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DRAFT

Jamaican Standard

Specification

for

Inspection, retesting and use of transportable gas containers

BUREAU OF STANDARDS JAMAICA

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Specification for

Inspection, retesting and use of transportable gas containers

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Jamaican Standards establish requirements in relation to commodities, processes and practices, but do not purport to include all the necessary provisions of a contract.

The attention of those using this standard method of test is called to the necessity of complying with any relevant legislation.

Amendments

No.	Date of issue	Remarks	Entered by and date

Contents

Foreword

This standard is a revision of and supersedes JS 41: 2014. It specifies the requirements for the inspection, retesting and use of steel cylinders.

The revision was made to update and incorporate new technological

developments in this area. This standard is intended to be compulsory.

Committee representation

The revision of this standard for the Standards Council, established under the Standards Act 1969, was carried out under the supervision of the Bureau's Transportable Gas Containers Technical Committee which at the time comprised the following members:

Mr H Chin, Chairman	Jamaica Institution of Engineers
Mr Steve Green	Massy Gas Products Limited
Mr Lelland Martin	Massy Gas Products Limited
Mr Romeo Boyd	Jamaica Fire Brigade
Professor Vernon Buchanan	University of Technology, Jamaica
Ms Carala Tucker (NEPA)	National Environment and Planning Agency
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Mr D Campbell	IGL Ltd.
Mr Odane McIntyre	IGL Ltd.
Miss Tanisha Wallace	IGL Ltd
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Mr G. Boyd, Technical Secretary	PETCOM
Mr Glen-Ross McDonald	Bureau of Standards Jamaica
Mrs E. Edwards, Facilitator	Bureau of Standards Jamaica
Ms Jassett Jackson, Recording Secretary	Bureau of Standards Jamaica

Acknowledgment

Acknowledgment is made to the following institutions for permission to reproduce material from the following documents:

The United States Department of Transportation (DOT)	CFR Title 49 Sections 173.34 and 178.61.
The National LP-Gas Association	The Recommended procedures for Visual Inspection and Requalification of DOT Cylinders in LP-Gas Service
The Compressed Gas Association, Inc.	CGA C-5 2010, CGA C-6 2019, CGA Pamphlet C-14, CGA V-1-2019

Related documents

This standard makes reference to the following documents:

BS EN 1986:2002	Transportable gas cylinders. Periodic inspection and of seamless steel gas cylinders
CFR 49	Code of Federal Regulation: Title 49. Transportation
CFR 49 Section 173.34	Code of Federal Regulation: Title 49. Qualification maintenance and use of cylinders
CFR 49 Section 178.61	Specification 4BW welded steel cylinders with electric-arc welded longitudinal seam

	The recommended procedures for visual inspection and requalification of DOT cylinders in LP gas service
CGA C-5 -2010	Cylinder service life-Seamless, steel, high pressure cylinders
CGA C-6-2019	Standards for visual inspection of steel compressed gas cylinders
JS 25: 2018	Jamaican Standard Specification for transportable gas containers
JS 31: 2012	Jamaican Standard Specification for the Repair and rebuilding of transportable gas containers
ISO 10691: 2004	Gas cylinders -- Refillable welded steel cylinders for liquified petroleum gas (LPG) -- Procedures for checking before, during and after filling
CGA V-1-2019	Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections
CGA Pamphlet C-14	Procedures for Fire Testing of DOT Cylinder 173.34. Pressure Relief Device Systems

Draft Jamaican Standard Specification for the Inspection, retesting and use of transportable gas containers

Section One. General

1. Scope

This standard specifies requirements for inspection, retesting and use of steel cylinders manufactured in accordance with JS 25 or any other applicable Code of Federal Regulations Standard: Title 49.

It also applies as far as practicable to cylinders of less than 1L capacity. It does not apply to cylinders containing dissolved acetylene.

2.0 Definitions

For the purpose of this standard, the following definitions apply:

2.1 arc or torch burns. Burning of the cylinder base metal, a hardened heat-affected zone, the addition of extraneous weld metal, or the removal of metal by scarfing or cratering.

2.2 bulge. Visible swelling of the cylinder.

2.3 competent person. A person who by a combination of training, experience and supervision can make objective judgments on a subject.

2.4 condemned. Scrap, no longer fit for use.

2.5 corrosion or pitting. The loss of wall thickness by corrosive media.

2.6 crack. A split or rift in the cylinder shell.

2.7 crevice corrosion. Occurs in the area of the intersection of the footring or headring with the cylinder.

2.8 cuts, gouges or digs. Deformations caused by contact with a sharp object in such a way as to cut into or upset the metal of the cylinder, decreasing the wall thickness at that point.

2.9 dents. Deformation caused by the cylinder coming in contact with a blunt object in such a way that the thickness of the metal is not materially damaged.

2.10 enterprises. Companies or organizations engaged in the filling of cylinders.

2.11 general corrosion. A reduction in wall thickness over an area exceeding 20% of the cylinder surface.

2.12 high pressure cylinders. Cylinders with a marked service pressure greater than 6 200 kPa (900 psi).

2.13 independent inspecting authority. The Bureau of Standards Jamaica.

2.14 inspection agencies. Any company/person authorized by the Independent Inspecting Authority to carry out inspection and retesting of cylinders on its behalf.

2.15 intersecting cut or gouge. The point of intersection of two or more cuts or gouges.

2.16 isolated pitting. Isolated pits of small diameter that do not effectively weaken a cylinder.

2.17 line corrosion. Corrosion which results in a continuous pattern or when pits are connected to others in a narrow band or line. This condition is more serious than isolated pitting.

2.18 low pressure cylinders. Cylinders with a marked service pressure of up to 6 200 kPa (900 psi).

2.19 Minimum Allowable Design Thickness. Minimum design thickness required by the specification under which the cylinder is manufactured.

2.20 Minimum Allowable Wall Thickness. The minimum wall thickness required by the specification under which the cylinder was manufactured.

2.21 reject. Not fit for service in its present condition.

3. Administration

3.1 Functions of the independent inspecting authority

3.1.1 To ensure that the packaging and/or distributing enterprises comply with the requirements of this standard and other requirements that it may dictate on the matter.

3.1.2 To authorize and monitor the inspection agencies/bodies that carry out periodic inspection and/or repairing of cylinders.

3.2 Obligation of the enterprises (companies)

3.2.1 To ensure that all inspections are carried out by a competent person (s).

3.2.2 To remove from the filling line, cylinders that have completed the term for being subjected to periodic inspection.

3.2.3 To remove from the filling line, any cylinder that through visual inspection appears to require re-certification in accordance with section two.

3.2.4 Without the intervention of an inspection agency, shall be able to put out of use and destroy the cylinders that cannot be repaired. A monthly summary of all cylinders destroyed shall be sent to the Independent Inspecting Authority (see 13.2).

3.3 Obligations of the inspection agencies

3.3.1 To ensure that all inspections are carried out by a competent person (s).

3.3.2 To effect periodic inspection and repairs that may result in conformity with the requirements contained in this standard and other instructions received from (or on behalf of) the Independent Inspecting Authority.

3.3.3 To issue a certificate of periodic inspection as indicated in clause 12 of this standard.

3.3.4 To carry out periodic inspection and/or repairs in a safe environment as defined and approved by the Independent Inspection Authority.

3.3.5 To have an indelible emblem that identifies the inspection agency. This emblem shall be approved by the Independent Inspecting Authority.

3.4 Other requirements. Authority to perform retesting according to this standard shall remain valid providing that the level of personnel and equipment used, is maintained at least equivalent to the level observed at the time of the previous inspection by the Independent Inspecting Authority.

4. Conditions for use of cylinder

4.1 Cylinders for containing gases shall be as specified in JS 25 or shall be listed as suitable for the conveying of compressed gases in the applicable Code of Federal Regulations Standard: Title 49. Such cylinders when used more than once, are required to be in such condition that they:

(a) do not leak;

(b) do not bulge;

(c) have no defective valves or safety devices; and

(d) bear no evidence of physical abuse, fire or heat damage, detrimental rusting or corrosion.

4.2 Where cylinders of a given service pressure are prescribed, other cylinders made under the same specification, but designed with a higher rated service pressure limit, are authorized for use.

