Overview of the Container Safety Ordinance

Unofficial translation
(October 2016)

The High Pressure Gas Safety Institute of Japan (KHK)

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This document has been compiled based on information available as of October 1, 2016. For the latest information or if there is any doubt or ambiguity, please refer to the High Pressure Gas Safety Act, related ministerial ordinances, etc.

1. Introduction

1-1. High Pressure Gas Containers (Cylinders)

High pressure gas containers (cylinders) referred herein are containers to be filled with high pressure gas that are transportable on the ground. Containers are indispensable for filling, storing, and transporting high pressure gas. As a matter of fact, rough handling of containers could lead to a large-scale accident such as bursting of a container.

In addition to those ordinarily referred to as gas containers, high pressure gas containers have quite widespread and have found divergent applications and types of usage.

For instance, in terms of the transport of high pressure gases, containers are used in a variety of forms, ranging from cylinders to be loaded in bulk to container bundles, which allow transport of several to dozens of cylinders (Diagram 1), as well as large containers on tanker trucks for the transport of even larger amounts of high pressure gas (Diagram 2).

The present document provides an outline of the types, the manufacture, inspection, reinspection, etc., of containers, which are regulated by the Container Safety Ordinance (hereinafter referred to as “the Container Ordinance”).

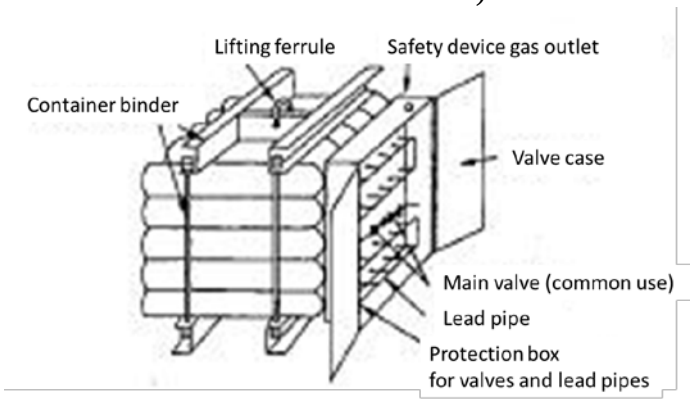

Diagram 1: Container bundle

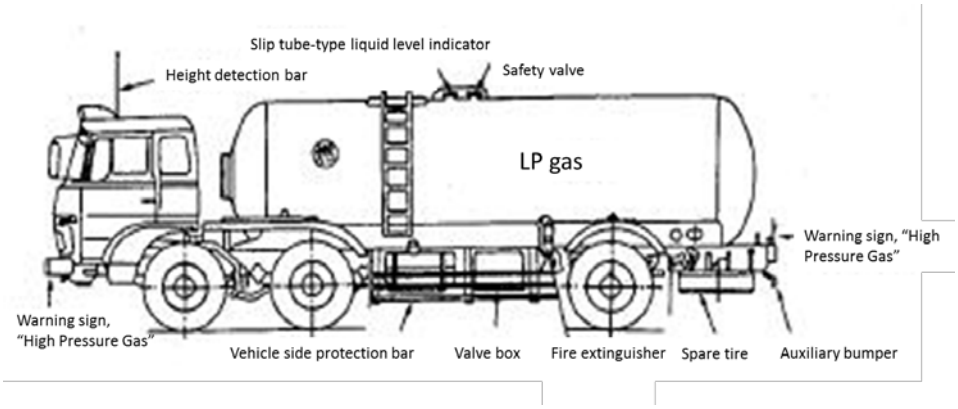

Diagram 2 Tanker truck

1-2. The History of the Container Safety Ordinance

Ordinance on high pressure gas containers were first introduced in the High Pressure Gas and Liquefied Gas Control Law (1922), which stipulated the manufacture and

handling of high pressure gas containers (manufacturing methods of the containers, filling of the containers with high pressure gas, etc.).
The history of the Container Ordinance is summarized in Table 1.

