



# Understanding Special Permits

## DOT Cylinder Testing Requirements

The US Department of Transportation (DOT) has established regulatory requirements for the re-qualification testing of compressed gas cylinders. The baseline requirements are for internal visual and hydrostatic testing procedures, as described in 49 CFR §180.205 and CSA 339/340.

However, the DOT and TC have approved an alternative-method to requalify compressed gas cylinders using ultrasonic examination (UE)..

## Cyl-Sonic Special Permit Overview

Cyl-Sonic, a division of Nordco, Inc., has obtained a special permit for 100% ultrasonic examination testing. This special permit – DOT SP 14920 – is current and available for review on the US Department of Transportation website.

The special permit authorizes the use of ultrasonic testing for the following cylinder specifications:

- 3A
- 3AA
- 3AL
- SP9001
- SP9370
- SP9421
- SP9706
- SP9791
- SP9909
- SP10047
- SP10869
- SP11692
- SP12440

## Hazardous Materials Regulations

The Cyl-Sonic special permit follows the hazardous materials regulations for the following classes of liquefied or non-liquefied compressed gases (or mixtures of such compressed gases):

- 2.1 - Flammable gas
- 2.2 - Non-flammable gas
- 2.3 - Inhalation hazard

## Test Procedures

The Cyl-Sonic special permit defines the requirements for the test procedures, which must meet the following:

- Each cylinder must be examined by a standardized (calibrated) UE system, using an appropriate reference cylinder and test setup.
- A copy of the operating test procedure (approved and acknowledged in writing by OHMSAPD) for performing UE testing of cylinders (under the terms of the special permit) must be at each facility performing cylinder re-qualifications.
- The system must be re-calibrated at the end of the test interval (cal out), which is after 10 cylinders or four hours, which occurs first. The Cyl-Sonic system does not allow further cylinder testing after the interval is reached, until the re-calibration takes place.
- The rotational speed of the reference cylinder must be such so that all simulated defects are adequately detected, measured, and recorded.
- The rotational speed of cylinder being tested cannot exceed the rotational speed used during the calibration process.
- The pulse rate must be adjusted to ensure a minimum of 10% overlap for each helix.

## Standard Reference Cylinder Requirements

The Cyl-Sonic special permit defines the requirements for the reference cylinder, known as the calibration standard. The UE reference cylinder is a cylinder (or cylinder section) that is used as a standard reference that must have similar acoustic properties, surface finish, and metallurgical conditions as the cylinders being tested.

The calibration standard must meet the following requirements:

- Must have a known minimum design wall thickness ( $t_{min}$ ), less than or equal to the cylinder being tested.
- For cylinders less than or equal to 6 inches in diameter, the standard must have the same nominal diameter as the cylinder being tested.
- For cylinder greater than 6 inches in diameter, the standard must conform to the size ranges shown in the table below.

Outside Diameter	Min. OD (inches)	Max. OD (inches)
7.00	6.30	10.50
7.50	6.75	11.25
9.00	8.10	13.50
9.25	8.33	13.88
10.00	9.00	15.00
12.00	10.80	18.00

In addition, the calibration standard must include the following artificial defects:

- A simulated defect for reduction in wall thickness (area corrosion). A minimum of two (2) different thickness steps are machined into the inside cylinder wall.
- A simulated defect for an isolated pit. A flat-bottom hole (FBH) is machined into the inside surface simulating an isolated pit.
- A simulated defect for line corrosion in the sidewall-to-base transition (SBT). A circumferential notch is machined into the internal surface to simulate SBE line corrosion.

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## Personnel Qualifications

The Cyl-Sonic special permit defines the following personnel qualifications:

- Personnel performing cylinder re-qualification must be qualified to the appropriate Ultrasonic Testing Certification level (Level I, II, or III) in accordance with the American Society for Non-Destructive Testing (ASNT) recommended practice SNT-TC-1A.
- System startup and calibration must be performed by a Level II operator; in addition, a Level II operator may authorize cylinders that pass the qualification testing to be marked. A person with a Level I certification, check calibration, and perform ultrasonic testing under the direct supervision (physically present) of a Level II operator or a Senior Review Technologist (SBT).
- A Senior Review Technologist (SBT) provides written UE procedures, supervises training and examinations (Levels I and II), provides technical guidance to operators, and reviews and verifies the re-qualification results. An SBT must possess one of the following:
  - Level III certification from ASNT
  - Professional Engineer (PE) license
  - PhD degree in Engineering or Physics

## Additional Safety Control Measures

DOT cylinders made from aluminum alloy 6351 must be examined using the eddy current (EE) procedure, as described in the Cyl-Sonic special permit.

In addition, DOT 3A cylinder manufactured from chromium-molybdenum alloy or nickel-chromium-molybdenum steel between January 1937 and December 1945 can be re-qualified as DOT-3AA cylinders using the 100% UE procedure detailed in the Cyl-Sonic special permit.

