**Technical Support – Work Order Specification**

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| **Title: Provision of Methods to determine High Efficiency Particulate Air (HEPA) filter ageing and cumulative effects of Dispersed Oil Particulate (DOP) testing on filter performance** |
| 1. Background to the project
2. Many nuclear facilities contain ventilation systems that are important to protect workers, the public and the environment from the potential harm caused by radioactive materials.
3. It is recognised by the industry that there is no means of confirming the condition of the filter in relation to strength and other physical properties. Consequently the impact of ageing on the integrity of HEPA filters cannot be determined [Ref 1, section 13.5.2].
4. Relevant good practice (RGP) specifies that HEPA filters should be subject to Dispersed Oil Particulate (DOP) or Decontamination Factor (DF) testing with a maximum periodicity of 12 months [Ref. 1, section 13.4.1] although it is acknowledged that no assurance of filter strength or physical resilience is gained. Furthermore, the contribution of DOP/DF testing on filter ageing and degradation is not understood.
5. RGP specifies that a justification for continued operation (rather than undertaking filter replacement) after 5 years operational life is required. However extant analysis and guidance has reported that mechanical integrity of the HEPA filter media cannot be determined or underpinned with certainty [Ref. 2].
6. Given that High Efficiency Particulate Air (HEPA) filters are widely used to prevent nuclear material escaping containment, substantiation methods for HEPA filter integrity are considered to have potential benefits for the whole industry and therefore are worthy of further investigation.
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| 1. SCOPE OF THE SERVICES REQUIRED
2. ONR requires a supplier who can provide technical support to the ONR research project with regard to HEPA filter ageing and degradation. The work shall be delivered through a phased approach as it is recognised that the output of each phase may result in scope changes.
3. Phase 1 – Research review: determine development in the causes of HEPA filter ageing and degradation.
4. Phase 2 – Research review: determine developments in HEPA filter mechanical resilience/robustness.
5. Phase 3 – Design/technology study of in-situ testing methods of HEPA filter mechanical integrity.

**NOTE:** It is anticipated that timescales for delivery of phase 1-3 will be circa 4 months. Phase 4 & 5 may be subject to subsequent tender, based on the ONR review of phase 1 – 3. 1. Phase 4 – Experiment designs to deliver in-situ HEPA filter mechanical performance testing.
2. Phase 5 – Confirmatory testing.
	1. DETAIL OF SCOPE
		1. Phase 1 - Research review: determine development in the causes of HEPA filter ageing and degradation.
3. W Bergman issued a report [Ref. 2] detailing experimental work undertaken to evaluate the causes and effects of HEPA filter ageing. This has remained a key baseline document upon which relevant good practice (RGP) is based.
4. A review of subsequent research undertaken since 1999 is required to investigate developments regarding the causes and effects of HEPA filter ageing subsequent to Bergman’s findings.
5. As part of this review, determination of whether the effect of DOP/DF testing on the ageing of the filters has been assessed is required. DOP/DF testing [Ref.1, section 13.4.3] is widely used to demonstrate the effectiveness of HEPA filtration.
6. The phase 1 review shall consider national and international research.
7. The phase 1 deliverable shall be a summary of research areas consulted, report summaries considered and discounted (i.e. assessed but considered to provide no pertinent output) and those with applicable content. Where valid research is identified a summary of conclusions shall be produced. It is intended that this output can be used a ‘signpost document for the nuclear ventilation industry and regulators as a point of reference and a baseline for future consideration.
8. The output of phase 1 shall be presented to the ONR, with supporting report.
	* 1. Phase 2 – Research review: determine developments in HEPA filter mechanical resiliance/robustness.
9. The phase 2 scope shall determine whether any research and development of HEPA filter assembly materials and design has resulted in improvements of resilience/robustness compared to the filters assessed by Bergman [Ref. 2].
10. The phase 2 review shall consider national and international research.
11. The phase 2 deliverable shall be a summary of research areas consulted, report summaries considered and discounted (i.e. assessed but considered to provide no pertinent output) and those with applicable content. Where valid research is identified, a summary of the conclusions shall be produced that identify existing or potential improvements to the mechanical resilience of HEPA filters.
12. Where potential improvements in the resilience of HEPA filters have not progressed from research to the commercial arena, a ‘gap analysis’ shall be provided that identifies the outstanding issues.
13. The output of phase 2 shall be presented to the ONR, with supporting report.
	* 1. Phase 3 – design and technology study of in-situ testing methods of Hepa filter mechanical integrity.
14. It is recognised in the nuclear industry that although DOP/DF filter testing provides assurance regarding filter efficiency it does not provide an indication of the mechanical strength or fragility of the filter [Ref. 1, section 13.5.2].
15. The phase 3 scope shall review whether means of determining the mechanical performance/resilience of aged HEPA filter strength has been developed.
