TERMS OF REFERENCE FOR THE R&D PROJECT

[Textile materials made from polyolefins sectional committee TXD 23 under Textile Department of BIS]

1 Title: Study of construction and performance requirements of 1 kg, 2 kg and 5 kg leno woven sacks.

2 Background:

2.1 The leno woven sacks are widely used for packaging fruits and vegetables due to their open mesh weave with high tensile, tear, and impact burst strength. The sacks also provide excellent ventilation, preventing rotting, sweating, and fungal growth, resulting in an increase in the shelf life of fruits and vegetables by approximately 50 %. The sacks are lightweight and cost-effective, with a lower cost compared to other packaging materials of similar capacity.

2.2 IS 16187:2014 'High-density polyethylene (HDPE)/polypropylene (PP) leno woven sacks for packaging and storage of fruits and vegetables' is formulated by BIS. It specifies the constructional and performance requirements of leno woven sacks for packaging of 25 kg and 50 kg.

2.3 The Leno bag manufacturing machinery and technology have improved recently resulting in higher strength tapes and fabric, even at lower fabric weight. Moreover, the fruit and vegetable packaging trends have also undergone significant change in the last 5 to 8 years with wider acceptance of organized retailing and smaller size packs along with regular size packaging. The bag labelling has also been modified. All these changes call for the revision of the existing standard, to make it more adaptable and acceptable to all concerned, including bag manufacturers, farmers, cold storage, wholesalers, retailers, and end-users. Additional thoughts also need to be included for sustainable packaging of leno bags, its reuse, and recycling in line with EPR.

2.3.1 The existing IS covers the requirements of woven leno sacks for packaging of only 25 kg and 50 kg. The outcome of this R&D will form the foundation for establishing the constructional and performance specifications of 1 kg, 2 kg, and 5 kg leno woven sacks, to be incorporated into the existing IS 16187:2014.

3 Objective:

Collect and analyse the relevant technical data and scientific evidence for constructional and performance specifications of 1 kg, 2 kg, and 5 kg leno woven sacks from both primary and secondary sources.

4 Scope:

4.1 Extensive study and analysis of the available literature on leno woven sacks, including but not restricted to the following:

a) National and International standards;
b) Research papers;

c) Guidelines by ministry/regulatory bodies;
d) Any studies conducted by any industry and their association, Institutes and NGOs; and
e) Any other relevant sources.

4.2 Collection of the manufacturing database (small, medium and large-scale), testing infrastructure and users in the country.

4.3 Collection of import and export data, identifying the standards and regulations adhered to by domestic and foreign manufacturers, and conducting a comparative analysis of these standards and regulations.

4.4 Collection of the testing data, types of equipment and methods related to leno woven sacks from 2 NABL Labs (at least 1 Government) by circulating suitable questionnaires through email or any other digital means.

4.5 Undertake visits to collect user feedback from 5 organized malls such as Reliance Store, Smart Bazaar, D-Mart, and similar establishments, along with 5 local stores, 5 markets (mandis), and 5 small-sized local shops that deal with leno woven sacks. The focus will be on the aspects including but not limited to the following:

a) Focused discussion on quality issues, challenges being faced and suggestions if any.
b) The brand owners whether they have EPR registration or not (except brand owners falling under the micro and small category of MSME).

4.6 Undertake visits to 2 industries of each small, medium and large scale (total **6**) and collect data including but not restricted to the following:

a) Types of raw materials used for manufacturing the sacks;
b) Manufacturing processes;
c) In-process quality checks being followed by the manufacturing unit;
d) Witness the testing of the product;
e) Testing instruments for testing woven leno sacks in the plant;
f) Testing methods being followed;
g) In-house testing data of 3 months;
h) Marking and labelling of the products;
i) Post-manufacturing quality checks;
j) Packaging requirements;
k) Sustainability aspects are being followed by units regarding the energy-saving, and waste disposal in terms of 3R (Reduce, Reuse and Recycle);
l) The producer of the product whether they have EPR registration or not; and
m) Focused group discussions with teams involved in production, testing, and R&D to address quality issues, discuss challenges faced and gather suggestions for improvement.

4.7 Collection of 60 samples of each category of leno woven sacks (1 kg, 2 kg, and 5 kg) from both small and medium-scale industries, resulting in a total of 360 samples. Conduct comprehensive testing from NABL lab according to methods specified in IS 16187:2014 to measure the parameters such as dimensions of the sacks, tape width, mesh size, fabric grams per square meter (GSM), tape linear density, fabric breaking strength, fabric seam strength,

weave type, seam type, and stitches per decimetre.

(*Refer to the table below for a clearer understanding*):

Sample collected from Industry type	Lab	Variety	No. of Samples
Small scale Industry	Lab 1	1 kg	60
		2 kg	60
		5 kg	60
Medium scale Industry	Lab 2	1 kg	60
		2 kg	60
		5 kg	60
NOTES **1** 10 Specimens shall be tested for all requirements as specified in **4.7**. **2** Typically, small and medium-scale industries are the primary producers of leno woven sacks.			

4.8 Preparation of a comprehensive project report covering all the above information.

5 Research Methodology:

a) Collect and analyse the data/information as specified in **4.1**, **4.2, 4.3** and **4.4**;
b) Visit manufacturers and users and collect data/information as specified in **4.5** and **4.6**;
c) Collect and test the samples as specified in **4.7**; and
d) Analyse the data/information and prepare a comprehensive project report.

6 Deliverables:

Comprehensive report (both soft and hard copy) consisting of outcomes of the study covering all the aspects of the scope appending the survey formats and responses, questionnaires, results of testing, report of visits, and other relevant documents/ information.

7 Requirements for the CVs:

B.Tech in Textile Technology/Textile Engineering/Textile Chemistry/Fibre Science & Technology/Plastic Engineering.

8 Timeline and Method of Progress Review:

The timeline for the project shall be 120 days from the date of award of the project. The stage-wise indicative timelines for the execution of the project shall be as follows:

Timeline	Method of progress
0 to 20 days	Literature review, desktop study, collection of relevant data and information.

Review Meeting 1: After conducting a literature survey and desktop research, the R&D strategy will be reviewed through a meeting with the nodal officer before any site visits.	
21 to 60 days	Visit users and Industries. Collect the samples.
Review Meeting 2	
61 to 100 days	Testing of samples.
101 to 110 days	Submit a draft report to BIS.
Review Meeting 3	
111 to 120 days	Submission of the final project report.

9 Support from BIS:

BIS will provide access to latest available editions of Indian standards and/ or international standards relevant to the project, on request.

10 Nodal Point:

In case of queries/clarification, Shri Ashwani Kumar, Scientist B and Member Secretary, TXD 23 may be contacted at txd@bis.gov.in.