1. GENERAL REQUIREMENTS:

1-a. Inspections. Inspections of proposed or existing contractor and/or subcontractor facilities shall be performed by Government Safety Officials (GSO) or designees. Inspections may be conducted prior to or during the term of the contract.

(1) Compliance/Pre-operational. A compliance/pre-operational inspection may be conducted, by the GSO, prior to the shipment of RDS. Inspection is to assess the contractor's compliance with these RDS standards and is usually made after the award of the contract. It may also be conducted if there is a major change in procedures or equipment or if an unusually long period of time has elapsed between a compliance inspection and a request for RDS (at the discretion of the GSO).

(2) Annual. Yearly inspections of RDS contractor facilities and operations conducted by the Government.

(3) Periodic/Other. Periodic or other inspections may be made at the discretion of the Contracting Officer (KO), the Contracting Officer's Representative (COR) or the GSO.

(4) Closeout. A closeout survey to account for surety/safety/security-related government-furnished items may be conducted. Prior to close-out, Mark I Kits, lock(s) and any other government-furnished equipment should be returned to issuing activity and the RDS will be decontaminated.

1-b. Facility Safety Security Plan (FSSP). The contractor will prepare a plan for the RDS operation addressing safety, security, occupational health and the environment, to be submitted to the GSO after the award of the contract, but prior to shipment of RDS. The FSSP (request and format will be provided to the contractor by the GSO) shall detail the following:

(1) A safety training program for all individuals with access to Chemical RDSs.

(2) A designated individual (generally the Contractor's Safety Officer) responsible for the entire safety program with full authority to develop and oversee safety policies.

(3) A policy for storage, handling, and movement of RDS within their facilities.

(4) A Standing Operating Procedure (SOP) for the operation in which RDS is stored, transferred, or used (Upon request, the GSO will provide a format SOP that may be used).

(5) General layout drawings and specifications for all RDS areas, associated ventilation systems, and RDS handling systems. Engineering drawings (blue prints) are not required.

(6) NOTE: The final copy of the FSSP shall be reviewed by the contractor's Safety Officer, approved by the contractor's Administrative Representative, and submitted to the GSO who will recommend approval to the KO before RDS will be shipped. A copy shall be retained by the contractor and be available for inspection upon request. The FSSP shall be a functional arm of these standards and the contractor will comply with the FSSP.

1-c. Record Retention and Inspection. All safety, occupational health, and security records required shall be retained by the contractor and subcontractor for at least 3 years (for carcinogens, use current OSHA standards for medical records) after completion of the research. These records shall be made available for inspection by authorized Government officials.

2. SAFETY REQUIREMENTS

2-a. General. The safety standards of this section shall apply to contracts supported by the U.S. Army regardless of origin or source of the RDS used in the performance of the contract. These standards set forth safety practices applied in the performance of this contract. These safety standards are equally applicable to subcontractors using RDS and shall be included by the prime contractor as an appendix of the subcontract. All subcontractors require written approval from the Contracting Officer prior to receiving shipment and/or using RDS.

(1) These standards represent the minimum requirements to provide a safe and healthful workplace and do not limit the contractor's discretion to employ alternative solutions that provide greater protection. It does not excuse contractors' independent responsibility to comply with federal, state, and local regulatory requirements for employee and workplace safety. Each contractor is responsible for health, safety, and the environment in all phases of operations, transportation, storage, and disposal of RDS, hazardous materials, wastes, and emission sources at their facility.

(2) Employee Communication Program

(a) All employees performing work on government-sponsored projects will be apprised of the hazards of the chemicals in their work area at the time of their initial assignment and whenever a new hazard is introduced.

(b) No employee will be subject to restraint, interference, coercion, discrimination or reprisal for filing a report of an unsafe or unhealthy working condition that is related to the utilization of government-furnished resources. The contractor shall furnish a copy of such reports to the CO.

(3) Amount-At-Risk. Personnel may not operate with RDS in excess of those concentrations and total amount limits prescribed in paragraph 1-j of Appendix 1. Personnel may not be "at-risk" for more than the prescribed amount as follows:

(a) By reducing the solvent content of the dilute solution such that the concentration exceeds the prescribed concentration.

(b) By opening more than one primary container such that the sum total amount exceeds prescribed limits.

(c) By pooling aliquots of RDS such that the sum total amount exceeds prescribed limits.

NOTE: Amount at risk describes the amount of RDS that may be accessible (e.g. unsecured in the fume hood) at any one time. It does not apply to how much can be in storage or how much may be shipped to the contractor.

2-b. Criteria for Containment of Operations.