4.3 A cylinder in use prior to the date on which this specification was first made effective, may continue to be used until the scheduled retesting date, at which time they will be recertified.

4.4 Storage, handling and transportation of LPG cylinders shall conform to national regulations.

5. Change of cylinder marking

5.1 Each required marking on a cylinder shall be maintained so that it is legible. Retest markings and original markings which are becoming illegible may be reproduced by stamping on a metal plate which shall be permanently secured to the collar of low pressure cylinders or stamped to the shoulder of high pressure cylinders.

5.2 Except for the marked service pressure, markings required on the cylinders may not be altered or removed.

5.2.1 Additional information not affecting the markings prescribed in JS 25 may be placed on the cylinder in locations stipulated in 5.1.

5.2.2 No indentation may be made on the sidewall of the cylinder unless specifically permitted in the applicable specification.

5.3 Other serial numbers and identification symbols may be added by the owners.

5.3.1 Identification symbols and serial numbers shall be registered and approved by the Independent Inspecting Authority before any marking is affixed to the cylinder.

5.3.2 A report, in sufficient detail, that previous serial numbers and identification symbols can be easily determined for each cylinder, shall be made to the Independent Inspecting Authority for approval before markings are done.

5.4 When the space originally provided for dates of subsequent retest dates becomes filled, the stamping of additional test dates may be carried out on a plate permanently secured to the cylinder.

5.5 The marked service pressure may be changed only upon application to the Independent Inspecting Authority and receipt of written instructions on the procedure to be followed. A service pressure change is not authorized for a cylinder which fails the prescribed periodic hydrostatic retest, unless it is reheat-treated and requalified in accordance with JS 31.

6. Pressure relief device systems

6.1 Each cylinder (except in 6.3) charged with compressed gas shall be equipped with one or more safety devices approved by the Independent Inspecting Authority and shall be capable of preventing explosion of the normally charged cylinder when it is subjected to a fire test conducted in accordance with CGA Pamphlet C-14. A cylinder shall not be shipped with a leaking safety relief device. Safety relief devices shall be tested for leaks and other defects before the charged cylinder is shipped from the cylinder filling plant. Safety relief devices shall satisfy the requirements of JS 25.

6.2 It is expressly forbidden to repair a leaking fusible plug device. A leaking fusible plug device shall be replaced only by a person authorized by the Independent Inspecting Authority.

6.3 Safety relief devices are not required on the following cylinders under the following circumstances:

(a) cylinders 300 mm or less in length, exclusive of the neck, and 112 mm or less in outside diameter do not require safety relief devices, except where these are, as described (see 6.4).

(b) cylinders conveying toxic gases specified in JS 25 are not to be used with safety relief devices.

(c) cylinders charged with mono-, di-, or trimethylamine, anhydrous; with not over 45 kg of nitrosyl chloride*, or with less than 75 kg anhydrous ammonia* do not require safety relief devices.

6.4 Safety relief devices are required on:

(a) cylinders charged with a liquefied gas to a service pressure of 12.4 MPa or higher.

(b) cylinders charged with a non-liquefied gas to a pressure of 12.4 MPa or higher at 21°C. and

(c) non-reusable cylinders. Metal safety relief valves are required on non-reusable cylinders for liquefied flammable gases.

Section two. Inspection and retesting

7. General requirements

7.1 Periodic testing. This must be performed by an authorized retester and must include a visual internal examination in accordance with clause 9 and clause 10 and a test by hydrostatic pressure in water jacket or other apparatus suitable for determination of the expansion of the cylinder (see clause 11). The internal inspection may be omitted for cylinders used for transporting non-corrosive low and high pressure liquefiable gases subjected to an external visual inspection only or the modified hydrostatic test (see 7.4).

7.2 Periodic inspection. All gas cylinders shall be subjected to periodic inspection and test in accordance with clause 8, clause 9 or clause 10 at the intervals stated in table 1. Applications shall be

be made to the Independent Inspecting Authority for the period of, and procedure for, retest and inspection of cylinders for use with gases not included in table 1.

7.3 Test pressure. The test pressure to be applied shall normally be stamped on the cylinder. For a list of the minimum retest pressure for DOT cylinders see appendix A.

7.4 Exceptions. Some cylinders by nature of the content of the gas for which they are used are exempted from the conventional hydrostatic test. They must however be subject to the modified hydrostatic test. A list of these cylinders is given in appendix A.

7.5 Preparation for inspection

7.5.1 Rust, scale, caked paint, and the like, shall be removed from that part of the exterior surface where corrosion is evident so that the base metal can be adequately exposed.

7.5.2 Means shall be provided for inverting the cylinder to facilitate inspection of the bottom. This is important because experience has shown this area to be the most susceptible to corrosion.

7.5.3 Cylinders shall be checked as outlined in clause 8 to clause 10 for corrosion, general distortion, leaks, fire damage, and any other defect that might indicate a weakness that would render them unfit for service.

7.6 Inspection equipment

7.6.1 Exterior corrosion, dents, bulges, gouges or digs are normally measured by simple direct measurement with scales or depth gauges. A rigid straight edge of sufficient length may be placed over the defect and a depth gauge/scale used to measure the distance from the bottom of the straight edge to the bottom of the defect.

Table 1. Interval between periodic inspection and hydrostatic tests

Duty of gas cylinder	**Interval between each inspection/hydrostatic test in accordance with clause 9 or clause 10.** **Years**	**Interval between each inspection/hydrostatic test and visual inspection only in accordance with clause 8.** **Years**
Permanent gases: oxygen, argon, nitrogen, hydrogen, air, helium, xenon, krypton, neon, boron trifluoride	5 or 10 (see NOTE 2)	-
All gases and gas mixture used in self-contained under-water breathing dress apparatus	2 (see NOTE 3)	-
Manufactured gas, carbon monoxide, fluorine, methane and natural gas	3 (See NOTE 1)	-
Non-corrosive low pressure liquefiable gases: ammonia, butadiene, butane, dimethylether, ethylamine, ethylene ethyl chloride, oxide, hydrogen cyanide, refrigerant gases, mono- methylamine, dimethylamine, trimethylamine, methylbromide, methylchloride, propane, propylene, cyclopropane, vinyl chloride	12 (see NOTE 4)	7
Corrosive low pressure liquefiable gases: boron trichloride, carbonyl chloride, chlorine trifluoride, hydrogen fluoride, hydrogen sulphide, nitrogen tetroxide, nitrosyl chloride, sulphur dioxide	5	-
Non-corrosive high pressure liquefiable gases: ethane, ethylene, nitrous oxide, sulphur hexafluoride, chlorotrifluoro-methane, bromotri-fluoromethane	12	7
Carbon dioxide (excluding fire extinguishing purposes)	7	-

Carbon dioxide, bromochloromethane, bromochlorodifluoro- methane, bromotrifluoro-methane, dibromotetrafluoro-ethane (all for fire extinguishing purposes)	10 or 20 (see NOTE 5)	-
Corrosive high pressure liquefiable gases: hydrogen chloride	5	-

NOTE 1. Manufactured gas includes town gas, coal gas and other manufactured fuel gases.

NOTE 2. Provided the dew point is not higher than -46°C at 1013 mbar, the period may be 10 years. In order to take advantage of the relaxation to 10 years, an application shall be made in writing to the Independent Inspecting Authority giving full details on how the dryness of the gas is to be controlled. This relaxation will be granted only to industrial concerns approved in writing.

NOTE 3. The initial periodic test shall be carried out 3 years after manufacture; subsequent tests will be at intervals of 2 years.

NOTE 4. The initial periodic test shall be carried out 10 years after manufacture; subsequent tests will be at intervals of 5 years.

NOTE 5. Provided each container is submitted to a full external inspection every 12 months from the date it is introduced into service, the period before the first periodic inspection and test may be extended to 20 years.

7.6.2 Commercial depth gauges are available that are especially suitable for measuring the depth of small cuts or pits. It is important when measuring such defects to use a scale that spans the entire affected area. When measuring cuts, the upset metal should be removed or compensated for, so that only the actual depth of metal removed from the cylinder wall is measured.

7.6.3 There are a variety of commercial ultrasonic devices available. These can be used to detect sub- surface faults and to measure wall thickness.

