TERMS OF REFERENCE FOR THE R&D PROJECT

(Method of Tests for Rubber and Rubber Products Sectional Committee, PCD 29 under PCD, BIS)

1. Title of the Project: Development of procedure for Determination of Polycyclic Aromatic Hydrocarbons (PAHs) — Gas Chromatography With Mass Spectrometric Detection (GC-MS) Method.

2. Background: Polycyclic Aromatic Hydrocarbons (PAHs) are a class of organic compounds consisting of fused aromatic rings, often encountered in various materials used in the rubber industry (rubber processing oils, carbon black, polymer, raw rubber, vulcanized rubber, unvulcanised rubber, organic compounds, inorganic compounds, and water). These compounds have drawn significant attention due to their potential health and environmental risks. PAHs are known to be formed during incomplete combustion processes and can be present in raw materials used in the rubber industry, as well as in the final rubber products. The presence of PAHs in rubber materials is a concern, as some PAHs have been classified as potential carcinogens and pose health risks to workers involved in the rubber manufacturing process. Given the potential health and environmental implications, it is imperative to develop reliable and accurate methods for the determination of PAHs in rubber-related materials.

3. Objective: To develop procedure for identification and quantification of polycyclic aromatic hydrocarbon (PAH) in various materials used in the rubber industry (rubber processing oils, carbon black, polymer, raw rubber, vulcanized rubber, unvulcanized rubber, organic compounds, inorganic compounds, and water) by Gas Chromatography Mass Spectrophotometry (GCMS).

4. Scope:

4.1 Undertake study and comparative analysis of existing literature, National and International Standards and Research papers for Determination of Polycyclic Aromatic Hydrocarbons (PAHs) in various materials used in the rubber industry (rubber processing oils, carbon black, polymer, raw rubber, vulcanized rubber, unvulcanized rubber, organic compounds, inorganic compounds, and water), study by any organisation, body, if any.

4.2 Collect data of rubber industries which uses materials containing PAHs and also tests the PAHs content. Also collect the data of Labs which test the PAH content in rubber related materials.

4.3 Visits to manufacturing units/labs shall be taken as per the following sample plan:

Manufacturing Units/Labs	**Number of Industries to Visit**
Large	2
Medium	2
Small	2
Micro	2
Labs	2 (1 Lab of Govt and 1 Lab of Private)

It is expected to carry out maximum of 10 visits, however, the final sample plan will be made after the data of rubber industries and testing facilities available has been shared by with the Nodal Officer of BIS.

4.4 Collection of information during visits to manufacturing units/labs may comprise of the following:

i) Varieties of materials, containing PAHs, used in the industry and tested.

ii) Data of developed and optimized sample preparation procedures for testing purpose for each material type to facilitate PAH extraction.

iii) Comprehensive validation of the GC-MS method, including studies on linearity, precision, accuracy, limit of detection (LOD), limit of quantification (LOQ), and recovery rates. Validation should cover a range of PAHs compounds commonly encountered in rubber related materials.

iv) Test Reports and other methods for determination of PAHs, if any, is used.

5. Research Methodology:

5.1 Review the literature in respect of the scope and analyse the findings.

5.2 Contact the industries and labs for information on various materials containing PAHs used in that industry and method for the PAH determination used, after collecting the data base of rubber industries and testing infrastructure.

5.3 A questionnaire to be prepared based on the literature survey done and circulate to the industries and labs for the feedback.

5.4 During the visit to manufacturing unit, followings methods shall be used:

i) Observation and focussed discussion with the technical experts/quality control personnel.
ii) Collecting the materials and doing the testing.

5.5 During the visit to Laboratory, observation and focused discussion to be done on the testing parameters and testing methods used.

6. Deliverables:

6.1 Project report covering all the aspects in the scope.

6.2 Feedback questionnaire, discussions report and test reports of materials tested and detailed sample preparation procedures used for testing purpose appended to the project report in digital and hard copy form.

7. Timeline and Method of Progress Review: The timeline for submission of the project is 3 months from the date of award of the project. Breakdown of stages are as follows:

Stage 1: Literature Survey and Collection of data of rubber industries and labs to be done in first 1 month.

Stage 2: Visits to units and labs to be carried out during the second month after consultation with nodal officer.

Stage 3: Draft Report to be submitted after the end of 2.5 months. The proposer may forward the draft report to BIS without waiting for test reports if the test is a long duration test.

Stage 4: Final Report to be submitted after 3 months.

8. Support BIS will Provide:

8.1 BIS will provide access to latest editions of Indian Standards, International Standards and resources of BIS labs.

8.2 For facilitation and communication purpose, nodal officer for this project from BIS is:

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