Table 1: The History of the Container Safety Ordinance

Year	Main contents of amendments
1925	Open containers were excluded from the application of the provisions.
1936	The provisions were fully revised (including addition of a definition of the container reinspection period).
1951	The provisions were fully revised in response to issuance of the High Pressure Gas Control Law.
1953	The container standards to be used in a container inspection were amended.
1956	The stamping and marking format on containers and the container reinspection standards were revised.
1959	Specific technical standards of container inspection and handling of imported containers were revised.
1961 to 1965	Ordinance on wall thickness of the container body, containers that conform to foreign standards, etc., were revised. With the establishment of the High Pressure Gas Safety Institute of Japan in 1963, container inspection was added as one of their obligations required by law.
1966	The Container Safety Ordinance was newly established by enactment of a full amendment of the Law. With this new establishment, the following provisions were added to the prior ordinance: • Along with the newly added definitions of ultra-low temperature containers and low temperature containers, the inspection standards and reinspection standards for these containers were stipulated; • Marking of the names of gas on the exterior surface of the color coded gas containers (colors other than gray) was stipulated; etc. In addition to the establishment of the Container Ordinance, the Ordinance-related standards (supplementary standards for the ministerial ordinances) were established. These standards were later reflected in the Standards Relevant to the Container Safety Ordinance.
1967, 1968	Provisions on valves for liquefied petroleum gas (LPG) containers and the definitions of ultra-low temperature containers and maximum filling pressure therefor were amended.
1973 to 1981	Catastrophic accidents that caused damages to the surrounding areas occurred consecutively at industrial complexes around the country, raising serious social concerns. Safety issues of the industrial complexes were examined by the High Pressure Gas and Explosives Safety Council, who then provided a report of the desirable safety structure of high pressure gas to the Minister of International Trade and Industry (current Minister of Economy, Trade and Industry). In response to the report, the container accessory inspection system was introduced, in an amendment to the High Pressure Gas Control Law, as an improvement and strengthening of ordinance on high pressure gas containers, etc.
1986	For the implementation of container inspection and/or other inspections, the system for the Designated Container Conformity Inspection Bodies was established and the corresponding provisions were developed.

Year	Main contents of amendments
1996	The seventh amendment of the High Pressure Gas Control Law was enacted. Transition was made towards ordinance that promoted voluntary safety measures among private operators. The High Pressure Gas Control Law was renamed the High Pressure Gas Safety Act. Unit of pressure was changed to the International System of Units (SI).

2. Overview of the Container Safety Ordinance

2-1. Types of Containers

Table 2 below shows the types of containers defined in Article 2 of the Container Ordinance.

Table 2: List of Container Types

Type of Container	Features	Application
Seamless containers	Containers without welding on those parts where pressure exceeding 0 Pa is applied from the inside.	—
Welded containers	Containers with welding on pressure-retaining parts.	Used for containers on tanker trucks, and LPG containers for domestic use
Ultra-low temperature containers	Containers which are capable of holding a liquefied gas with a temperature of 50 degrees below zero Celsius or lower, and which are coated with heat insulating material as a measure to prevent the gas inside the containers from rising above the normal operating temperature.	Used for filling with gases with low critical temperatures, such as liquid oxygen, liquid natural gas, etc.
Low temperature containers	Containers which are used for filling with a liquefied gas, and which are coated with heat insulating material or cooled with refrigeration equipment as a measure to prevent the gas inside the containers from rising above the normal operating temperature.(excluding ultra-low temperature containers)	—
Brazed containers	Containers, the pressure-retaining parts of which are joined by brazing.	—
Non refillable containers	Containers which were manufactured for a single filling of high pressure gas and which cannot be refilled.	Used mainly for filling with chlorofluorocarbons.

Type of Container	Features	Application
Fiber-reinforced plastic (FRP) composite containers	Containers with a liner, made of composite structure of resin-impregnated continuous fiber which is wrapped circumferentially, or circumferentially and axially.	—
Hoop-wrapped containers	Containers with a liner of resin-impregnated continuous fiber which is wound by hoop winding only (method of winding fiber perpendicular to the axis around the liner body)	—
Fully-wrapped containers	Containers with a liner of resin-impregnated continuous fiber which is wound by helical winding (method of spirally winding fiber around the liner body and end domes) or by in-plane winding (method of linearly winding fiber around the liner body and end domes)	—
General seamless containers	Seamless cylinders, other than compressed natural gas containers for vehicle fuel systems and aluminum alloy seamless cylinders for SCUBA.	Used for filling with compressed gases, such as oxygen gas, hydrogen gas, etc.
General FRP composite containers	FRP composite cylinders, other than compressed natural gas containers for vehicle fuel systems, compressed hydrogen containers for vehicle fuel systems, international compressed hydrogen storage containers for vehicle fuel systems, and compressed hydrogen containers for transportation vehicles.	Breathing air cylinders ,etc. for use on land
General FRP composite containers for LPG	The general FRP composite containers with plastic liners (all-composite containers) to be filled with LPG (only with the casing).	Used mainly as LPG containers for domestic use