7.6.4 Magnetic particle inspection can be adapted for cylinder inspection to quickly locate surface faults not readily visible to the naked eye.

7.6.5 Dye penetrant materials are available which show surface faults not readily visible to the naked eye.

8. Low pressure cylinders exempt from hydrostatic testing

8.1 General. This section refers to cylinders as defined in clause 7.4.

8.2 Corrosion

Corrosion or pitting in cylinders involves the loss of wall thickness by corrosive media. There are several kinds of pitting or corrosion to be considered.

Isolated pitting of a small cross-section does not effectively weaken the cylinder wall but may lead to complete penetration and leakage. If the pitting is isolated, the original wall is essentially intact.

8.2.1 Corrosion limits. To fix corrosion limits for all types, designs and sizes of cylinders, and

include them in this standard is not practicable. Failure to meet any of the four general rules detailed in
8.2.1.1 to 8.2.1.4 is cause for condemning the cylinder**.**

8.2.1.1 When a cylinder exhibits corrosion, the cylinder shall be condemned when the tare weight is less than 90% of the original stamped weight. A cylinder shall be rejected when the tare weight is less than 95% of the stamped tare weight. A rejected cylinder may be requalified in accordance with JS 25 by water jacket or by direct expansion testing with determination of expansion measurements. When determining tare weight, be sure the cylinder is empty.

8.2.1.2 A cylinder shall be condemned when the remaining wall in an area having isolated pitting only is less than one-third of the original minimum allowable wall thickness.

8.2.1.3 A cylinder shall be condemned when the line or crevice corrosion on the cylinder is 75.0 mm in length or over and the remaining wall is less than three-fourths of the original minimum allowable wall thickness.

8.2.1.4 A cylinder shall be condemned when the remaining wall in an area of general corrosion is less than one-half of the original minimum allowable wall thickness.

8.2.2 Representative cylinder wall thickness. To use the criteria in 8.2.1, it is necessary to know the original wall thickness of the cylinder or the original minimum allowable wall thickness.

Table 2 Minimum allowable design thickness for certain common size low pressure cylinders

Nominal cylinder diameter (mm)	DOT specification marking (mm)	Original minimum allowable wall thickness* (mm)
101.6	4B500	2.16
127.0	4B400	2.77
127.0	4B240	2.29
152.4	4B400	2.29
152.4	4BA500	2.03
152.4	4B500	2.82
152.4	4B240	2.29
171.5	4B300	2.29
177.8	4BA300	2.21
203.2	4B400	3.18
203.2	4B240	2.29
203.2	4B300	2.67
203.2	4BA300	2.21
228.6	4B240	2.29
228.6	4BA240, 4BW240, 4BA300, 4BW300	1.98
254.0	4BA240, 4BW240, 4BA300, 4BW300	1.98
304.8	4B240	2.67
304.8	4B240, 4BW240	1.98
368.3	4B240	3.18
368.3	4BA240, 4BW240	2.21
368.3	4AA480	4.70
368.3	3A480	5.38
558.8	4B240	4.85
558.8	4BA240, 4BW240	3.30
609.6	4B240	5.28
609.6	4BA240, 4BW240	3.61
762.0	4B240	6.38
762.0	4BA240, 4BW240	4.37

*Some cylinders have thicker walls due to differences in manufacturing methods and inspection procedures. Values shown are for absolute minimums allowed by specifications. Higher values may be used if information showing thicker walls than those listed is obtained from the manufacturer of the cylinder. The use of ultrasonic testing is suggested for determining wall thickness.

Table 2 provides original minimum allowable wall thickness for a number of common size low pressure cylinders which are likely to be governed by the criteria of this section.

8.2.3 Application of limits. To illustrate how to establish actual corrosion rejection limits, an example using a cylinder of Specification 4B240 with 368.3 mm nominal diameter is given in appendix B. From table 2, the original minimum wall thickness is 3.175 mm. For measurement of pit depth, see figure 1 and figure 2.

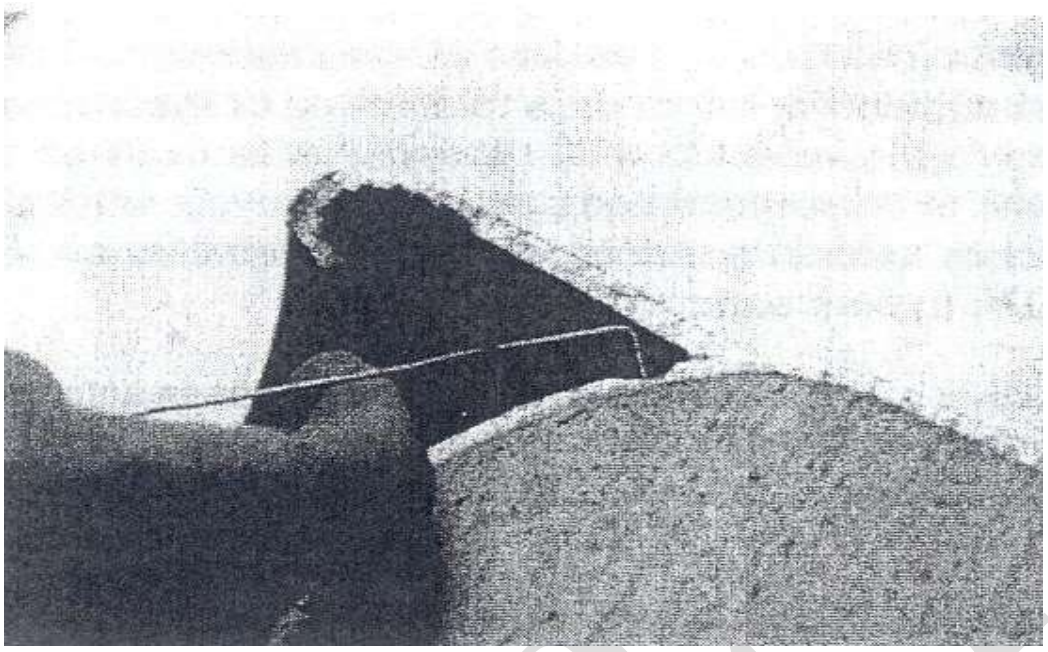
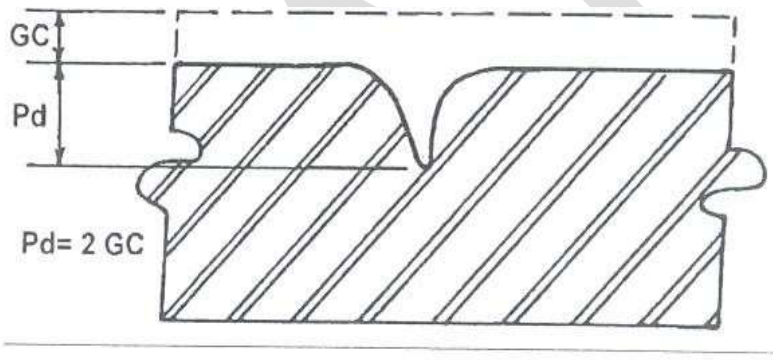


Figure 1. Crevice corrosion near the cylinder footring



GC = general corrosion
loss Pd = pitted depth

Figure 2. Relative pitted depth corrosion loss

8.3 Dents

Dents in cylinders are deformations caused by cylinders coming in contact with a blunt edge in such a way that the thickness of metal is not materially impaired.

Dents are of concern where the metal deformation is sharp and confined, or where they are near a weld. Where metal deformation is not sharp, dents of larger magnitude can be tolerated.

8.3.1 Rejection rules

8.3.1.1 Dents at welds. Where denting occurs so that any part of the deformation includes a weld, the maximum allowable dent shall be 6 mm in depth. The depth should be measured on a longitudinal plane.

8.3.1.2 Dents away from welds. When denting occurs so that no part of the deformation includes a weld, the cylinder shall be rejected if the depth of the dent is greater than one-tenth of the greatest dimension of the dent.

8.4 Cuts, gouges and digs

Cuts, gouges and digs in cylinders are deformations caused by contact with a sharp object in such a way as to upset the metal of the cylinder, decreasing the wall thickness at that point. In addition, they raise the stress of the steel.

