

comet[®]

Propane Cylinder Guide



⚠ WARNING READ THE PROPANE CYLINDER GUIDE CAREFULLY. FAILURE TO FOLLOW THE INSTRUCTIONS AND WARNINGS IN THE GUIDE MAY RESULT IN SERIOUS OR FATAL INJURY AND/OR PROPERTY DAMAGE, AND WILL VOID THE PRODUCT WARRANTY. THIS PRODUCT MUST BE FILLED AND SERVICED BY A QUALIFIED PROFESSIONAL. FOLLOW ALL APPLICABLE FEDERAL, LOCAL AND STATE CODES AND REGULATIONS.



THIS IS THE SAFETY ALERT SYMBOL. IT IS USED TO ALERT YOU TO POTENTIAL PERSONAL INJURY AND OTHER HAZARDS. OBEY ALL SAFETY MESSAGES THAT FOLLOW THIS SYMBOL TO REDUCE THE RISK OF PERSONAL INJURY AS WELL AS PROPERTY DAMAGE.

NOTE: INSPECT FOR DAMAGE AND NOTIFY STORE WHERE PURCHASED IMMEDIATELY IF DAMAGE IS PRESENT TO AVOID RISK OF PERSONAL INJURY AND PROPERTY DAMAGE. IF THE PRODUCT APPEARS TO BE MALFUNCTIONING OR SHOWS SIGNS OF DAMAGE OR CORROSION, DO NOT REFILL. USE PROPER SAFETY EQUIPMENT WHEN FILLING OR SERVICING A CYLINDER.

INTRODUCTION

CoMet® cylinders are designed for residential liquid propane gas applications. They meet ISO 11119-2 requirements and have been accepted by the Department of Transportation in special permit SP14457 and Transport Canada Equivalency Certificate SU 9768.

CoMet® cylinders are designed to be durable, however, they must be treated with care and be well maintained. This guide is intended for suitably trained service personnel to assist in carrying out the safe maintenance, operation, valving, inspection and periodic testing of CoMet® cylinders. In addition to this guide, the service professional must also be aware of and familiar with any, and all, filling guidelines, regulations, requirements and laws of all the appropriate local and/or national authorities and industry organizations.

REFERENCES

- Transport Canada (TC) CAN/CSA B339-02 Cylinders, Spheres, and Tubes for the Transportation of Dangerous Goods.
- Transport Canada Equivalency Certificate SU9768.
- US Department of Transportation (DOT) Special Permit SP 14457
- US Code of Regulations, Title 49, Section 180.209. Requirements for Requalification of Specification Cylinders
- ISO 11119-2 Composite Cylinder with Welded Metal Inner Liner
- Compressed Gas Association (CGA) Pamphlet C-6 (Standards for Visual Inspection of Steel Compressed Gas Cylinders)