Type of Container	Features	Application
Compressed natural gas containers for vehicle fuel systems	Containers that fall under either of the following: (1) Seamless cylinders for the fuel system of compressed natural gas vehicles: Seamless containers to be filled with compressed natural gas used in the fuel system of the vehicles. (2) Composite cylinders for the fuel system of compressed natural gas vehicles: FRP composite cylinders to be filled with compressed natural gas used in the fuel system of the vehicles.	Compressed natural gas containers for vehicle fuel systems
Compressed hydrogen containers for vehicle fuel systems	FRP composite cylinders to be filled with compressed hydrogen gas used in the fuel system of the vehicles.	Compressed hydrogen containers for vehicle fuel systems
Low filling cycle compressed hydrogen containers for vehicle fuel systems	Compressed hydrogen containers for vehicle fuel systems which are equipped on private passenger vehicles listed in Article 61, paragraph (2), item (ii) of the Road Vehicles Act	Compressed hydrogen containers for vehicle fuel systems (Private passenger vehicles)
International compressed hydrogen storage containers for vehicle fuel systems	Containers which are FRP composite cylinders to be filled with compressed hydrogen gas for the fuel system of vehicles, and which conform to the Global Technical Regulations (GTRs) prescribed in the Global Registry, based on the Agreement Concerning the Establishing of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or Used on Wheeled Vehicles.	Compressed hydrogen containers for vehicle fuel systems (Containers compatible with the Global Technical Regulations)
Low filling cycle international compressed hydrogen storage containers for vehicle fuel systems	International compressed hydrogen storage containers for vehicle fuel systems which are equipped on private passenger vehicles listed in Article 61, paragraph (2), item (ii) of the Road Vehicles Act.	Compressed hydrogen containers for vehicle fuel systems (Containers for private passenger vehicles compatible with the Global Technical Regulations)

Type of Container	Features	Application
Liquefied natural gas containers for vehicle fuel systems	Containers for vehicles to be filled with liquefied natural gas used in the fuel system of the vehicles.	Liquefied natural gas containers for vehicle fuel systems
Liquefied petroleum gas containers for vehicle fuel systems	Containers to be filled with LPG used in the fuel system of the vehicles.	Liquefied petroleum gas containers for vehicle fuel systems
Containers for trunk	Compressed natural gas containers and compressed hydrogen containers for vehicle fuel systems that are equipped only in the trunk of a vehicle (only in a place structurally protected from flying pebbles, rain water, and any other corrosive environment).	Compressed natural gas containers for vehicle fuel systems and compressed hydrogen containers for vehicle fuel systems
High pressure gas containers for transportation vehicle	Containers for transporting high pressure gas, which are fixed on tank vehicles (provided for in Article 35-3, paragraph (1), item (xxiii) of the Enforcement Ordinances for Road Vehicles Act) or on towing vehicles (provided for in Article 1, paragraph (1), item (ii) of the Safety Standards on Road Vehicles).	High pressure gas containers for transportation vehicles
Compressed hydrogen containers for transportation vehicles	High pressure gas containers for transportation vehicles, which are FRP composite cylinders for transporting compressed hydrogen.	Compressed hydrogen containers for transportation vehicles
Liquid hydrogen containers for transportation vehicles	High pressure gas containers for transportation vehicles, which are ultra-low temperature containers for transporting liquid hydrogen.	Liquid hydrogen containers for transportation vehicles
Seamless aluminum alloy containers for SCUBA	Seamless cylinders made of aluminum alloy to be filled with the air or gas for SCUBA, as specified in the provisions of Article 39, paragraph (1), item (iv) of the General High Pressure Gas Safety Ordinance.	Used for SCUBA cylinders.

Type of Container	Features	Application
PG (pressure gas) containers	—	Containers to be filled with helium, neon, argon, krypton, or nitrogen gas, or mixtures of two or more of the two aforementioned gases.
SG (special gas) containers	—	Containers to be filled with monosilane, phosphine, arsine, diborane, etc.
Class-1 FC containers	—	Containers to be filled with liquid fluorocarbon 12, liquid fluorocarbon 134a, etc.
Class-2 FC containers	—	Containers to be filled with liquid fluorocarbon 422D, liquid fluorocarbon 900JA, etc.
Class-3 FC containers	—	Containers to be filled with liquid fluorocarbon 410B, liquid fluorocarbon 410JA, etc.

