Requalification, Filling, and Use of ICC-3 Cylinders

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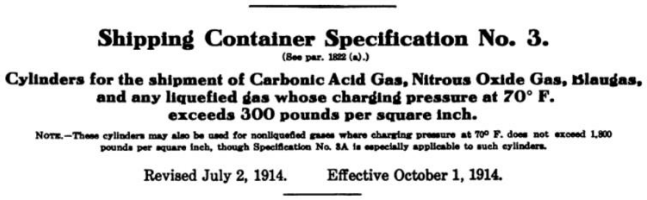
August, 2017

Regulatory History

Cylinders used to transport compressed gases date back to the late 1800s. As the compressed gas industry began to grow rapidly, the need for safety regulations became evident. Federal authority to regulate the transportation of compressed gases originated in a 1910 amendment to the Transportation of Explosives Act of March 4, 1909. The amendment authorized the Interstate Commerce Commission (ICC) to regulate the packing, marking, loading, handling, and transportation of compressed gases by common carriers. These regulations became effective October 1, 1914.



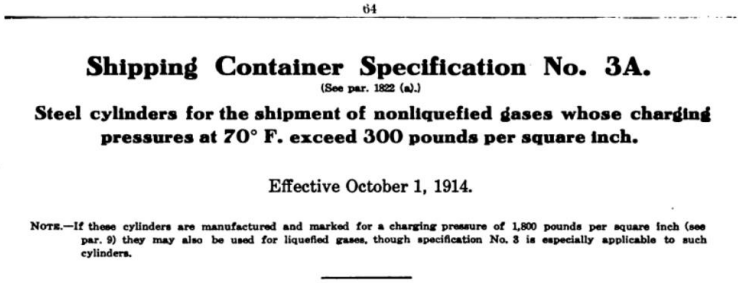
Shipping Container Specification No. 3.
(See par. 1822 (a).)

Cylinders for the shipment of Carbonic Acid Gas, Nitrous Oxide Gas, Blaugas, and any liquefied gas whose charging pressure at 70° F. exceeds 300 pounds per square inch.

NOTE.—These cylinders may also be used for nonliquefied gases where charging pressure at 70° F. does not exceed 1,800 pounds per square inch, though Specification No. 3A is especially applicable to such cylinders.

Revised July 2, 1914. Effective October 1, 1914.

Cylinders manufactured during this time were marked "ICC" to indicate compliance with the current ICC regulations. The earliest cylinder specifications were known as Shipping Container Specifications No. 3 and 3A. They were marked on the cylinders as ICC-3 and ICC-3A * * * *, where the stars are to be replaced by figures indicating the charging pressure.



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Shipping Container Specification No. 3A.
(See par. 1822 (a).)

Steel cylinders for the shipment of nonliquefied gases whose charging pressures at 70° F. exceed 300 pounds per square inch.

Effective October 1, 1914.

NOTE.—If these cylinders are manufactured and marked for a charging pressure of 1,800 pounds per square inch (see par. 9) they may also be used for liquefied gases, though specification No. 3 is especially applicable to such cylinders.

"In 1967, pursuant to the Department of Transportation Act, Pub. L. 89–670, 80 Stat. 931, regulatory jurisdiction over the packaging of dangerous articles for transportation was transferred from the ICC to the Department of Transportation (DOT)" (Federal Register). The transition from ICC to DOT regulations was finalized December 31, 1969. All cylinders that were manufactured during ICC regulations are authorized for continued service provided they meet the current DOT regulations. "Previously Authorized Packaging," Title 49 Code of Federal Regulations(CFR), Pt 173, authorizes the use of cylinders marked with the prefix of ICC if the package (cylinder) otherwise conforms to the applicable requirements.

> ***§173.23 Previously authorized packaging.***
>
> *(a)When the regulations specify a packaging with a specification marking prefix of "**DOT**," a packaging marked prior to January 1, 1970, with the prefix of "**ICC**" may be used in its place if the packaging otherwise conforms to applicable specification requirements.*

What makes ICC-3 cylinders special is there is no letter (A for example) or charging (service) pressure marking following the "3." Many re-fillers and requalifiers assume that the cylinder specification has been tampered with or was mislabeled during manufacturing. This specification was used primarily for carbon dioxide, nitrous oxide, and other liquefied gases which are filled by liquid volume instead of by pressure.

Filling

How do we know what types of cylinders can be used to ship compressed gases? Many fillers rely on industry practice and formal function-specific training for this information. It is, in fact, found in "Transportation." Title 49 CFR. There are several different citations within the regulations that relay this information to the industry and it is important for fillers to know where the regulations affecting filling can be found. "Subpart G - Gases; Preparation and Packaging." Title 49 CFR, Pt 173 gives us the requirements for the shipment of properly filled compressed gases in packages; in this case, cylinders.

§173.301 General requirements for shipment of compressed gases and other hazardous materials in cylinders, UN pressure receptacles and spherical pressure vessels. *(1) Compressed gases must be in UN pressure receptacles built in accordance with the UN standards or in metal cylinders and containers built in accordance with the DOT and ICC specifications and part 178 of this subchapter in effect at the time of manufacture, and requalified and marked as prescribed in subpart C in part 180 of this subchapter, if applicable. The DOT and ICC specifications authorized for use are as follows:*

2P	4AA480
2Q	4B
ICC-3[1]	4B240ET
3A	4BA
3AA	4BW
3AL	4D
3AX	4DA
3A480X	4DS
3AAX	4E
3B	4L
3BN	8
3E	8AL
3HT	39
3T	

[1]Use of existing cylinders is authorized. New construction is not authorized.