When measuring cuts, gouges or digs, the upset metal should be removed or compensated for, so that only the actual depth of metal removed from the cylinder wall is measured.

8.4.1 Rejection rules

8.4.1.1 Cuts, gouges or digs reduce the wall thickness of the cylinder and contribute to increased stress. Depth limits are as set below; however cylinders shall be condemned at one-half of the limit set whenever the length of the defect is 76 mm or more.

8.4.1.2 When the original wall thickness at manufacture is not known and the actual wall thickness cannot be measured, a cylinder shall be condemned if the cut, gouge, or dig exceeds one-half of the minimum allowable design thickness.

EXAMPLE. In a 368 mm nominal diameter DOT-4B240, 45.4 kg propane cylinder, the depth of the defect shall not exceed one-half of 3.18 mm or 1.58 mm. If the defect was 76 mm or more in length, it shall not exceed one-half of 1.58 mm or 0.79 mm.

8.4.1.3 When the original wall thickness at manufacture is known or the actual wall thickness is measured, a cylinder shall be condemned if the original wall thickness minus the depth of the defect is less than one-half of the minimum allowable design thickness.

8.4.1.4 Intersecting cuts and gouges shall be rejected in all cases.

8.5 Bulges

Cylinders are manufactured with a reasonably symmetrical shape. Cylinders which have definite visual bulges shall be removed from service and evaluated as outlined in this section.

8.5.1 Measurement

Bulges in cylinders can be measured as follows:

(a) Bulges on the cylinder sidewall can be measured by comparing a series of circumferential measurements.
(b) Bulges in the head, and also in some cases on the sidewall, can be measured by comparing a series of measurements of the peripheral distance between the valve spud and the center seam (if any) or an equivalent fixed location on the cylinder sidewall.
(c) Variations from normal cylinder contour can be measured directly by measuring the height of a bulge with a scale or comparing templates of bulged areas with similar areas not bulged.

8.5.2 Rejection rules

Cylinders shall be condemned when a variation of 1% or more is found in the measured circumferences or peripheral distances measured from the valve spud to the centre seam (or equivalent fixed point).

EXAMPLE. An example for a 381 mm outside diameter cylinder follows:

Normal cylinder outside diameter	381 mm
Cylinder circumference	1196.9 mm
Maximum circumference (47.12 + .01[47.12])	1208.8
mm Variation in circumference	11.9 mm
Equivalent variation in diameter $\frac{0.47}{\Pi}$	3.8 mm

If the bulge is uniform around the cylinder, the limiting height of the bulge would be:

$\frac{3.81 \text{ mm}}{2} = 1.90$ mm

8.6 Leaks

Leaks may originate from a number of sources, such as defects in a welded or brazed seam, defects at the threaded opening, or from sharp dents, digs, gouges or pits.

To check for leaks, the cylinder shall be charged and carefully examined. All seams and pressure openings, sharp dents, digs, gouges, and pits shall be coated with soap or other suitable solution to detect the escape of gas.

8.6.1 Rejection rules

Any leakage, other than leakage and thread connection which can be corrected by tightening, shall be cause for rejection. Repairs shall be made by the cylinder manufacturer or by a repair facility authorized by the Independent Inspecting Authority.

8.7 Fire damage

Cylinders shall be carefully inspected for evidence of exposure to

fire. Common evidence of exposure to fire are:

(a) charring or burning of the paint or other protective coat.

(b) burning or discoloration of the metal.

(c) distortion of the cylinder.

(d) melted out fuse plugs or plugs with visibly extruded fusible metal

(e) burning or melting of valve.

(f) melting of any plastic components e.g. date ring, plug or cap.

8.7.1 Rejection rules

Cylinders which have been damaged by fire shall not be placed in service until they have been returned to the manufacturer, or to a repair facility authorized by the Independent Inspecting Authority, for reheat-treating, retesting and installing of new valves and new safety devices, as required by the regulations of the Bureau of Standards Jamaica.

If the protective coating on the cylinder is only discoloured from smoke or debris and it is found by examination that the coating is intact, the cylinder need not be considered to have been affected by the fire exposure and thus is not subject to heat treatment and retest requirements. Valves and safety devices on such cylinders, however, should be examined and tested to determine whether they are functioning properly and should be replaced if necessary. Hydrostatic testing is not an adequate test and shall not be used to determine the extent of fire damage.

If the paint is only superficially charred, a cylinder may be accepted by a competent person.

8.7.2 Arc and torch burns

Cylinders with arc and torch burns shall be rejected. Defects of this nature can be recognized by one of the following conditions:

(a) removal of metal by scarfing or cratering;
(b) a scarfing or burning of the base metal; or
(c) a deposit of weld metal or displacement of base metal.

8.8 Neck defects

Cylinder necks shall be examined for cracks, folds, and other flaws. Neck defects are normally detected by testing (spraying or covering) the neck during charging with a suitable leak detection solution.

Cylinder neck threads shall be examined whenever the valve is removed from the cylinder. At manufacture, cylinders have a specified number of full threads of proper form as required by the applicable thread standards.

Each time valves are removed; all threads of cylinders in corrosive service shall be visually inspected by an inspector knowledgeable in the specifications for these threads and familiar with the requirements of this section to confirm the suitability of these threads for continued service. As manufactured, cylinders shall have a minimum length of full thread as specified in the "L-1 + L-3" column of table 4, CGA V-1 *Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections.*

Using adequate and sufficient lighting, the inspector shall visually determine the number of full threads. A thread shall be considered full if its root and crest display no significant visual difference to that of the upper-most cylinder thread. Threads that do not meet this criteria are considered to be incomplete or a partial thread.

NOTE. More information on threads can be found in CGA V1.

8.8.1 Rejection rules

Cylinders shall be rejected if the required number of threads is materially reduced, or if a gas-tight seal cannot be obtained by reasonable valving procedures. Common thread defects can include but are not limited to worn or corroded crests, broken threads, nicked or cut threads.

Cylinders failing to meet the following criteria shall be rejected or condemned:

(a) At least five continuous full threads for tapered threads on low pressure cylinders, seven continuous full threads for tapered high pressure cylinders, and at least six full threads for all cylinders with straight heads;
(b) No visible cracks in the threads or adjacent visible areas; and
(c) No visible damages from corrosion or other sources that might adversely affect the

structural integrity of the threads of valve installation.

Cylinders shall be rejected if a gas-tight seal cannot be attained after the cylinder is valved.

8.9 General distortion

Noticeable distortion may be evaluated by references to the sections in these procedures under denting or bulging. If the valve is noticeably tilted, the cylinder shall be rejected.

8.10 Attachments

8.10.1 Footrings and headrings of cylinders shall be examined to determine whether they are in serviceable condition. Distortion of the footring through service abuse may prevent it from supporting the cylinder properly in an upright and stable position. Likewise, distortion of the headring could prevent it from protecting the cylinder valve. In addition to distortion, footrings and headrings shall be examined for looseness and failure of welds especially where the base metal of cylinders has been removed.

8.10.2 Cylinders may be rejected based on visual inspection of the attachment.

8.10.3 Repairs to footrings and headrings shall be made only by a manufacturer of the same type of cylinder or a cylinder repair facility authorized by the Independent Inspecting Authority.

8.10.4 Cylinders specified by DOT-4BW240 series and JS 25 that are used to transport liquefied petroleum gas (without regard to the date of previous tests) that show dents or other evidence of rough usage, or that are found to be corroded, shall be retested and certified before being recharged.

8.10.5 When a cylinder bears a removable attachment, it shall be removed prior to the visual inspection of the cylinder.

8.10.6 In the case of a marking plate not completely sealed, any evidence of corrosion between it and the wall shall require removal of the plate and visual inspection of the cylinder wall. However, removal of the plate shall be undertaken only by authorized inspection agencies.

9. Low pressure cylinders subject to hydrostatic testing

9.1 General. Cylinders covered in this section are low pressure cylinders not exempted from hydrostatic requirements. Requirements for exempted cylinders are covered in clause 8. Cylinders not exempted require an internal and external examination and a hydrostatic retest. Defects applicable to the external examination are prescribed in clause 8. Additional procedures for internal inspection are detailed in 9.2 and 9.3.