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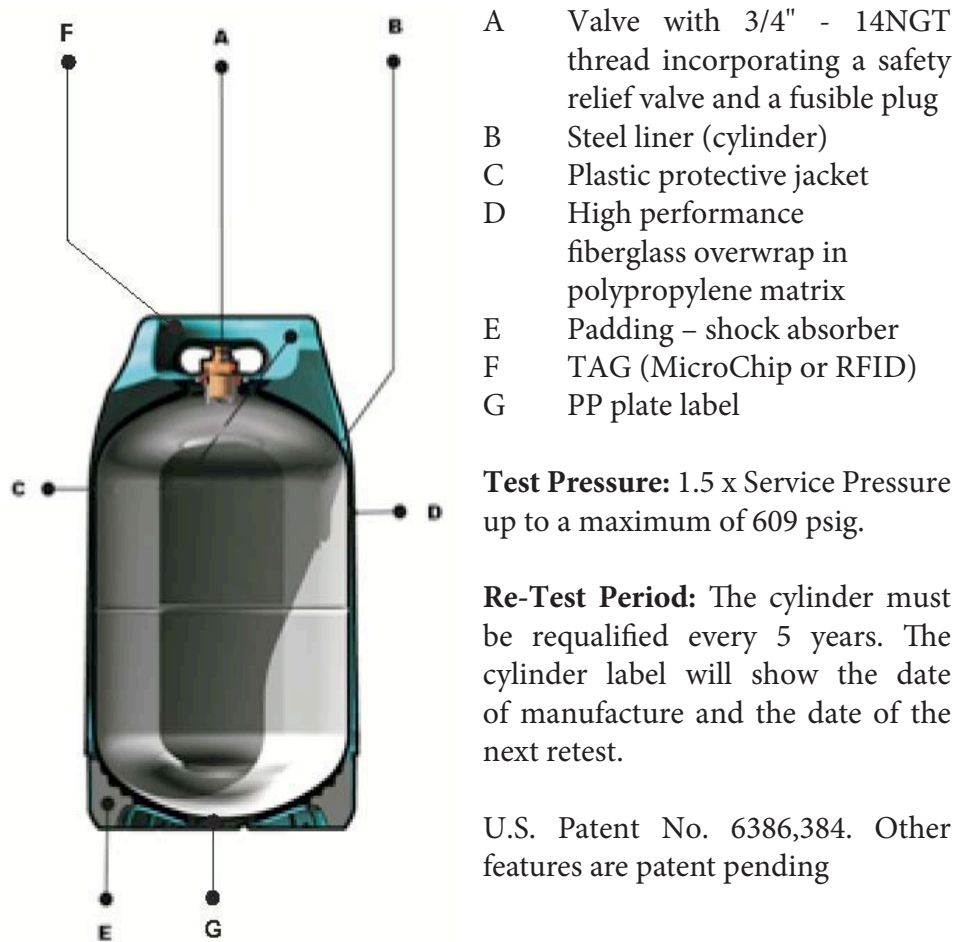
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1. CYLINDER DESIGN AND SPECIFICATIONS

The CoMet® cylinder consists of a steel liner with a proprietary external coating to prevent corrosion underneath the composite wrapping. The metal liners are then overwrapped by fiberglass in a thermoplastic polypropylene matrix. Mandatory markings are engraved on the resistant body using a polypropylene plate. This pressure vessel is then inserted into an injection molded, high impact resistant plastic jacket.



2. MANUFACTURE

2.1 Steel Liners

Two deep drawn domes and a bung are welded through a proprietary process. Material tests are conducted in accordance with the relevant standards. The valve thread is ¾"-14NGT, but other specifications can be accommodated if required. Prior to overwrapping, the liners are coated with a proprietary coating to prevent corrosion between the liner and wrapping.

2.2 Inspection Procedures

Raw materials are checked and identified upon receipt. Metal liners are checked for wall thickness, straightness, out-of-roundness, eccentricity and surface finish. Threads are verified as to gauge. Additional visual and dimensional checks are conducted on liners prior to wrapping to ensure they are clean, free from surface defects and manufactured to the design drawing.

2.3 Composite Overwrapping

The composite wrapping material is composed of fiberglass commingled with materials for strength and durability. The commingled wrap is applied to the metal liner using controlled filament winding machines to ensure correct placement of each strand of material. The commingled fibers are flowed in an oven using a temperature controlled profile to ensure complete contact between each layer and the metal liner.

2.4 Cylinder Batch Inspection & Testing

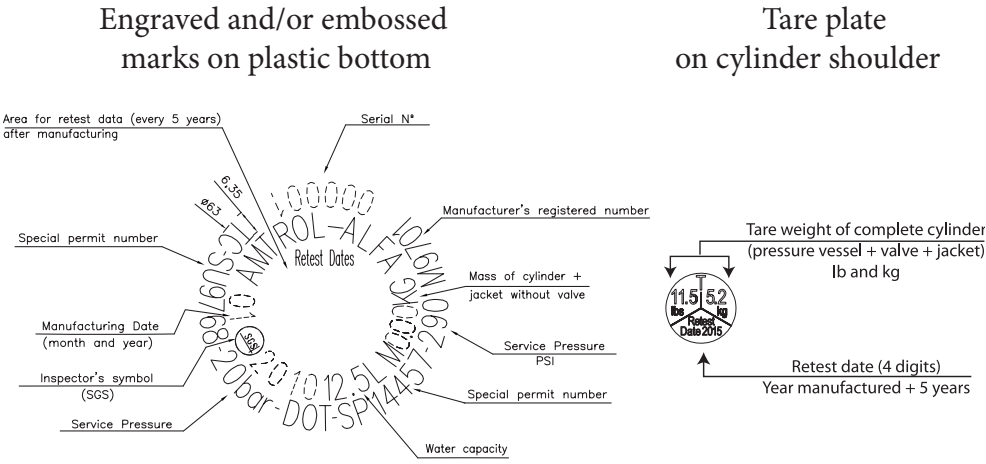
The maximum CoMet® cylinder batch size is 200 units, plus the number of CoMet® cylinders required for destructive testing, in accordance with ISO 11119-2. Each batch of CoMet® cylinders is examined to ensure compliance with the design specifications. The following final inspections are carried out in accordance with Quality Assurance procedures: a) visual inspection b) dimensional check c) weight check d) water capacity check and e) compliance of marking.