2-2. Manufacture of Containers

With respect to the manufacturing methods of high pressure gas containers, the following technical standards are stipulated in Article 3 of the Container Ordinance:

a. Containers shall be manufactured with materials appropriate for the type of high pressure gas to be filled, filling pressure, operating temperature, and environment in which the containers are used;
b. Containers shall be manufactured with a wall thickness appropriate for the type of high pressure gas to be filled, filling pressure, operating temperature, and environment in which the containers are used;
c. Containers shall be manufactured with construction and specifications appropriate for the materials and operating temperatures thereof and environment in which the containers are used;
d. Containers shall be manufactured with fabrication, welding, and heat treatment methods appropriate for the materials and construction thereof; and
e. Containers shall be manufactured with appropriate dimensional accuracy.

These technical standards are specified according to the performance approach. Specific manufacturing methods for high pressure gas containers are described as Exemplified Standards depending on the construction and the use of the container.

Although procedures such as notifications, etc., are not required for the manufacture of high pressure containers, they may not be transferred or delivered to users unless they have passed a container inspection.

2-3. Container Inspection and Accessory Inspection

Container and accessory are subject to the ordinance as shown in Diagram 3.

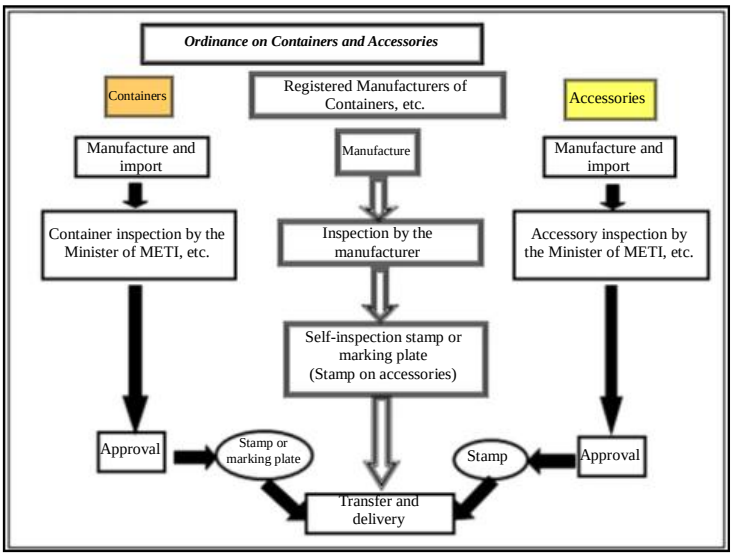

Diagram 3: Ordinance on containers and accessories

(1) Container manufacturers shall manufacture containers to conform with the specified technical standards.
*For details, refer to “2-2. Manufacture of Containers.”
(2) Container manufacturers, accessory manufacturers, or importers of containers or accessories shall subject their containers and accessories to inspections (container inspection for containers and accessory inspection for accessories), conducted by a third party, such as the Minister of METI. The system of Registered Manufacturers of Containers also exists, which allows self-inspections by the container manufacturers themselves.

With respect to container inspections, the method of container inspection as well as the container standards shall be met.

Article 6 Methods of Container Inspection

With respect to the methods of container inspection, the provisions therefor are provided for in Article 6 of the Container Ordinance.

a. Container inspection shall be conducted by first determining, as needed, the test piece, test pressure, test medium, retention time, confirmation methods, and other conditions to be identified in order to ensure reproducibility;
b. The Japanese Industrial Standards and other standardized standards shall be used, as necessary, for test procedures, test piece, test instrument, etc.;
c. In cases of the containers, for which the Minister of METI has approved the material, wall thickness, construction, etc., as appropriate, and for which documents showing the quality of material and strength of the container, which are deemed appropriate, and other materials necessary for container inspection are provided, the tests or inspections pertaining to said documents can be omitted.; and
d. Records of container inspection results shall be made and kept appropriately.

The container standards to be used in a container inspection are stipulated in Article 7 of the Container Ordinance.