9.2 Preparation for inspection

9.2.1 The provisions obtained in 7.1 and 7.2 shall be followed. Additionally, the interior of the cylinder shall be prepared for inspection by removal of internal scale, or other condition which would interfere with the inspection of the internal surface. Cylinders with an interior coating shall be examined for defects in the coating. A defective coating shall be removed.

9.2.2 An inspection light of sufficient intensity to illuminate the interior walls is mandatory for internal inspection. Flammable gas cylinders shall be purged with inert gas or water before being examined with a light. Steps shall be taken to ensure that cylinder contents are completely removed prior to purging. Cylinders containing liquefied gases shall have their tare weight checked to ensure all liquefied gases have been emptied before being purged.

9.3 Internal inspection

Cylinders shall be inspected internally at least every time the cylinder is periodically retested.

9.3.1 General corrosion. Interior general corrosion can be evaluated by ultrasonic examination or a hydrostatic test combined with careful inspection. Thickness measuring and flaw detection devices of the ultrasonic type may be used to evaluate specific conditions. For basic corrosion limits, refer to 8.2.1.

9.3.2 Defects other than corrosion. A cylinder shall be rejected when doubt exists as to its suitability for continued service. Where the bottom of the defect cannot be seen or where its extent cannot be measured by various inspection instruments, the cylinder shall be condemned. Examples of such internal defects are: cuts, mechanical abrasions and fabrication irregularities.

10. High pressure cylinders

High pressure cylinders are those cylinders with a marked service pressure of 6210kPa (900 psi) or greater. They are seamless; no welding is permitted.

10.1 Preparation for inspection

Cylinder inspection shall only be undertaken if the possible dangers associated with the contents and pressure of the cylinders are recognized and appropriate precautions are taken.

WARNING. Use CGA P-38, Guidelines for Devalving Cylinders, for devalving guidelines. Cylinders containing a flammable or toxic gas shall be purged properly using inert gas or water in a safe area.

10.2 Hammer test

10.2.1 The hammer test is a valuable indicator of internal corrosion and is a convenient test that can be made without removing the valve prior to each charging of the cylinder. The hammer test should be performed on empty unpressurized cylinders.

10.2.2 The hammer test consists of tapping the cylinder sidewall with a light blow using a 0.23 kg ball-peen hammer or equivalent. A cylinder will normally have a clear ring. A dull ring would indicate internal corrosion, liquid or accumulation of foreign material in the cylinder. Such cylinders shall be inspected internally in accordance with 9.3.

NOTE. The hammer test is not applicable to aluminum cylinders.

10.3 Exterior inspection

10.3.1 General. Cylinder sidewalls and bottoms shall be in a condition that allows adequate visual inspection. If paint or other material has accumulated on the cylinder thick enough to prohibit full view of sidewall and bottom defects, such accumulation shall be completely removed.

10.3.2 Corrosion limits. The corrosion limits for a cylinder are defined as a function of the minimum allowable design thickness (t_d) and they apply to crevice and line corrosion, general corrosion, and isolated pits or clusters of pits. Basic corrosion limits apply to both internal and external corrosion.

The actual measured wall thickness shall be at least 95% of the minimum allowable design

thickness (t_d) or the cylinder shall be condemned. Whenever the corrosion includes isolated pits, the cylinder shall be examined using the criteria in 10.3.2.3.1. Figure 3 shows the acceptance/rejection criteria of cylinders with isolated pits and general corrosion.

The following formula can be used to calculate the minimum allowable design thickness for DOT-3A and DOT-3AA high pressure cylinders, and was used to develop the factors in table 3.

$$t_d = \frac{D}{2}\left[1 - \sqrt{\frac{S - 1.3P}{S + 0.4P}}\right]$$

where:
t_d = Minimum allowable design thickness D = Cylinder outside diameter
P = Minimum test pressure S = Maximum wall stress

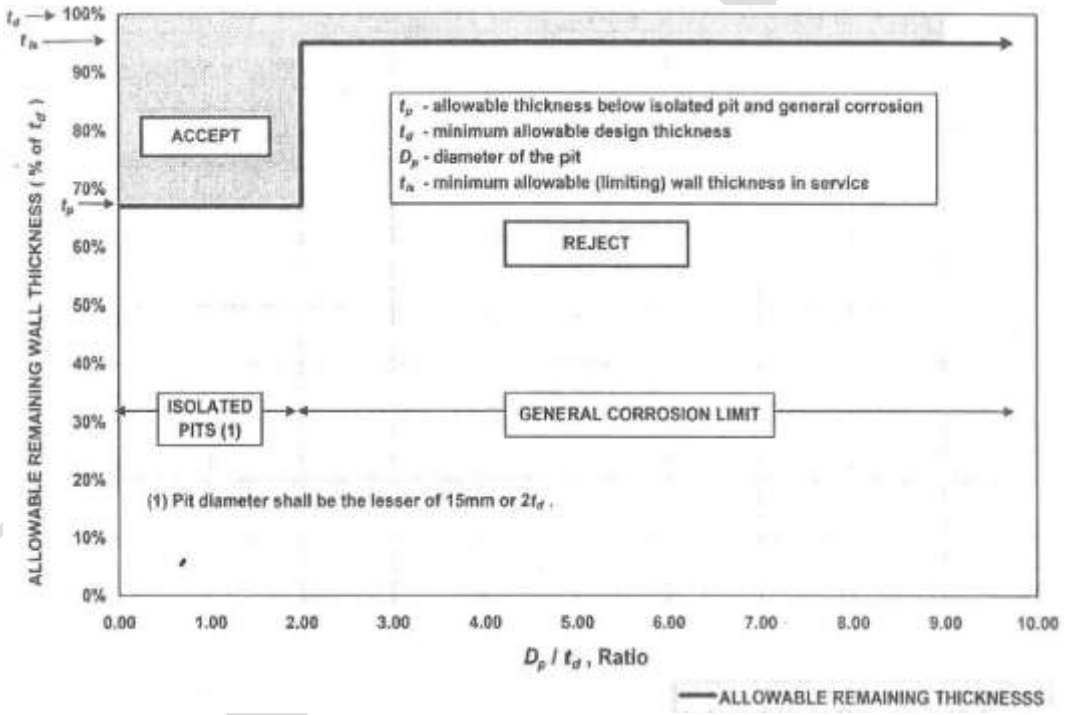


Figure 3. Inspection requirements for corrosion limits

Table 3. Factors for calculation of minimum allowable design thickness for DOT -3A and DOT-3AA high pressure cylinders

DOT specification	At manufacturer	In service
3A1800	0.0232	0.0220
3A2015	0.0260	0.0247
3A2265	0.0293	0.0278
3A2400	0.0310	0.0295
3AA1800	0.0182	0.0173
3AA2015	0.0204	0.0194
3AA2265	0.0230	0.0219
3AA2400	0.0243	0.0231
3AA3000	0.0304	0.0289
3AA3500	0.0356	0.0338
3AA4500	0.0458	0.0435

DOT specification	At manufacturer	In service
3AA6000	0.0612	0.0581

NOTE. The factors in this table also can be used to determine the allowable minimum design thickness (t_d). To determine cylinder minimum allowable design thickness (t_d), multiply the cylinder's outside diameter by the conversion factor in this table.

10.3.2.1 ***Crevice and line corrosion.*** These procedures shall be followed when considering crevice and line corrosion:

(a) **When the remaining wall thickness is measurable:**

(1) Determine the in-service minimum allowable (limiting) wall thickness (t_{is}) for the cylinder being inspected.

(2) **Rejection rules.** Condemn the cylinder when the remaining wall thickness (surface measurement minus the deepest corrosion depth) is less than the limiting wall thickness.

(b) **When the original wall thickness is unknown and the remaining wall thickness cannot be measured:**

(1) Determine the manufacturing minimum allowable design thickness (t_d) (table 3); and

(2) Determine the in-service limiting wall thickness.