2.5 Independent Inspection Authorities

The independent inspection authority used in the manufacture of CoMet® cylinders at the present time is SGS United Kingdom LTD.

2.6 Marking and Labeling

Each finished CoMet® cylinder is permanently marked as follows:



If the serial number is no longer legible, the cylinder must be rejected or the supplier must be contacted for advice. A CoMet® cylinder, which still has a legible serial number, can be returned to service only after all the other product information is made legible. For instance, an illegible part of a CoMet® cylinder label which has the part identification on it can be corrected by putting that information back on the cylinder, only if the serial number is still legible on the label.

2.7 Radio Frequency Identification (RFID)

Each finished CoMet® cylinder includes an integrated MicroChip (TAG or RFID). This microchip automatically identifies the cylinder characteristics at the filling station e.g. tare weight and retest date.

3. CYLINDER USE

3.1 General

CoMet® cylinders are intended to be used in the same manner as other LPG cylinders. There are certain differences, however, which are addressed in the following sections:

⚠ WARNING DO NOT USE, STORE OR TRANSPORT CYLINDER WHERE IT WOULD BE EXPOSED TO TEMPERATURES ABOVE 150°F OR BELOW -40°F. RELIEF VALVE MAY OPEN ALLOWING A LARGE AMOUNT OF FLAMMABLE GAS TO ESCAPE.

Handling: CoMet® cylinders should never be dragged, dropped, or roughly handled. When transporting CoMet® cylinders, take steps to ensure that the valve is protected and that the CoMet® cylinder is well secured. CoMet® cylinders should never be allowed to roll around loose, tip or fall during transport. Secure CoMet® cylinders in a protected position and do not allow other cargo to strike or damage cylinder. DO NOT SMOKE IN THE VEHICLE WHILE TRANSPORTING THE CYLINDER.

Chemical Exposure: If a CoMet® cylinder has been exposed to chemicals or aggressive fluids, the external composite surfaces must be checked for any visible signs of damage. CoMet® cylinders known to have been covered, splashed or left standing (soaked) in unknown chemical(s) should be removed from use. CoMet® cylinders with any sign of chemical attack (e.g. plastic jacket has been softened, smeared, bubbled, etc.) should be removed from use.

Special care should be taken if the CoMet® cylinders are exposed to the following:

Solvents: Materials including paint cleaners, epoxy solvents, resin removers, organic solvents, etc.

Vehicle Fluids: Materials that contain benzene, glycol (anti-freeze), battery acids/alkalis, window washer fluids, oils containing solvents, flammable materials, organic volatile materials, gasoline and oil additives, fuels (gasoline, gasohol, methanol, etc.).

Strong Bases: Materials that contain medium to high concentrations of sodium hydroxide, potassium (and/or other) hydroxides, materials that contain strong soap solutions, cleaning solutions, etc.

Acids: Materials that are or contain any concentration of acids like hydrochloric, sulphuric, nitric, phosphoric, etc.

Corrosives: Materials that contain corrosive components or that are corrosive themselves, such as the aforementioned chemicals as well as cleaners, glass cleaners, metal cleaners, resin cleaners/removers, drain openers/cleaners, glues, rubber and other chemical cements, and atmospheres containing corrosive gases.