Article 7 Container Standards for Container Inspection

a. Containers shall be designed to conform with the standards for manufacturing methods as stipulated in Article 3;
b. Containers shall pass a hydraulic test conducted with a pressure greater than the hydraulic test pressure;
c. In addition to the preceding item, containers shall possess a filling pressure and strength appropriate for the operating temperature;
d. Containers shall have no defects that are harmful to practical use;
e. Containers shall have appropriate dimensional accuracy;
f. Containers shall be able to endure external load conceivable in the environment in which they are used;
g. Containers shall have airtightness appropriate for the filling pressure;
h. Containers may not have been used for other purposes if such prior use raises a risk to the maintenance of safety; and
i. Containers shall comply with the restrictions on types of high pressure gas, filling pressure, internal volume, and marking methods when such restrictions are appropriate from the perspective of the construction, material, and usage pattern of the containers.

As with the case of manufacturing methods for containers, the inspection methods and container standards for container inspection are specified according to the performance approach, and the details are described as Exemplified Standards depending on the construction and the use of the container. Therefore, container inspection is performed according to the applicable Exemplified Standard.

(3) Containers may not be transferred or delivered to users, unless they have passed a container inspection and bear a stamp or marking plate as specified. In addition, accessories may not be transferred or delivered to users, etc., unless they have passed an accessory inspection and bear the specified stamp.
The users, who have purchased containers or obtained them in any other way, may fill them with high pressure gas only after they place a marking on the containers as specified below.

Stamping format on a container (An example of liquefied petroleum gas containers) is as indicated in Photo 1.

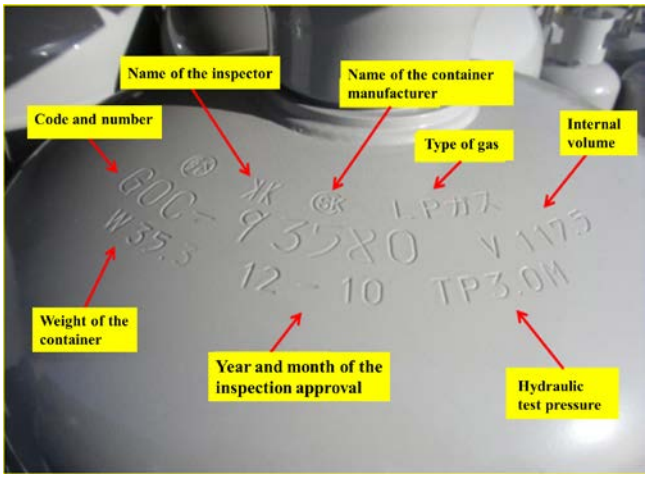

Photo 1: Stamp on a container (An example of liquefied petroleum gas containers)

The following details are to be stamped on a container which has passed a container inspection:

a. The mark of the inspector name
b. The name or the mark of the container manufacturers and the person whose container has undergone the inspection
c. Type of high pressure gas to be filled with
d. The code and the number of a container;
e. The internal volume of the container (symbol V, unit L)
f. The weight of the container excluding the weight of the accessories (symbol W, unit kg);
g. The year and month of the container inspection approval (The year, month, and day for containers with an internal volume of 4,000 L or more and containers for vehicle fuel systems, etc.);
h. Hydraulic test pressure (symbol TP, unit MPa) and M

In other cases, a marking plate shall be placed on those containers which are specified by Article 8, paragraph (2) of the Container Ordinance as being difficult to stamp. There are several methods of attaching a marking plate, depending on the type of container. One method is to weld, solder, or braze a thin plate, which has been stamped clearly and indelibly, on the shoulder or on another readily visible area of the container in such a way that it is irremovable. Alternatively, for example, a paper form which indicates the specified items clearly and indelibly may be pasted, in such a way that it is irremovable, on the shoulder, or on another readily visible area of the container, or wrapped in the fiber layer of a composite container in a readily visible area.

An example of a marking plate is shown in Photo 2.

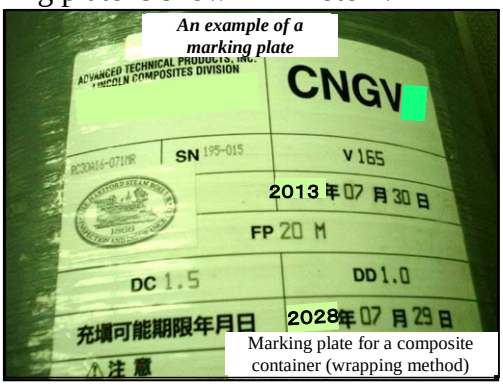

Photo 2: Marking plate of a composite container
(An example of compressed natural gas containers for vehicle fuel systems)

Stamping format on an accessory is as indicated in Photo 3.

