of material and the original paperwork.

4. Chemical Composition

- 4.1. A laboratory chemical composition of the pipe body will be taken to compare to the standard grade table, including C, Mn, Cr, Mo, V, Ni, Cu, with B analysis required only for pipes with C of less than or equal to 0.12% by mass.

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- 4.2. The Carbon Equivalent (CE) will be calculated using the appropriate method in API 5L Section 9.2.

5. Material Disposition

- 5.1. The pipe from which the specimens were taken may be disposed of after written approval by Ben Campbell [bcc3] the project owner. A disposition form with the materials property data evaluation clearly presented will be supplied with the final report.
- 5.2. All test specimen and coupon materials will be archived.
- 5.3. Should the material not meet the mechanical testing or RT acceptance criteria in API 5L for the appropriate pipe grade, Ben Campbell [bcc3] the project owner will be notified. Ben Campbell, the project owner, will notify Sunil Shori, or other designated CPSD representative, of each such instance that this occurs. The pipe from which the specimen was obtained and all test specimens and coupon materials removed from the pipe will be held till further direction or approval has been obtained.

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