⚠ WARNING IF THE COMET® CYLINDER HAS BEEN EXPOSED TO THE FOREGOING CORROSIVE MATERIALS, IT SHOULD BE TAKEN OUT OF SERVICE AND INSPECTED BY QUALIFIED PERSONNEL PRIOR TO PUTTING BACK INTO SERVICE.

3.2 Procedure for Checking Before, During and After Filling

⚠ WARNING CYLINDERS MUST BE PERIODICALLY INSPECTED FOR DAMAGE. TO AVOID RISK OF PERSONAL INJURY AND PROPERTY DAMAGE, IF THE PRODUCT APPEARS TO BE MALFUNCTIONING OR SHOWS SIGNS OF DAMAGE, IMMEDIATELY DISCONTINUE USE OF CYLINDER AND DO NOT REFILL.

This document does not replace official rules and standards, industry guidelines, regulations, requirements and laws of the appropriate local, state, or country. Please consult with each for a full and accurate description.

Cleaning: Wash the CoMet® cylinder with mild soap and water only. Rinse with water after washing. Avoid the use of solvents and acids.

Inspection before filling: The acceptance of a CoMet® cylinder for filling is to be based upon visible inspection of the outer jacket, the information contained on the bottom information plate of the Cylinder and the parts of the pressure vessel without protection. The outer jacket is an integral part of the CoMet® cylinder. A Comet® cylinder should not be used if the outer jacket is damaged. Section 5.0 shows examples of the acceptance / rejection criteria for CoMet® cylinders prior to filling.

⚠ WARNING LIMITS ON REFILL - IT IS ILLEGAL TO REFILL THIS CYLINDER MORE THAN FIVE YEARS AFTER THE RECERTIFICATION DATE STAMPED ON THE BOTTOM (FIVE YEARS AFTER THE DATE OF MANUFACTURE) UNLESS THIS CYLINDER HAS BEEN RECERTIFIED BY A QUALIFIED TESTER AND IN ACCORDANCE WITH REQUIREMENTS OF DOT-SP 14457 SECTION 7C AND TRANSPORT CANADA EQUIVALENCE CERTIFICATE SU 9768. IT IS ILLEGAL TO REFILL THIS CYLINDER AFTER THE LAST PERMISSIBLE REFILL DATE STAMPED ON THE BOTTOM.

⚠ WARNING NEVER FILL AN LP CYLINDER BEYOND 80% OF ITS CAPACITY FULL BECAUSE A FIRE CAUSING DEATH OR SERIOUS INJURY MAY OCCUR. ALL FILLING OF CYLINDERS MUST COMPLY WITH DOT REGULATIONS (SECTION 173.304) AND NFPA 58.

⚠ CAUTION BE CERTAIN CYLINDER IS PURGED OF TRAPPED AIR PRIOR TO FIRST FILLING. BE CERTAIN NOT TO OVERFILL CYLINDER. BE CERTAIN CYLINDER REQUALIFICATION DATE IS CHECKED.

⚠ CAUTION CONTACT WITH THE LIQUID CONTENTS OF CYLINDER WILL CAUSE FREEZE BURNS TO THE SKIN.

⚠ WARNING CYLINDER FILLING: COMET® CYLINDERS SHOULD BE FILLED LIKE TRADITIONAL LPG CYLINDERS. IT IS MANDATORY TO SPRAY THE COMET® CYLINDER SURFACE WITH A NON-CORROSIVE LIQUID (WATER) BEFORE FILLING TO REMOVE ANY STATIC ELECTRICITY.

Post filling checks: Post fill checks are the same as for traditional LPG cylinders. They include filled amount, leakage checks, correct labeling, fitting of caps and plugs and other items.

3.3 Regulatory Approvals

CoMet® cylinders are approved for transporting propane, Hazard/class/ Division 2.1, UN1978 classified under DOT Special Permit 14457 and TC Equivalency Certificate SU 9768.