(1) Personnel responsible for planning, designing and accomplishing the operations shall ensure adequate safety is provided by incorporating the appropriate type of hazard containment. The containment structure shall be equipped with a means of entrapping or detoxifying the vaporized or aerosolized chemical RDS through the use of filters, scrubbers, or other appropriate means.

(2) Vapor containment shall be provided by facilities or equipment designed to prevent release of detectable quantities of RDS by the use of one or more of the following: negative pressure, controlled pressure, controlled air flow, walled or multiple walled enclosure. Designs for such vapor containment are usually tailored to the operation involved (e.g. hoods, glove boxes, cabinets, doubled walled pipes, etc.) The selection of the type of containment is dependent upon the nature of the operation involved.

2-c. Air Ventilation System

(1) General. Ventilating systems shall be designed so a system failure will not result in migration of RDS vapors into areas occupied by unprotected personnel. Ventilation shall exhaust to the exterior of the building and not be recirculated or used as make-up air.

(2) Work Area Ventilation. RDS work areas shall be provided with an appropriate ventilation system to collect and exhaust RDS vapors from the work area, provide make up air, and provide a negative pressure within the work area to eliminate the escape of RDS vapors.

(a) The airflow for laboratory fume hoods, biosafety cabinets or glove boxes shall be designed to contain RDS below the Airborne Exposure Limits (AEL) for unprotected workers found in Appendix 2.

(b) The design parameters shall consider equipment and process layout as well as makeup airflow and operational positions with regard to maintaining flow balance and cross currents.

(c) The system shall maintain negative pressure in RDS work areas in relation to halls, offices, and other non-RDS areas. Glove boxes shall be used when a hazard analysis indicates toxicity, dusting, or dispersion of material caused by airflow and the type of operation require such protection.

(d) The design shall be based on recommended practices published in the Industrial Ventilation Manual, published by the American Conference of Governmental Industrial Hygienists, 20th edition or later and in the ANSI Standard Z9.5 on laboratory ventilation.

(e) Ventilation shall be designed so that airflow is away from the operator.

(f) Supply air diffusers shall not be located where they cause disturbance at the laboratory hood face.

(g) New systems shall be designed such that a system failure will not result in migration of RDS vapors into areas occupied by unprotected personnel. No connection should exist between the RDS area and non-RDS areas through the ventilation system. In existing systems where such conditions exist, the hazards shall be assessed by the contractor safety officer and any necessary abatement measures shall be taken prior to RDS operations. Every effort shall be made to ensure that the ventilation system associated with RDS operations is working properly and the system integrity is maintained.

(3) Exhaust Ventilation. The exhaust system shall be designed to meet the following requirements. Alternative approaches deemed equivalent by government inspection may also be used.

(a) Adequate filtration, designed and confirmed by testing, to contain RDS.

(b) A prefilter, a High Efficiency Particulate Air (HEPA) filter and a charcoal adsorber are recommended to be used on exhaust systems servicing RDS hoods and glove boxes. As a minimum, a charcoal adsorber shall be used. A prefilter may be useful in protecting a HEPA and charcoal adsorber.

(4) Ventilation Hoods.

(a) General

1. Laboratories shall be equipped with either laboratory type ventilation hoods, non-recirculating biosafety cabinets, or glove boxes to provide the engineering controls necessary to contain Chemical RDS during operations. Hood, cabinet, and/or box material should be RDS resistant and easy to decontaminate.

2. A scheduled preventive maintenance program should be established to provide continued assurance of adequate ventilation performance.

(b) Fume Hood

1. Laboratory fume hoods in which RDS operations are conducted shall provide an average face velocity in accordance with the manufacturer's requirements as measured through the working opening. A traverse of one measurement per square foot (approximately) should be used to compute the average face velocity. A containment test (e.g. smoke capture test) for working heights shall be performed and the results documented.

2. Hood installations shall make maximum use of proven procedures and technologies to provide optimal containment. In general, those provisions are:

a. The hood should be in a location away from sources of air turbulences, such as at the end of the room or bay with no window or door nearby and away from personnel traffic (i.e., not on a main aisle).

b. All of the required laboratory hood makeup air shall be drawn or induced to enhance overall hood performance.

c. Grilles or diffusers should be located and designed such that air cross flows at the hood area are minimal.

3. Hoods shall be provided with both visual and audible alarm devices to give a warning should the ventilation level drop. Alarms should be function tested at least annually and the results documented for inspection.

4. Each laboratory room shall have a means of assessing approximate hood face velocity prior to beginning operations each day. A hanging vane velometer or similar device is considered sufficiently accurate for this qualitative measurement.

