

## TERMS OF REFERENCE FOR THE R&D PROJECTS

**1 Title:** Maximum service life of LPG cylinders (as per IS 3196-1) and reconditioned cylinders (as per IS 13258)

**2 Background:**

**2.1** BIS has published the following two standards-

**2.1.1** IS 3196 (Part 1): 2013 (Welded low carbon steel cylinders exceeding 5 litres water capacity for low pressure liquefiable gases: Part 1 cylinders for liquefied petroleum gases (LPG) - Specification) which lays down the minimum requirements for the materials, design, manufacture, construction, tests and marking on welded low carbon steel cylinders intended for storage and transportation of liquefied petroleum gases of nominal capacity exceeding 5 l up to and including 250 l water capacity.

**2.1.2** IS 13258: 2014 (Welded low carbon steel cylinders exceeding 5 litre water capacity for low pressure liquefiable gas - Requirements for inspection and reconditioning of used lpg cylinders) which lays down the requirements for the inspection, materials, procedure, testing and marking for reconditioning of used LPG cylinders manufactured as per IS 3196 (Part 1) : 2006 'Welded low carbon steel cylinders exceeding 5 litre water capacity for low pressure liquefiable gases : Part 1 Cylinders for liquefied petroleum gases (LPG) — Specification (fifth revision)' of capacity exceeding 5 litre and up to and including 250 litre.

These documents can be accessed in the Know your Standards tab on both the website (bis.gov.in) and the BIS CARE App.

**2.2** Both these standards are under mandatory certification as mentioned in Gas Cylinder Rules, 2016.

**2.3** Currently Cylinders in use are deemed to be fit if they pass the tests mentioned in IS 13258 and IS 16185 (Periodic inspection and testing - Welded carbon steel gas cylinders - Code of practice) but no service life is provided in these standards.

**2.4** Considering the importance of the subject as human lives are at stake, Service Life is necessary to be determined. Service Life is also important as it entails all factors such as usage, storage, deterioration of material due to environmental conditions and regular refilling of these cylinders (fatigue).

**3 Objective:** To study & to ascertain maximum service life of LPG cylinders (as per IS 3196-1) and reconditioned cylinders (as per IS 13258)

**4 Scope:**

**4.1** In the work given you have to undertake extensive examination of Literature on the subject which will include study of International and Indian Standards, research papers published, comparative analysis of new and used cylinders, existing national and international regulations and guidelines or any other study conducted on the subject matter.

**4.2** It will also include visits to Large/ Medium/ Small manufacturing industries as per the approved sampling plan, Identifying the manufacturing and user base. It will also include

identifying the testing facilities available in the country for carrying out the tests. Visits to Bottling plants is also to be carried out as per Sampling Plan.

**4.3** A final analysis of the data collected and summarization of the final outcomes which will be useful in determining the service life of cylinders.

## **5 Expected Deliverables**

**5.1** Reports on comparative analysis of cylinders manufactured, stored and usage conditions at different geographical locations.

**5.2** Report on factors influencing the service life of these cylinders.

**5.3** Report on comparative study on condition of cylinders that have completed 10, 20, 30 and 40 years.

**5.4** Report on number of samples undertaken, no. of field visits conducted along with the outcomes of those visits and how different is manufacturing at various locations.

**5.5** Service life of LPG cylinders of both new and reconditioned cylinders.

## **6 Research Methodology:**

**6.1** Begin with a thorough review of existing literature, research, guidelines and regulations and National and International Standards. This will help in understanding the current requirements.

**6.2** Identify and engage key stakeholders, including Academia, manufacturers, laboratories, importers/exporters and experts in optics and engage them accordingly. Collect their input, concerns, and expectations regarding the above specifications through interviews and questionnaire.

**6.3** The project should cover on-site visits for studying of procedures and protocols being followed at various locations for manufacture, storage and transport, through survey-based research. Available Plant data shall be consolidated on Industry basis viz. frequency of rejection of cylinders during periodic testing, scrapped cylinder data and other rejection details.

**6.4** A sampling plan to be devised using cylinders manufactured from different industries at various locations all over India. Study also needs to be conducted at various bottling plants at different geographic locations to take into account the environmental conditions prevailing at the place where these cylinders are stored for filling. Sampling plan to be approved by BIS.

**6.5** Different tests such as decay analysis, Fatigue Test, Cycle Test to be conducted on the samples collected. Retesting and reconditioning of cylinders in circulation that have completed upto 10, 20 years, 30 and 40 years to be reviewed and comparative study to be done. Report shall be prepared of research findings and data collected as per the deliverables of this project. Factors influencing the life of the cylinder such as Loss of Tare weight, Finished thickness loss, demographic factors, different geographical areas should be studied. New tests which will be useful in determining the service life to also be examined.

## **7 Sampling Plan**

**7.1** Samples should be taken as per the sampling plan for each of the regions i.e. North, South, East, West and Central Region.

S. No.	Life of the Cylinder	Cylinder Quantity
1	New Cylinder	03
2	5 Yrs old cylinder	03
3	10 Yrs old cylinder	03
4	15 Yrs old cylinder	03
5	20 Yrs old cylinder	03
6	25 Yrs old cylinder	03
7	30 Yrs old cylinder	03
8	35 Yrs old cylinder	03
9	40 Yrs old cylinder	03
10	Older than 40 Yrs	03

**7.2** Sample drawn for each region and each life of a cylinder should be manufactured by a different company. For eg. If 05 samples are being drawn of 15 yrs old cylinder of central region then each of those samples should be from different manufacturers.

## **8 Timeline and Method of Progress Review:**

**8.1** Interim Report covering the review of the literatures and existing stipulations, thereof – within 1 months from the date of assignment received from BIS.

**8.2** Visiting the manufacturers, users along with collection of samples – within 1 months

**8.3** Mid term review- within 2.5 months

**8.4** Preliminary Report on Data collected – By end of 3 months from the date of issue of sanction letter by BIS.

**8.5** Validation of data and report - 3.5 months

**8.6** Final report - By end of 4 months

**8.7** In case of delay in submission of final draft report, the justification shall be given by the project proposer for consideration by the Sectional Committee.

The proposer taking up the project shall clear all doubts on provisions of research including ToR and BIS guidelines before acceptance of the project and signing agreement.

## **9. Support BIS will Provide:**

- a) National /international standards relevant to the project;
- b) Details of BIS Licensees details;
- c) Product manual; and
- d) Details of BIS recognized laboratories.

## **10. Relevant sectional committee and Nodal officer from BIS: Sectional committee:**

MED 16 (Gas Cylinders Sectional Committee)

Nodal officer:

Mr. Prasoon Yadav, Scientist C/ Deputy Director – Member Secretary MED 16,

Email: [med@bis.gov.in](mailto:med@bis.gov.in)