(3) **Rejection rules.** Condemn the cylinder when the measure corrosion defect is greater than the difference between the manufacturing minimum allowable thickness (t_d) and the limiting wall thickness

10.3.2.2 ***General corrosion.*** The following procedures shall be followed when considering general corrosion:

(a) When the tare weight is marked on the cylinder and the tare weight at the time of inspection is less than 95% of the original marked tare weight, the cylinder shall be condemned. Cylinders with a water capacity greater than 227 kg such as tube trailers or multi-element gas containers (MEGCs) are not subject to this requirement; or

(b) When the original tare weight is unknown:

(1) If the in-service minimum allowable wall thickness (t_{is}) is known (or determinable by calculation in 10.3.2 or by table 3), the cylinder is to be condemned when either:

(i) the remaining wall thickness within the area of general corrosion as directly measured by ultra-sonic equipment such as a thickness gauge is below the in-service minimum allowable wall thickness (t_{is}), or:

(ii) the remaining wall thickness within the area of general corrosion as calculated by measuring the depth of the external corrosion and subtracting this measurement from the minimum allowable design thickness *(t_d)* of the cylinder as measured by a depth gauge is below the in-service minimum allowable wall thickness (t_{is}).

Whether the cylinder is condemned or not, these measurements shall be documented as part of the records; or

(2) If the in-service minimum allowable wall thickness *(t_{is})* is unknown or the remaining wall thickness is not known, then the cylinder shall be condemned when the general corrosion covers more than 20% of the cylinder surface area. Cylinders with a water capacity greater than 227 kg such as tube trailers and MEGCs shall comply with 1(i) or 1(ii). If the general corrosion is less than 20%, measure the remaining wall thickness as described in 10.3.2.1 and condemn the cylinder when the remaining wall thickness is less than the limiting wall thickness.

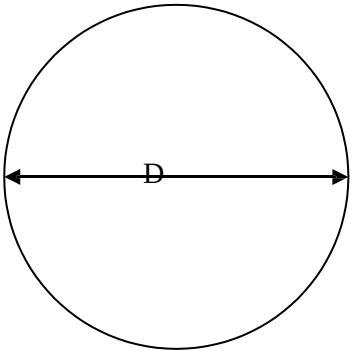
10.3.2.3 Isolated pits

10.3.2.3.1 An isolated pit is any area of corrosion that is smaller in diameter than two times the minimum allowable design thickness *(t_d)* or 15 mm, whichever is less (see figure 4a), and the distance from the center of the pit to the center of the next nearest pit shall be greater than the sum of the diameters of the two pits (see figure 4b).

10.3.2.3.2 Rejection rules

Isolated pits shall not exceed one-third of the minimum allowable design thickness *(t_d).*

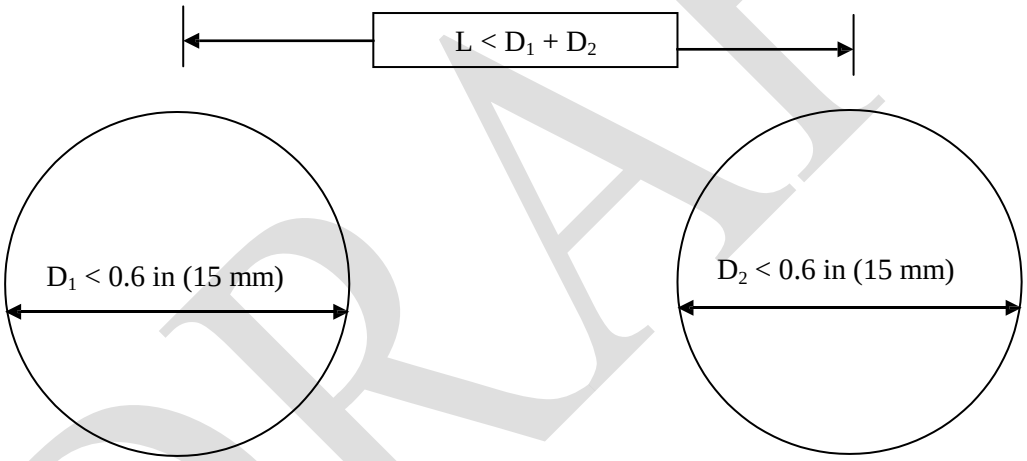
Cylinders shall be condemned when they exhibit isolated pits with a depth greater than one-third of the minimum allowable design thickness *(t_d).*



Isolated pit

Lesser of D < 2 t_d or 0.6 in (15 mm)

Figure 4a. Consideration of pit diameters, isolated pit

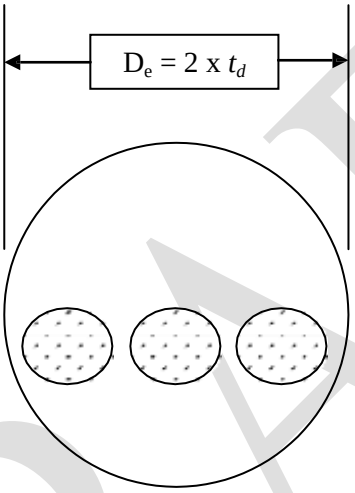


Isolated pits

Figure 4b. Consideration of pit diameters, isolated pits

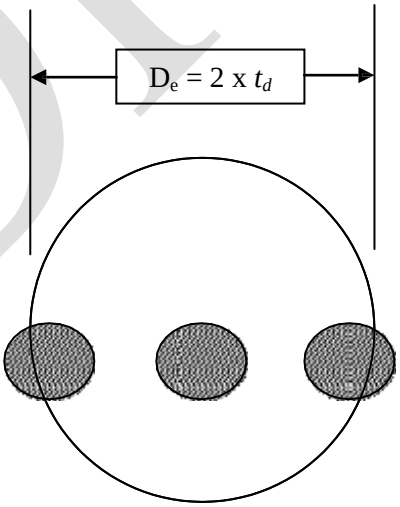
10.3.2.4 ***Cluster of pits*****.** Clusters of pits (or multiple pits) are groups of pits that have a diameter less than two times the minimum allowable design thickness *(t_d)* and where the center to center distance between any two pits is less than the sum of the diameters of the two pits ($L < D_1+D_2$). For a cluster of pits, the remaining wall thickness at the deepest pit shall be at least 95% of the minimum allowable design thickness *(t_d)* or the cylinder shall be condemned.

To determine if a cluster of pits is considered to be an area of general corrosion or an isolated pit, an envelope is drawn around the entire cluster of pits. If the envelope is smaller than two times the minimum allowable design thickness *(t_d)* ($D_e < 2\ t_d$), then the cluster of pits should be considered an isolated pit (see figure 5a). Isolated pits are as defined in 10.3.2.3.1. If the diameter of the envelope is larger than two times the minimum allowable design thickness *(t_d)*, ($D_e > 2\ t_d$) then the cluster of pits should be considered as an area of general corrosion with a size equal to the diameter of the envelope (see figure 5b).



Cluster of pits that may be considered as an isolated pit D_e = Diameter of the cluster envelope

Figure 5a. Consideration of cluster pitting, isolated pit



Cluster of pits that shall be considered as an area of general corrosion D_e = Diameter of the cluster envelope

Figure 5b. Consideration of cluster pitting, area of general corrosion

10.3.2.5. ***Inspection requirement for corrosion.*** The inspection requirements for corrosion are provided in figure 3.

10.3.3 Cuts, gouges and digs

10.3.3.1 ***Measurement.*** Cuts, gouges, or digs may be measured with suitable depth gauges (any upset metal shall be smoothed off to allow true measurements without causing further damage to the parent metal).

10.3.3.2 ***Rejection rules.*** The cylinder shall be rejected if the established limits according to 10.3.2 by stress considerations have been reached.

10.3.3.3 ***General.*** Any defect of appreciable depth having a sharp bottom raises stress, and, even though a cylinder may be acceptable from a stress standpoint, it is common practice to remove such defects. After any such conditioning operation, verification of the cylinder strength shall be made by wall thickness measurement followed by hydrostatic testing.

10.3.4 Dents. Dents can be tolerated when the cylinder wall is not excessively or abruptly deformed. Consideration of appearance plays a major factor in the evaluation of dents. In general, industry practice for a 230 mm (dia.) x 1300 mm (length) cylinder accepts dents of up to 1.575 mm depth when the major diameter of the dent is 50 mm or greater.