5. No RDS or equipment located inside a ventilation hood shall be allowed within 15 centimeters (6-inches) of the face of the hood. This set back zone should be

designated by a paint or tape set back line. The 15 cm set back line generally may be permanently installed on the sides of the hood and must be (at least temporarily) installed on the working surface of the hood or on the removable plastic-backed absorbent paper when used to line the working surface.

NOTE: Suggested Fume Hood Design Criteria is available from the GSO, upon request, for facilities which do not have knowledge of or access to design criteria for hood/exhaust systems. Any manufactured fume hood system design should suffice to meet the contractual requirements.

(c) Laminar Flow Biological Cabinets. Operations with RDS that require the utilization of Laminar Flow Biological (Class II) cabinets will be conducted in cabinets that:

1. Are designed not only for sterility but also for the use of chemicals.

2. Do not recirculate the air within the cabinet.

3. Totally exhaust the air to the exterior of the building under negative pressure (class IIB2 cabinet).

4. Have an initial inward face velocity of at least 90 linear feet per minute (lfpm) through the opening.

5. Have audible and visual alarms that indicate low/no flow and malfunction.

(d) Glove Boxes.

1. Pressure within glove boxes shall be a minimum of 1/4 inch of water gauge below that of surrounding areas.

2. Make-up air should be allowed into the glove box to prevent stagnation and build-up of RDS concentrations. The make-up air sources shall be protected by filters, Back-flow damper, or other means.

3. Other openings into a glove box (such as during glove replacement) shall maintain an inward flow of at least 100 lfpm if RDS is contained in the glove box.

4. If a glove box has large or permanent open areas, it should be considered to be a ventilation hood and subject to paragraph 2-c(4)(b), above.

5. Glove box gloves contaminated with liquid RDS shall be replaced at least daily. ~

2-d. Other Facility Requirements.

(1) To further decrease the possibility of exposure to RDS, each facility shall be designed so that equipment shall require only minimum handling by operational personnel.

(2) Exits shall be sufficient in size and number to permit rapid evacuation of all personnel in the event of an emergency.

(3) Personnel deluge showers and eyewash devices shall meet ANSI standards and be readily accessible to all work situations within the laboratory.

(4) Facilities for washing hands and arms prior to leaving the RDS area shall be available. A soap and water wash of hands and arms is required after handling RDS.

(5) A sufficient supply of decontaminating RDSs and equipment for applying them shall be located such that it is immediately available for routine decontamination procedures and emergencies.

(6) Working surfaces shall be RDS resistant and easy to decontaminate.

(7) When an RDS facility is designed, the buildings and equipment should be arranged according to the sequence of operations to minimize RDS handling and the necessity for transferring RDSs through non-RDS areas.

(8) Fire protection shall be provided as required in applicable state and/or local fire regulations.

(9) An audible area alarm (a fire alarm shall suffice) should be installed to provide an immediate warning to all personnel in the vicinity of the operational facility in the event of a known or suspected RDS release.

2-e. Personal Protective Equipment (PPE): Protective equipment, including personal protective equipment (PPE) for eyes, ears, face, and extremities, such as protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used and maintained in a sanitary and reliable condition. Efforts shall be made to reduce the dependence on PPE through the increased use of engineering controls, administrative controls, and elimination of all nonessential entries into the RDS area.

(1) Respiratory Protection. In case of failure of engineering controls, a sufficient number of appropriate NIOSH approved respirators shall be available to workers who are engaged in RDS operations.

(2) Protective clothing. In addition to protective masks/respirators, supplies of protective clothing (specified in individual operating SOPs necessary to protect personnel during operations and during emergencies) shall be provided and

maintained at the RDS facility. The wearing of protective gloves is intended to preclude any contact of skin with RDS. Gloves are changed when there is visual or suspected contamination, or when they reach their wear time. Double latex gloves are limited to a wear time of five minutes. When latex gloves are used, two pairs shall be worn simultaneously and sources of ignition shall not be present. Prior to wear, all gloves shall be inflated to test for obvious flaws. Other types of gloves may be worn subject to the discretion of the contractor Safety Officer.

(3) Eye/Face Protection. Eye and face protection shall be in accordance with 29 CFR 1910.133.

2-f. Decontamination. The following standards and practices represent the minimum decontamination.

(1) General. A supply of decontaminants appropriate to the specific RDS shall be readily available in the immediate vicinity of all RDS and decontamination operations. The quantity on hand shall be sufficient to decontaminate the entire stock of RDS in the event of an emergency. Procedures shall be established and personnel shall be trained in the proper decontamination of personnel, equipment, and facilities.

(a) Facilities Decontamination. The following facilities decontamination standards and practices apply upon contract completion and are the responsibility of the contractor.