16. A summary of ageing HEPA filter failure modes shall be produced and grouped as considered appropriate.
17. For each of the grouped failure modes, consideration of methods, technologies and applications that would enable in-situ testing of the strength and reliance of a HEPA filter is required. Where no means of assessing the performance of an identified failure mode is identified or considered feasible, an explanation of the limiting factors is required.
18. Without prejudice, the use of Real time Radiography (RTR) is offered as an example of technology that has been developed which may provide real time feedback on the behaviour of the HEPA filter internal components.
19. The output of phase 3 shall be presented to the ONR with supporting report.
	* 1. Phase 4 & 5
20. Phase 4 & 5 may be subject to subsequent tender, based on the ONR review of phase 1 – 3. A detailed specification on the requirements for phase 4 & 5 will follow the review of phase 1 – 3 output. The outline scope of phase 4 & 5 will be: PHASE 4 - Design of Experiment to determine HEPA Filter mechanical ageing & PHASE 5 - Testing proposed methods of determining HEPA filter ageing.
	1. References
21. ES\_1738\_1\_Issue 1 Ventilation systems for Radiological Facilities, Sellafield Limited.
22. Maximum HEPA-filter Life, LLNL, W. Bergman report 1999.
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| 1. OBJECTIVES
2. Objective 1 - determine whether extant research has determined improvements with regard to materials or methods of construction to deliver HEPA filtration ageing resilience.
3. Objective 2 – determine whether extant research has developed methods of in-situ HEPA filter testing that provides deterministic assurance of strength and other physical properties.
4. Objective 3 – develop and demonstrate methods of in-situ HEPA testing that provides deterministic assurance of strength and other physical properties.
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| 1. CONSTRAINTS
2. Bidders shall declare any conflicts of interest that arise in delivering this project from previous work undertaken for duty holders.
3. Nominated personnel whose CVs have been submitted at tender shall only be substituted by prior agreement with ONR.
4. Bidders shall propose an appropriate team to this project and retain the team so assigned throughout the project, unless agreed otherwise by ONR. ONR shall approve the project team proposed by the provider before commencement of the contract. The instability of the team through may provide sufficient justification for ONR to terminate the contract.
5. The successful bidder should aim to avoid the need to assign a security classification of OFFICIAL-SENSITIVE or higher to any output so that it may be published and freely circulated. A separate annex containing protectively marked material may be used if necessary, subject to agreement with the ONR project officer.
6. The project should be subject to independent oversight within the provider’s organisation to ensure objectives and outputs are achieved. Both technical audit and oversight outcomes shall be documented in each of the interim and final report(s).
7. During delivery of this project, the project team may uncover matters which require confidentiality considerations. It is incumbent on the project provider to raise such matters at the earliest opportunity in order to determine the nature of the issue and an adequate response.
8. Material gathered during the course of this project shall be referenced and presented in the reports produced at the completion of the appropriate phase. Documents obtained from third parties that retain a security or commercial designation, will be handled in accordance with the requirements set by the owner.
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| 1. CONTRACT MANAGEMENT
2. The technical support contractor shall update ONR about progress and delivery of the required work via monthly progress meetings. In advance of the monthly progress meeting a revised programme and invoice shall be submitted to ONR for review. The programme shall be issued 5 working days before the progress meeting.
3. It is expected the regular progress meetings between ONR and the Technical support contractor shall be held and the premises of the technical support contractor however with prior agreement they can be conducted by phone/teleconference.
4. Output review meetings for each phase of the research project may be held at ONR’s office in Bootle upon prior agreement from the ONR.
5. All information produced in support of this research project (e.g. design information, test documents, data and reports) shall be the property of the ONR. Written output shall be produced in Microsoft ‘Word’ and spread sheets in Microsoft ‘Excel’ formats. Drawings shall be issued as signed Pdf images with supporting dwg files.
6. Drawings produced to support the construction of plant required for the experiment shall be updated to reflect the ‘as-built’ status of the equipment.
7. Configuration control of the experiment documentation shall be subject to formal change control recording document history and reasons for change.
8. Technical queries shall be used to record formal questions issued to the technical support contractor.
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| **TECHNICAL RESPONSE** |
| The Technical Response should demonstrate a clear understanding of the work required. Please provide: * a description of how you will deliver the scope of work (methodology) and the proposed delivery team you will use, clearly signposting to relevant sections within your Capability Prospectus where appropriate/relevant ;
* a description of proposed deliverables and/or outputs;
* an outline of anticipated engagement (project meetings & management);
* details of proposed cost and associated effort assumptions;
* a project delivery plan showing activities and milestones;
* a planned invoice schedule;
* details of any assumptions or constraints;
* CVs and SQEP details of individuals who will be undertaking the work;
* The charging rates and invoicing and payment schedule and arrangements throughout the contract, including the means by which progress can be tracked against payments;
* Arrangements for managing delivery of the work through engagements and dealing with disputes (including details of who will act as the liaison point between the provider and ONR).
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