You will notice in the above listing, there are specifications for many types of packages, including aerosols, high pressure seamless cylinders, low pressure welded cylinders, and porous cylinders. Depending on the type of compressed gas, further regulations specify which of the above specifications can be used for liquefied, non-liquefied and dissolved gases. Since the focus of this article is ICC-3 cylinders, let's continue on with that. Notice in the above table the listing for ICC-3 specification is the only one with the ICC prefix. This is because, new construction of the 3 specification cylinders is not authorized under DOT regulation as we read

in footnote 1 below the table. This footnote also allows the continued use of the cylinders provided they meet all other requirements. ICC-3 cylinders have traditionally been used to transport carbon dioxide (CO2) gas because it is filled by volumetric weight based on a fill density, as found in §173.304a. Since CO2 was the first compressed gas to be transported in cylinders and ICC-3 was the first seamless cylinder specification, it is common for them to continue to be used to transport CO2, although ICC-3 cylinders can be used to transport other gases provided appropriate action has been taken to change the gas service.

Requalification

Periodic requalification of cylinders is required on most compressed gas cylinders. This information is found in "Continuing Qualification and Maintenance of Packagings." Title 49 CFR Pt 180. However, there is a typo in §180.209, Table 1. The first row is listed as DOT 3 and this should read ICC-3 since this specification of cylinder was only manufactured under ICC regulation discussed previously in this article.

> ***§180.209 Requirements for requalification of specification cylinders.*** *(a) Periodic qualification of cylinders. Each specification cylinder that becomes due for periodic requalification, as specified in the following table, must be requalified and marked in conformance with the requirements of this subpart. Requalification records must be maintained in accordance with*

TABLE 1—REQUALIFICATION OF CYLINDERS[1]

Specification under which cylinder was made	Minimum test pressure (psig)[2]	Requalification period (years)
DOT 3	3000 psig	5.
DOT 3A, 3AA	5/3 times service pressure, except noncorrosive service (*see* §180.209(g))	5, 10, or 12 (*see* §180.209(b), (e), (f), (h), and (j).
DOT 3AL	5/3 times service pressure	5, 10 or 12 (*see* §180.209(e), (j) and §180.209(m)[3]).
DOT 3AX, 3AAX	5/3 times service pressure	5, 10 (*see* §180.209(e).
3B, 3BN	2 times service pressure (*see* §180.209(g))	5 or 10 (*see* §180.209(e), (f)).
3E		
3HT	e	3 (*see* §§180.209(k) and 180.213(c)).
3T	e	5.
4AA480	(*see* §180.209(g))	5 or 10 (*see* §180.209(e) or (h)).
4B, 4BA, 4BW, 4B-240ET	except non-corrosive)	5, 10, or 12 (*see* §180.209(e), (f), and (j)).
4D, 4DA, 4DS		5.
DOT 4E	2 times service pressure, except non-corrosive (*see* §180.209(g))	5 or 10 (*see* §180.209(e)).
4L	Test not required.	
8, 8AL		10 or 20 (*see* §180.209(i)).
Exemption or special permit cylinder	See current exemption or special permit	See current exemption or special permit.
Foreign cylinder (*see* §173.301(j) of this subchapter for restrictions on use)	As marked on cylinder, but not less than 5/3 of any service or working pressure marking	5 (*see* §§180.209(l) and 180.213(d)(2)).

In this line, DOT is a typo, it should read ICC-3

[1]Any cylinder not exceeding 2 inches outside diameter and less than 2 feet in length is excepted from volumetric expansion test.

[2]For cylinders not marked with a service pressure, see §173.301a(b) of this subchapter.

[3]This provision does not apply to cylinders used for carbon dioxide, fire extinguisher or other industrial gas service.

Many people assume that ICC-3 and ICC/DOT 3A are the same specification. While they are both made of carbon steel, in fact they are different specifications. ICC-3 is only authorized for 1800 psi service pressure as we are instructed in "Subpart G - Gases; Preparation and Packaging." Title 49 CFR, Pt 173. While ICC/DOT 3A cylinders can have a wide range of service pressures. In Table 1 and §173.301 above, you notice that "ICC-3" is a separate specification. Therefore, it needs to be listed separately on your Requalifier Identification Number (RIN) approval letter if your company performs cylinder requalification on these specification cylinders. It has come to my attention that many Independent Inspection Agencies (IIA) do not have this specification listed on their application form and therefore, it does not get included in the RIN letter authorizing requalifiers to requalify these cylinders.

§173.301a Additional general requirements for shipment of specification cylinders.
(b) Authorized cylinders not marked with a service pressure. For authorized cylinders not marked with a service pressure, the service pressure is designated as follows:

Specification marking	***Service Pressure psig***
3	1800
3E	1800
8	250

§180.213 Requalification markings.
(a) General. Each cylinder or UN pressure receptacle requalified in accordance with this subpart with acceptable results must be marked as specified in this section. Required specification markings may not be altered or removed.

Figure 1 is an example of valid ICC-3 marking. Notice the absence of a letter and pressure following the 3. Provided these cylinders met all other requirements for continued service, they would be valid for service.

Figure 1 - Example of VALID ICC-3 marking

Figure 2 – Example of an Altered ICC-3 Marking - CONDEMN

Notice in Figure 2, the "A" and "2015" are different size and font than the "ICC-3." §180.213 prohibits alteration of specification markings. This cylinder would be condemnable.

To summarize, it is the intention of this article to inform cylinder fillers and requalifiers that with attention to detail and knowledge of regulations these unique older cylinders may still be valid for service as opposed to dismissal based on their age. For further technical training and information please, contact Amy Morgan Bruecks by phone at (405) 516-8248 or by e-mail at amy@amybruecks.com.