TERMS OF REFERENCES FOR RESEARCH PROJECT

1. Title : Study on the Design, Construction, and Performance Requirements of Gravity Fire Sprinkler System for Old Buildings/Buildings in Congested Areas

Sectional Committee : Fire Fighting Sectional Committee, CED 22

2. BACKGROUND:

The old buildings/markets are situated in highly congested areas where accessibility for fire tenders is limited, and there is no automatic fire suppression/fighting arrangement. These buildings typically have a substantial fire load and remain closed during the night. Consequently, firefighting in such structures becomes exceptionally challenging. Therefore, the Gravity Fire Sprinkler System could prove effective for these buildings, offering a cost-effective solution.

A study is required to assess the effectiveness of the Gravity Fire Sprinkler System for old buildings or buildings in congested areas. The study is also necessary to establish the requirements for the design, construction, and performance of the Gravity Fed Sprinkler System.

3. OBJECTIVE

The proposed R&D project aims to develop a gravity-operated sprinkler system as a cost-effective and efficient solution for old buildings/markets in congested areas, particularly with limited space and structural vulnerabilities. The objective of the project is to establish the requirements for the design, construction, and performance of the Gravity Fed Sprinkler System.

4. SCOPE OF THE PROJECT

The scope of the study encompasses the following key points:

4.1. Undertake an extensive and intensive examination of the available literature on the subject.

4.2. Analyse research papers published on the subject, studies conducted by industry or organizations, and any other relevant literature.

4.3. Undertake visits to old buildings and buildings in congested areas to collect the data for requirement of Gravity Fire Sprinkler System.

4.4. Develop a structured questionnaire to get feedback with consultants, regulators, and laboratories.

4.5. Design of a representative full scale fire testing based on the data collected.

4.6. Assessment of the feasibility of a gravity-operated sprinkler system for old buildings/markets through full scale fire testing.

4.7. Demonstration of the functionality and effectiveness of the system in suppressing the fires.

4.8. Assessment of the system that the sprinkler can also act as a fire alarm through a flow switch, which will indicate about the early fire detection in the absence of Automatic Fire Alarm facility.

4.9. To provide recommendations for wider applications, including small hotels, guest houses, and restaurants.

4.10. Undertake a comprehensive analysis of all collected data, incorporating findings from the literature review, visits to old buildings, visits to buildings in congested areas, and full-scale fire testing.

4.11. Identify patterns, trends, and critical insights relevant to the Design, Construction, and Performance of the Gravity Fire Sprinkler System.

5. METHODOLOGY

In respect of the areas covered under the scope, the methodology encompasses the following:

5.1. Review the literature as specified under the Scope.

5.2. Visit to three different congested areas to collect the data for requirement of Gravity Fire Sprinkler System.

5.3. Preparation of the questionnaire and share the same with consultants, regulators, and laboratories.

5.4. Design a representative full scale fire testing setup based on the data collected.

5.5. Prepare the full-scale fire test and perform the test to collect the relevant data for design, construction, and performance of the system.

5.6. Comprehensive analysis of all the collected data, incorporating findings from the literature review, visits to old buildings, visits to buildings in congested areas, and full-scale fire testing.

5.7. Identify patterns, trends, and critical insights relevant to the Design, Construction, and Performance of the Gravity Fire Sprinkler System. The analysis shall include the following:

- Minimum head required to work the sprinkler system feasibly.
- The output of the water and the size of the tank to operate one sprinkler for minimum 30 minutes.

- Specify the required components, including sprinkler heads, piping network, and fire service inlet.
- Design requirements for a fire service inlet outside the building, with a non-return valve on the sprinkler pipe for connecting water from fire engines.
- Evaluate the system's feasibility in terms of water pressure requirements, performance, and cost-effectiveness.
- Consider the gravity sprinkler system's ability to control fire, and minimize the need for manual intervention by firefighters in congested areas.

6. DELIVERABLES

Considering the scope and objectives, the research shall be taken up by the proposer and prepare a report on the following deliverables:

- Project report covering all the aspects of the Scope.
- Questionnaire, feedback, and report for full scale fire test and its design shall be appended to the project report.

7. TIMELINE AND DELIVERY MILESTONES

The timeline of the project shall start from the date of issue of sanction letter by BIS. The details are as follows:

Stage	Timeline
Report on literature review, visits, questionnaire, and feedback.	4 weeks
Report of design of full-scale fire testing. Submission of interim report to Sectional Committee at the end of the tenth week.	10 weeks
Review of the interim report by the Sectional Committee and feedback by the Sectional Committee.	12 weeks
Report of full-scale fire test and draft final report submission.	18 weeks
Review of the draft final report by the Sectional Committee and feedback by the Sectional Committee.	20 weeks
Final comprehensive report submission including the feedback from the Sectional Committee.	22 weeks
NOTE — In case of delay in submission of final report, the justification shall be given by the awardee for consideration by the Sectional Committee.	

8. SUPPORT FROM BIS

a) To provide any National/ International standards.

b) Licensee details of manufacturers of similar products.

c) List of BIS approved laboratories for testing similar products.

9. NODAL PERSON

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