10.3.5 Arc and torch burns

10.3.5.1 Defects of this nature may be recognized by one of the following conditions:

(a) removal of metal by scarfing or cratering;
(b) a scarfing or burning of the base metal;
(c) a hardened heat-affected zone; or
(d) a deposit of weld metal or displacement of base metal.

10.3.5.2 ***Rejection rules*****.** Cylinders with arc or torch burns shall be rejected.

10.3.6 Bulges. Cylinders are manufactured with a reasonable symmetrical shape. Those with definite visible bulges such as caused by fire damage or over pressuring shall be condemned.

10.3.7 Fire damage. See 8.7.

10.3.8 Neck defects. The requirements of 8.8 shall be applicable.

10.3.9 Attachments. Attachments on cylinders may lose their intended function through service abuse. These attachments and associated parts of the cylinder shall receive careful inspection. Welding is not permitted on high pressure cylinders. Other requirements regarding attachments are given in 8.10.

10.4 Internal inspection

Cylinders shall be inspected internally at least every time the cylinder is periodically retested. The interior of the cylinders shall be prepared for inspection by removal of dirt, scale, or other conditions as necessary to permit the inspection of the internal surface. Cylinders with interior coating shall be examined for defects in the coating. If the coating is damaged, it shall be removed. A good inspection light, of sufficient intensity to illuminate interior walls, is mandatory for internal inspection. Cylinders containing hazardous materials shall be vented and purged to remove gas or liquid before being examined with a light. Upon venting, these

gases should cool down enough to reduce pressure and venting cylinders will assist in the removal of residual liquefied gases prior to purging.

10.4.1 Corrosion and pitting

A variety of non-destructive test (NDT) methods can be used to detect and evaluate corrosion and pitting. These include hydrostatic test, acoustic emission test, ultrasonic test, visual inspection, magnetic particle, and eddy current.

10.4.1.1 ***General corrosion*****.** Interior general corrosion can be evaluated by ultrasonic examination or a hydrostatic test combined with a careful visual inspection. Thickness measuring and flaw detection devices of the ultrasonic type may be used to evaluate specific conditions. For basic corrosion limits, refer to 10.3.2.

10.4.1.2 ***Localized pitting or line corrosion.*** This form of corrosion may not be detected by the hydrostatic test. These types of corrosion cause significant localized stresses. These stresses are detrimental and the cylinder shall be removed from service for further evaluation in accordance with 10.3.1.

10.4.2 Interior defects. A cylinder shall be withdrawn from service for further evaluation when doubt exists as to its suitability for continued service. Examples of such internal defects are: cuts, mechanical abrasions and fabrication irregularities.

11. Hydrostatic testing

11.1 General. Where it is required that a volumetric expansion be ascertained from hydrostatic testing, the procedure of JS 25 shall be used. Procedure and equipment for the test in which a volumetric expansion is not required are given below.

11.2 Test equipment

11.2.1 All rigid pipework, flexible tubing, valves, fittings and components forming the pressure system of the test equipment shall be capable of withstanding a pressure of twice the maximum test pressure of any cylinder that may be tested.

11.2.2 Pressure gauges and 50 mm minimum diameter gauges, shall not have errors exceeding 1% of the maximum scale value between 10 and 90% of its range. Elsewhere on the scale, the maximum error shall not exceed 1.5% of the maximum scale value. Gauges less than 50 mm are not recommended for use. Gauges shall be tested at regular intervals, and in any case not less frequently than once per month, against a traceable secondary standard maintained by the Authorized Inspection Agency and recalibrated, as required.

11.2.3 The design and installation of the equipment, and the cylinders connected to it, shall be such as to avoid trapping air in the system.

11.3 Test method

11.3.1 More than one cylinder may be tested at a time, provided that they all have the same test pressure and that each test point is capable of being isolated.

11.3.2 The test pressure shall be established from the marking on the cylinder (for DOT cylinders see appendix A). A suitable device shall be employed to ensure that no cylinder is subjected to a pressure in excess of its test pressure.

11.3.3 Before applying pressure the external surface of the cylinder(s) shall be completely dry.

11.3.4 The test pressure, once attained, shall be held for a minimum period of 30 seconds, during which the pressure as registered shall remain constant.

11.3.5 Under these test conditions, the cylinder(s) shall not show any signs of leakage, visual deformation or defect.

11.3.6 If there is a leak in the pressure system, it shall be corrected and the cylinder(s) shall be retested.

11.3.7 Any cylinder that fails to comply with the requirements shall be rejected.

11.3.8 Where water has been used as the test medium, the interior of each cylinder shall be thoroughly dried by a suitable method, immediately after hydrostatic testing. The interior of the cylinder shall be inspected to ensure that it is free from contamination. Any contamination shall be removed by a suitable method.

12. Certificates of reinspection and retest

12.1 The certificate showing the results of reinspection and retest (see appendix D) shall be kept by the owner or the authorized agent for the full life of the cylinder and a copy lodged with the Independent Inspecting Authority. The Independent Inspecting Authority shall be notified of the serial numbers of all cylinders permanently withdrawn from service.

12.2 The owner's copy of the certificate shall also be available for inspection by the Independent Inspecting Authority. Each cylinder, having satisfied the reinspection and retest requirements, shall have the date (month and year) plainly and permanently stamped on the neck ring of the cylinder; for example, 4-90 for April 1990. The dash between the month and year figures may be replaced by the mark of the company or inspecting agency. Stamping shall be done in accordance with JS 25, and such that the date of the previous tests is not obliterated (see also 5.4).

12.3 The certificate shall include the following information:

(a) proprietor/owner
(b) the serial number of the cylinder
(c) the manufacturer
(d) tare weight
(e) year of periodic inspection
(f) result of periodic inspection
(g) inspecting agency and inspector
(h) date of manufacture of cylinder

A sample inspection form is given in appendix C.

13. Destruction of unserviceable cylinders

13.1 The decision to reject a cylinder, i.e. to be put out of use or destroyed, can be taken at any stage during the process of inspection. Such cylinders shall be:

(a) identified;
(b) marked;
(c) isolated;

(d) rendered safe, if necessary; and

(e) stamped with a series of 'X's in close proximity to the serial number or the serial number shall be permanently removed.

13.2 The inspecting agency shall send a detailed list of the cylinders taken out for non-use or to be destroyed to the enterprise and/or distributor, and summary list to the Independent Inspecting Authority indicating only their serial number and type.

13.3 If thirty days from the date of notification have passed and the enterprise and/or distributor does not object to the list of cylinders to be put out of use or destroyed, the inspecting agency shall proceed with the means at its disposal.

13.4 It shall be the exclusive responsibility of the enterprise and/or distributor for the destruction of the cylinder by crushing, and burning an irregular hole in the top dome of the cylinder equivalent in area to approximately 10% of the area of the top dome. In the case of thin-walled cylinders, the cylinders shall be pierced and deformed in at least two places.

Appendix A

Addition of exception clause

A.1 Special considerations

A.1.1 Cylinders made in compliance with specifications JS 25, DOT-4B, DOT-4BA, DOT-4BW, DOT- 4E and ICC-26-300 which are used exclusively for:

Anhydrous dimethyl
Anhydrous
monomethylamine
Anhydrous trimethylamine
Methyl chloride
Liquefied petroleum gas
Methylacetylene-propadiene
stabilised Difluoromethane
Difluoroethane
Monochlorotrifluoro-ethylene or mixtures thereof

Mixtures of one or more of the above gases with trichloromonofluoromethane, and which are commercially free from corroding components and protected externally by suitable resisting coatings (such as galvanizing, painting, etc.) may be retested decennially, instead of quinquennially, or, as an alternative, such cylinders may be subjected to an internal hydrostatic pressure equal to at least two times the marked service pressure without determination of expansions (see NOTE), but this latter test must be repeated quinquennially, after expiration of the first 10-year period.

When subjected to the latter test, cylinders must be carefully examined under the test pressure and removed from service if leaks and other harmful defects exist.

NOTE. Cylinders requalified by the modified hydrostatic test method or external inspection shall be marked after each retest or reinspection, by stamping the date of the reinspection or retest followed by the symbol **'E'** (external inspection) or **'S'** (modified hydrostatic test method), as appropriate.