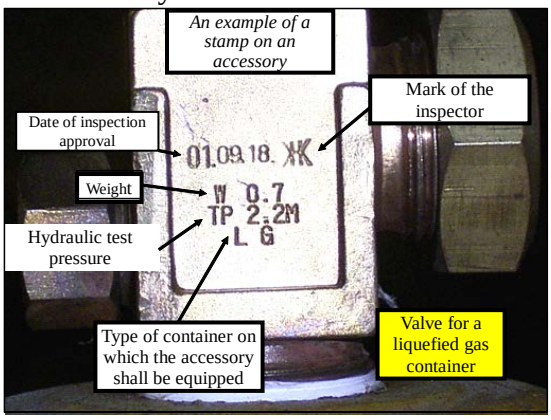

Photo 3: Stamp on an accessory

The following details are to be stamped on an accessory which has passed an accessory inspection:

a. The year, month, and day of the accessory inspection approval (The year and month for the accessories to be equipped on international compressed hydrogen storage containers for vehicle fuel systems);
b. The mark of the inspector name;
c. The name or the mark of the accessories manufacturers
d. The code and numbers of the accessories
e. The weight of the accessory: (symbol W, unit kg) (except for ultra-low temperature containers and containers for vehicle fuel systems);
f. Hydraulic test pressure (symbol TP, unit MPa) and M; and
g. The type of containers on which the accessory shall be equipped.

(4) The owner of a container must place a marking which indicates the type of high pressure gas, and his/her name and address, and apply color coding over more than half the container surface area.

Types of color coding are as indicated in Diagram 4 below.

Color coding of the containers

Types of high pressure gas	Color coding
Oxygen gas	Black
Hydrogen gas	Red
Liquefied carbon dioxide	Green
Liquid ammonia	White
Liquid chlorine	Yellow
Acetylene gas	Brown
Other types of high pressure gas	*Gray

* No color coding ordinance on the compressed hydrogen containers for vehicle fuel systems and the international compressed hydrogen storage containers for vehicle fuel systems among containers for hydrogen gas, the containers to be filled with other gases which are made of aluminum, aluminum alloy, and stainless steel and which are not colored, the LPG containers, and the compressed natural gas containers for vehicle fuel systems.

Diagram 4: Markings on containers

Photo 4: An example of marking on oxygen gas containers

Photo 5: An example of marking on hydrogen gas containers

2-4. Container Reinspection and Accessory Reinspection

Diagram 5 shows the flow of process from the inspection of containers and accessories to the reinspection therefor.

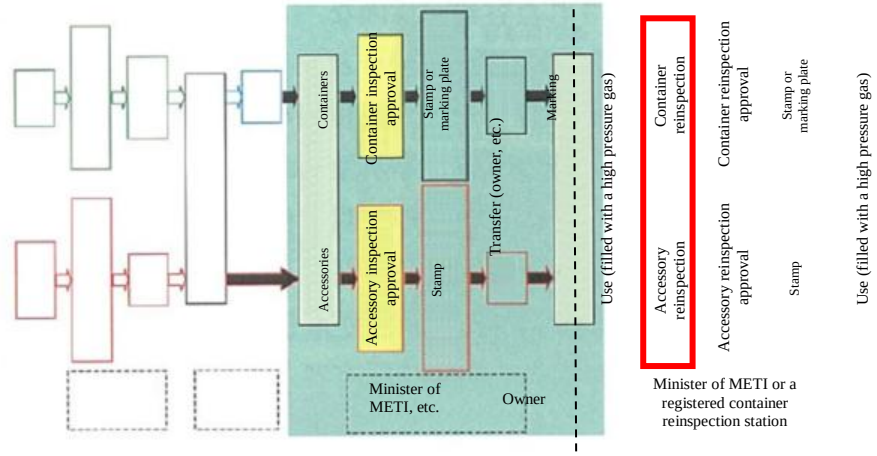

Diagram 5: Flow of process from the inspection to reinspection of containers and accessories

Institutions that conduct container reinspection and accessory reinspection are as follows:

- A prefectural governor;
- The Minister of Land, Infrastructure and Transport (for containers and accessories therefor that are fixed on railroad vehicles);
- The High Pressure Gas Safety Institute of Japan;
- A Designated Container Conformity Inspection Body; or
- A registered container reinspection station.