3.4 Valve

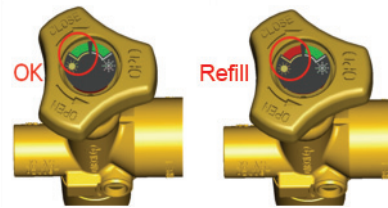
CoMet® propane cylinders are equipped with a specially designed Cavagna's OPD valve incorporating a built in pressure level gauge, a safety relief device and a fusible plug set up to 212°F (100°C).

⚠ WARNING NO OTHER VALVE SHOULD BE USED ON THE COMET® PROPANE CYLINDER.

The OPD valve operates inside the upright cylinder and is activated as the liquid propane in the cylinder rises to a level that pushes a float upward stopping the flow of gas into the bottle.

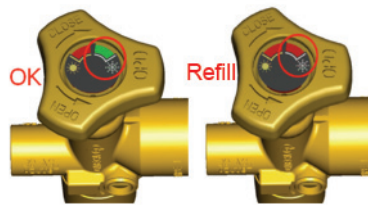
The pressure level gauge reads the dynamic pressure of the cylinder and has two windows identified by the sun and a snowflake. When the cylinder is not being used and the valve is closed, the level gauge will indicate red.

Always check the gauge 10 minutes after starting cylinder use. For temperatures equal to or above 65°F (17.8°C), check the sun window.



If the sun window is green, the propane reserve is at least 1.1lb (0.5kg). If the sun window is red, the cylinder has less than 1.1lb (0.5kg) of propane and should be refilled.

For temperatures equal to or below 64°F (17.7°C), check the snowflake window:



If the snowflake window is green, the propane reserve is at least 1.1lb (0.5kg). If the snowflake window is red, the cylinder has less than 1.1lb (0.5kg) of propane and should be refilled.

4. PERIODIC EXAMINATION AND TESTING

4.1 General

⚠ WARNING LIMITS ON REFILL - IT IS ILLEGAL TO REFILL THIS CYLINDER MORE THAN FIVE YEARS AFTER THE RECERTIFICATION DATE STAMPED ON THE BOTTOM (FIVE YEARS AFTER THE DATE OF MANUFACTURE) UNLESS THIS CYLINDER HAS BEEN RECERTIFIED BY A QUALIFIED TESTER AND IN ACCORDANCE WITH REQUIREMENTS OF DOT-SP 14457 SECTION 7C AND TRANSPORT CANADA EQUIVALENCE CERTIFICATE SU 9768. IT IS ILLEGAL TO REFILL THIS CYLINDER AFTER THE LAST PERMISSIBLE REFILL DATE STAMPED ON THE BOTTOM.

CoMet® cylinders must be inspected within 5 years from date of manufacture. Refer to DOT SP 14457, TC SU9768, Pamphlet CGA C6, and Section 5. of this Guide. In the United States and according to DOT 49CFR § 180.209(g), the periodic requalification requires each CoMet cylinder used in LPG gas service that meets the requirement limits in Table 1 of ASTM D-1835, "Standard Specifications for Liquefied Petroleum (LP) Gases", to be re-tested once every 5 years using external visual inspection, according criteria of acceptance in Section 5 of this guide. In addition, for Canada, TC requires an internal inspection within 5 years from date of manufacture and threads shall also be inspected during requalification. All requalification evaluation must be done by an approved testing authority and have a RIN number listed with DOT or TC, whatever is applicable.

4.2 External Visual Inspection

⚠ WARNING CYLINDERS MUST BE PERIODICALLY INSPECTED FOR DAMAGE. TO AVOID RISK OF PERSONAL INJURY AND PROPERTY DAMAGE, IF THE CYLINDER APPEARS TO BE MALFUNCTIONING OR SHOWS SIGNS OF DAMAGE, IMMEDIATELY DISCONTINUE USE OR FILLING OF CYLINDER.

CoMet® cylinders should be periodically inspected for exterior damage. Prompt identification of damage and repair will maintain CoMet® cylinders in a serviceable condition.

If the outer jacket is damaged, a careful inspection of the pressure envelope must be performed per Section 5. The CoMet® cylinder should be clean and all attachments that will interfere with visual inspection should be removed. Acceptable cleaning methods include washing with mild soap and water, soft brushing, controlled water jet cleaning, plastic bead blasting or other suitable method. Grit, shot blasting and solvents are not considered suitable.