A.1.2 Cylinders made in compliance with specifications
DOT-3A, DOT-3AA, DOT-3B, DOT-4A, DOT-4BA, and DOT-4BW having service pressures up to and including 2068 kPa, which are used exclusively for methyl bromide, liquid; mixtures of methyl bromide and ethylene dibromide, liquid; mixtures of methyl bromide and petroleum solvents, liquid; or methyl bromide and non-flammable, non-liquefied compressed gas mixtures, liquid; which are commercially free from corroding components, and which are protected externally by suitable corrosion-resisting coatings (such as galvanizing, painting, etc.), may be tested decennially instead of quinquennially. All tests must be supplemented by a very careful examination of the cylinder at each filling, and the cylinder must be rejected if evidence is found of bad dents, corroded areas, a leak, or other conditions that indicate possible weakness which would render the cylinder unfit for service.

A.1.3 A cylinder made in compliance with specification DOT-3A, DOT-3A 480X, or DOT-4A 480 used exclusively for anhydrous ammonia, commercially free from corroding components, and protected externally by resisting coatings (such as painting, etc.), may be retested every ten years instead of every five years.

Table 4 summarizes the retest period, minimum retest pressure and the specifications under which the various cylinders were made.

Table 4 Retest pressure and period for DOT cylinders

Specification under which cylinder was made	Minimum retest pressure	Retest period (years)
DOT-3	20,680 kPa (3000 p.s.i)	5
DOT-3A, 3AA, AL	5/3 times service pressure, except non-corrosive service	5 or 10, (See A.13)
DOT-3AX, 3AAX	5/3 times service pressure	5
3B, 3BN	2 times service pressure	5 or 10 (see A.1.2)
3C	Retest not required	
3D	5/3 times service pressure	5
3E	Retest not required	-
3HT	5/3 times service pressure	3
3T	5/3 times service pressure	5
4	4830 kPa (700 p.s.i)	10
4A	5/3 times service pressure	5 or 10 (see A.1.2)
4AA480	2 times service pressure	5 or 10
4B, 4BA, 4BW, 4B-240ET	2 times service pressure except non-corrosive service	5 or 10 (see A.1.1 and A.1.2)
4C	Retest not required	
4D, 4DA, 4DS	2 times service pressure	5
DOT-4E	2 times service pressure except non-corrosive service	5 (see A.1.2)
4L	Retest not required	-
8, 8AL	Retest not required	-
DOT-9	2760 (max. 4150 kPa)	5
25	3450 kPa (500 p.s.i)	5
26 for filling at 3100 kPa	5/3 times service pressure	5
26 for filling at 3100 kPa and below	2 times service pressure except non-corrosive service	5 or 10 (see A.1.1)
33	8300 kPa	5
38	3450 kPa	5
Any cylinder with marked test pressure	Retest at marked pressure	5

Appendix B

Example of application of corrosion limits to low pressure cylinders

B.1 General corrosion accompanied by pitting

(a) When the actual wall thickness can be measured, the cylinder shall be condemned when the remaining wall is less than 1.600 mm. (See 8.2.1.4)

(b) When the wall thickness cannot be measured and the original thickness is unknown, the cylinder shall be condemned when the deepest pit in the general area exceeds 1.067 mm. This is because general corrosion will already have removed 0.533 mm of the original wall and the total pit depth is
0.533 + 1.067 = 1.600 mm. The remaining wall is then 1.575 mm. (See NOTE 1 and NOTE 2 below.)

(c) When the actual wall thickness cannot be measured but the original thickness is known, the cylinder shall be condemned when the original wall, less one and one-half times the maximum pit depth, is less than 1.600 mm.

NOTE 1. Although general corrosion does not always follow a definite pattern, where there is appreciable pitting in areas of general corrosion, the pitted depth (Pd) usually is about twice the general corrosion loss (GC) (See figure 2).

NOTE 2. Pitted depth may be measured by placing a straight edge across the pitted area and measuring the distance from the bottom of the straight edge to the bottom of the pit. Where this is not practical because of obstruction such as footrings, bands, etc., special curved measuring devices such as in figure 1, or even putty casts may be prepared to be able to measure the depth of such a pitting.

B.2 Isolated pits not in general corrosion area

(a) When actual wall thickness can be measured, the cylinder shall be condemned if its remaining wall is less than 1.067 mm thick.

(b) When the actual thickness cannot be measured and the original wall thickness is unknown, the cylinder shall be condemned if the pit depth on the wall exceeds 2.134 mm.

(c) When the actual wall thickness cannot be measured and the original wall is known, the cylinder shall be condemned if the remaining wall obtained by subtracting the maximum pit depth from the original wall is less than 1.067 mm.

Appendix C
Visual inspection and test report (Sample)

VISUAL INSPECTION / TEST REPORT

Inspection Agency: _____ **Date:** _____

Location: _____

CYLINDER IDENTIFICATION						**PROTECTIVE COATING**		**DEFECT FOUND ON CYLINDER**								**PROOF TEST**		**Disposition (Cylinder Status)**	**Inspector's Initial**	**Comments**
Serial No.	Identifying Symbol	Spec. JS 25; ICC; DOT	Manu-facturer	Date of Manu-facture	Current Test Date	Type	Condi-tion	Corrosion & Pitting	Dents	Cuts, Digs & Gouges	Fire Damages	Bulges	Neck Defects	Attach-ments	Leaks	Test Date	Test Pressure			

Disposition Code: OK-Return to Service S-Scrap
Rej-Reject for Authorised Repair

_____ _____ _____
Inspector's Signature **Supervisor's Signature** **Date**

Appendix D

Retest Certificate (Sample)

1. Name of Manufacturer.....

2. Address of Manufacturer.....

3. Name of Owner.....

4. Address of owner.....

5. Name of Inspector.....

6. Address of Inspector.....

4. Batch No., batch size, serial No. and other distinguishing mark (s) of

   Container.....

5. Nature of Examination.....

6. Hydrostatic Test Pressure Applied.. .....

7. Are value testing and inspection done in accordance with JS 25 and results

   ☐ recorded? yes ☐ No

8. Recertification work carried out.....

I certify that on ..... I thoroughly examined the cylinder (s) described above and that I am satisfied that it (they) is (are) fit for further service.

Inspector's Signature.....

Qualification.....

Date.....

Standards Council

The Standards Council is the controlling body of the Bureau of Standards and is responsible for the policy and general administration of the Bureau.

The Council is appointed by the Minister in the manner provided for in the Standards Act, 1969. Using its powers in the Standards Act, the Council appoints committees for specified purposes.

The Standard Act, 1969 sets out the duties of the Council and the steps to be followed for the formulation of a standard.

Preparation of standards documents

The following is an outline of the procedure which must be followed in the preparation of documents:

a) The preparation of standards documents is undertaken upon the Standards Council's authorization. This may arise out of representations from national organizations or existing Bureau of Standards' Committees or Bureau's staff. If the project is approved it is referred to the appropriate sectional committee or if none exists a new committee is formed or the project is assigned to a Bureau staff.

b) If necessary, when the final draft of a standard is ready, the Council authorizes an approach to the Minister in order to obtain the formal concurrence of any other Minister who may be responsible for any area which the standard may affect.

c) With the approval of the Standards Council, the draft document is made available for general public comments. All interested parties, by means of a notice in the Press, are invited to comment. In addition, copies are forwarded to those known, interested in the subject.

d) The committee considers all the comments received and recommends a final document to the Standards Council.

e) The Standards Council recommends the document to the Minister for publication.

f) The Minister approves the recommendation of the Standards Council.

g) The declaration of the standard is gazetted and copies placed on sale.

h) On the recommendation of the Standards Council the Minister may declare a standard to be compulsory.

i) Amendments to and revisions of standards normally require the same procedure as is applied to the preparation of the original standard.

Overseas standards documents

The Bureau of Standards maintains a reference library which includes the standards of many overseas standard organizations. These standards can be inspected upon request.

The Bureau can supply on-demand copies of standards produced by some national standards and is the agency for the sale of standards produced by International Organization for Standardization (ISO) members.

Application to use the reference library and to purchase Jamaican and other standard documents should be addressed to:
Bureau of Standards
6 Winchester Road,
P.O. Box 113,
Kingston 10,
Jamaica, W.I.