Container inspection stations are registered by the prefectural governor. In order to be registered as a container inspection station, the inspection facilities shall conform with the appropriate technical standards.

(1) Container reinspection

Containers undergo repeated filling of high pressure gas and are used under severe conditions; therefore, reinspections shall be conducted at specified intervals to guarantee their safety. Only then may the containers be refilled with high pressure gas.

(2) Container reinspection period

Container reinspection period varies depending on the types of container. For example, welded containers shall be subjected to a container reinspection every 5 years before reaching 20 years after they were manufactured. Afterwards, this period is shortened to 2 years for welded containers of 20 years or older since their manufacture.

Diagram 6 shows the container reinspection periods for each type of container.

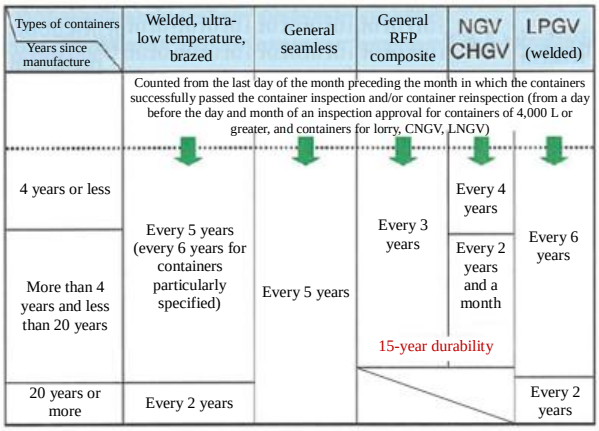

Diagram 6: Container reinspection periods

(3) Container reinspection stamp

When a container successfully passes a container reinspection, the container reinspection stations, etc. shall place a stamp or marking plate on the container with specified items such as reinspection approval date (the year and month).

(4) Accessory Reinspection

Accessories such as valves, safety valves, emergency shutoff devices, etc., which the containers come equipped with shall also be subjected to reinspections at specified intervals in the same way as the containers to check the level of deterioration, operation status, etc. They may be re-mounted on the containers and used after they pass the reinspection.

(5) Accessory reinspection period

Accessory reinspection period is determined differently for accessories equipped on containers and for accessories not equipped on containers.

Accessories which have successfully passed the accessory inspection and which bear a stamp shall be subjected to an accessory reinspection every 2 years if they are not equipped on containers.

Accessory reinspection periods for the accessories equipped on containers are shown in Diagram 7. Accessory reinspection period varies in relation to the container reinspection period of the containers on which the accessories are equipped. (In general, accessory reinspection is conducted at the same time when the containers undergo a container reinspection.)

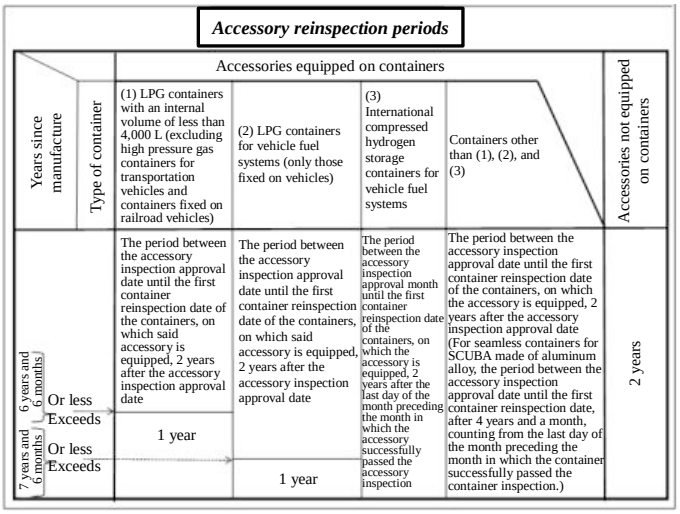

Diagram 7: Accessory reinspection period

(6) Accessory reinspection stamp

When an accessory successfully passes an accessory reinspection, the container reinspection stations shall attach a stamp on the accessory with specified items such as reinspection approval date (the year and month).