Chemical cleaning agents, paint strippers, corrosives, vehicle fluids, strong bases, acids and solvents which are harmful to the composite material are not to be used.

Inspection procedure: The entire surface of the CoMet® cylinder shall be externally visually inspected according to Section 5. Notable defects include:

- a) Cuts, gouges, bulges, cracks or delaminations. Apply the criteria for acceptance/rejection (Section 5).
- b) Other defects e.g. depressed bung or fire damage. Apply the criteria for acceptance/rejection (Section 5).
- c) Integrity of all permanent attachments.

Any CoMet® cylinder rejected by an authorized service person must be segregated for reconditioning or scrapping.

4.3 Internal Inspection

⚠ WARNING FAILURE TO FOLLOW THE INSTRUCTIONS AND WARNINGS IN THE GUIDE MAY RESULT IN SERIOUS OR FATAL INJURY AND/OR PROPERTY DAMAGE, AND WILL VOID THE PRODUCT WARRANTY. THIS PRODUCT MUST BE FILLED AND SERVICED BY A QUALIFIED PROFESSIONAL. FOLLOW ALL APPLICABLE FEDERAL, LOCAL AND STATE CODES AND REGULATIONS.

Internal inspection is required during the periodic inspection procedure for TC, as follows:

4.3.1 Valve Removal: The CoMet® cylinder must be empty of pressurized LPG for an internal visual inspection. When the CoMet® cylinder is empty, remove the valve using proper tools and holding fixture so that the CoMet® cylinder fiber windings and valve are not damaged. CoMet® cylinders must be depressurized in a safe and controlled manner before proceeding. CoMet® cylinders with inoperative valves shall be brought to a place for safe valve removal. Valves must be removed from cylinders for inspection/maintenance.

⚠ CAUTION ENSURE THE VALVE IS NOT DAMAGED AND IS FUNCTIONING PROPERLY. IF THE VALVE IS DAMAGED OR NOT FUNCTIONING PROPERLY, THE INSPECTOR/OPERATOR MAY THINK THAT THE COMET® CYLINDER IS EMPTY AFTER OPENING THE VALVE AND NOT HEARING ANY GAS RELEASED. ALL VALVED COMET® CYLINDERS THOUGHT TO BE EMPTY SHOULD STILL BE HANDLED AS IF THEY ARE UNDER PRESSURE, AND THE VALVE SHOULD BE REMOVED CAREFULLY ACCORDING TO THE VALVE MANUFACTURER'S GUIDELINES.

4.3.2 Procedure: After removing any and all residual pressurized gas, liquid and any other foreign matter, the CoMet® cylinder shall be inspected internally for any signs of internal corrosion or other signs that may affect its integrity, using a safe inspection lightning system with appropriate internal illumination.

⚠ CAUTION COMET® CYLINDERS SHOWING SIGNS OF INTERNAL DEFECTS, E.G. CRACKS, DAMAGED LINER, INTERNAL CORROSION OR CHEMICAL ATTACK, SHALL BE SCRAPPED. IF CLEANING IS REQUIRED, CARE SHALL BE TAKEN TO AVOID DAMAGING THE COMET® CYLINDER WALLS. COMET® CYLINDERS SHALL BE RE-INSPECTED AFTER CLEANING.

4.3.3 Inspection of Cylinder Threads

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Threads: After removing the valves (or any other fittings) during requalification, the CoMet® cylinder valve threads shall be inspected.

Internal Threads: The internal threads of the CoMet® cylinder shall be examined to ensure that they are of full form and clean. They shall be checked for burrs, cracks, and other thread damage. Count the number of continuous full threads, starting at the top, which do not have imperfections. CoMet® cylinders must have a specified minimum number of continuous full threads as required in applicable thread standards. The overriding requirement is to have no less than the minimum number of threads so that a gas-tight seal can be obtained by reasonable valving methods.

4.3.4 Final Operations

Purging: Any moisture can be removed from the CoMet® cylinder with dry air or inert gas. CoMet® cylinders must not be left open without valves for any period, other than that required for essential maintenance, to prevent corrosion of the inner liner surface.

Leakage test: CO₂, dry air or an inert gas shall be used as test medium. The leak test is performed to evaluate the valve connection and the valve itself. It may also be used to do a final check on the entire CoMet® cylinder.

- a) More than one CoMet® cylinder may be tested at the same time.
- b) The external surface of the CoMet® cylinder shall be in such condition that any leak can be detected.
- c) CoMet® cylinders which do not leak or show any permanent distortion shall be deemed to have satisfied the requirements of this test.
- d) Any cylinders that fail must be scrapped.

The leak rate (Q) shall be less than the requirement for permeability in ISO11119-3.2: $X < 0,25 \text{ mL/h/L}$. For 22 lb cylinders: $Q < 103 \text{ g/year}$. For 11 lb cylinders: $Q < 51 \text{ g/year}$. If bubbles are detected during testing, the rate should be estimated and compared to the above requirements.

Marking: After successful completion of the requalification, each CoMet® cylinder shall be legibly and durably marked with the following information:

- a) The symbol of the re-qualification testing facility approved by DOT or TC and the identification number of the inspection body.
- b) The year (minimum) of next requalification. The marking shall be 5 mm high (minimum).
- c) The tare weight or indication of tare weight shall be re-established.

Rejection and scrapping of CoMet® cylinders: The decision to reject a CoMet® cylinder may be taken at any stage during the periodic inspection procedure. A rejected CoMet® cylinder shall be rendered unserviceable so that it cannot be reissued into service as a pressure vessel. Rendering cylinders unserviceable is performed by drilling a minimum of two holes in the CoMet® cylinder.

5. ACCEPTANCE/REJECTION CRITERIA



Figure 1a
Abrasion Damage (level 1) – Serviceable



Figure 1b
Abrasion damage, originating sharp edge for possible cutting of hands (level 2) – Repairable



Figure 2a
Impact Damage (level 1) - Serviceable



Figure 2b
Impact Damage (level 2) - Repairable



Figure 2c
Impact Damage (level 3) originating valve damage distortion - Not Repairable



Figure 3a
Superficial Heat Damage (level 2) - Repairable



Figure 3b
Heat Damage (level 3) - Not Repairable



Figure 4
Structural damage (level 3) - Not Repairable



Figure 5
(24 hours after attack damage with H₂SO₄ - 98%) Chemical Attack
Damage (level 2) - Repairable

NOTE: Both thermoplastic outer jacket and composite wrapping were exposed to H₂SO₄ - 98% and LPG (1 hour; 6 hours; 24 hours), revealing no significant sign of damage. However, every time a CoMet® cylinder is in contact with an unknown substance, such cylinder should be removed from use and inspected by Qualified Personnel.



Figure 6
Marking Illegible (level 2) - Repairable



Figure 7a
Cuts & Gouges (level 2) – Repairable

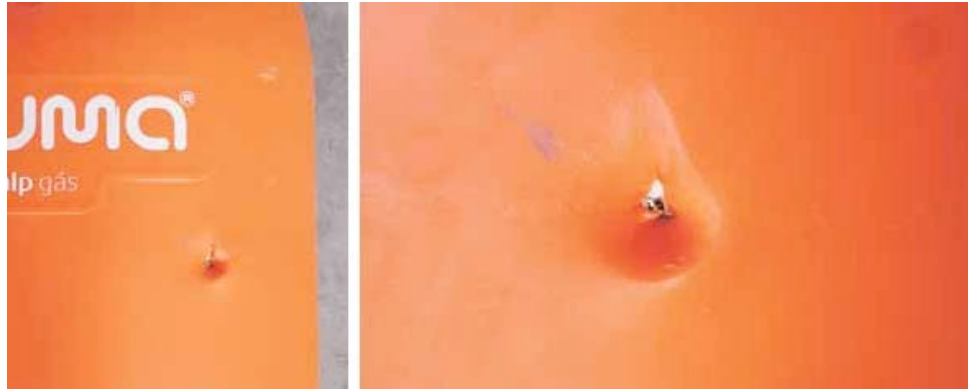


Figure 7b
Cuts & Gouges that penetrate the jacket (level 3) -Not Repairable



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