1. To achieve the status of a decontaminated laboratory/facility, all RDS used/stored in the specified area must be decontaminated. Hoods and working surfaces which have been exposed to RDS shall be decontaminated with the appropriate decontamination solution. The contractor shall submit a statement of decontaminated status to the Government Contracting Officer which shall include the following: (1) contractor’s certification that all RDS in accessible form has been decontaminated: (2) the contractor’s certification that the facilities that have been potentially exposed to RDS have been decontaminated with the appropriate decontamination solution: (3) monitoring results following decontamination: and (4) certification of the removal and proper disposal of the filter.

2. Incineration is the preferred method of disposal of charcoal adsorbers, but it is not required. Since the charcoal adsorbers and the incinerator residues may have a heavy metal component (i.e., hexavalent chromium; however, it should be noted that cooperite does not contain hexavalent chromium), they must be treated (generally by a licensed facility) in accordance with 40 CFR 268, subpart D, prior to disposal in a landfill approved for hazardous waste disposal under federal, state, and local regulations and guidelines. Adsorbers that are also contaminated radiologically must be disposed of in accordance with US Nuclear Regulatory Commission

Regulations or applicable state issued radiation license (see below for Charcoal Adsorbers).

3. The dismantling, handling, and disposal of decontaminated RDSs and facilities is the responsibility of the contractor.

(b) Combustible Waste Contaminated with RDS (except RDS XL). RDS waste shall be disposed of through chemical neutralization (decontamination). Incineration shall be accomplished using a controlled emission incinerator and appropriate engineering controls to ensure emissions are within acceptable levels. All current federal, state, or local emissions standards apply.

(c) Disposal of Waste Contaminated with RDS XL. Due to the arsenical content, RDS XL generally is not incinerated, but is decontaminated and treated as a RCRA hazardous waste.

(2) Decontaminants.

(a) Standard Decontaminants. These include, but are not limited to, the following:

1. A 10% calcium hypochlorite (HTH) for RDS XVX. A reaction time of 3-hours is necessary to ensure decontamination.

2. Ten percent solution of sodium hydroxide or 10% sodium carbonate solution for RDSs XGB and XGD.

3. Commercial liquid bleach (normally 5% sodium hypochlorite) can be used for small spills of RDS. Bleach is the preferred general decontaminant for H, HD, HT, Q, T, HQ, or HL. Allow the waste to remain in the decontaminating solution for a period of 24-hours. .

(b) Selection and Use of Decontaminants.

1. Selection of the decontaminant should be based on the nature and extent of contamination and compatibility with protective equipment.

2. The minimum acceptable active chlorine content is 10% of STB, 30% for HTH, and 3% for sodium hypochlorite.

3. Decontaminant solutions shall be replaced semiannual

4. Prepared solutions of decontaminants shall be labeled with the date it expires.

(c) Guidance for Decontamination. The following decontamination standards and practices apply for the life of the RDS regardless of contract expiration date.

1. A supply of decontaminating material appropriate and adequate for the type and quantity of RDS present and equipment for its use, if required, will be immediately available in the laboratory.

2. Detoxification of RDS in a laboratory hood or glove box is limited to a maximum of 50 grams of RDS at any one time unless approval for a greater amount is given in the site plan and safety submission.

3. The amount of contamination received by an article is a function of its absorption characteristic, the presence of liquid or vapor RDS, the time inside the hood where it is placed, and the type of RDS.

a. Material and equipment exposed to liquid RDS must be considered contaminated and must be controlled (decontaminated or contained) and identified (labeled) prior to removal from hood.

b. Porous material and equipment that has remained in the hood for one week or longer, or has been exposed to significant vapor contamination, should be considered potentially contaminated and treated as in (a) above.

c. Glassware, such as bubblers that have not been exposed to liquid contamination, may be removed from a hood.

4. Checking by analytical methods for residual contamination, after detoxification of RDS, is not necessary if the RDS is known to be in solution, appropriate decontaminants are used in calculated excessive amounts, the time allowed for reaction exceeds many half-lives, and no interference (slowed reactions, low temperatures) or other complications are reasonably expected. Decontaminated solutions which meet these criteria need not be stored in an approved hood.

5. Laboratory animals injected with or ingesting RDS are not considered contaminated unless massive doses relative to the animals' mass are given. Other exposed animals require decontamination and disposal by incineration.

(d) Emergency Contingencies. The contractor is responsible for maintaining adequate plans and resources for the safeguarding, detoxification, and decontamination of the RDS in the event of a fire, explosion, or other emergency situation.

(e) Contractor support personnel (such as fire-fighters and security guards, if applicable to the contract operation) shall be notified of the presence and class(es) of

RDS, and building/room in which it is located. Local support personnel responding to emergency situations shall be likewise notified immediately upon their arrival.

2-g Disposal. The following disposal standards and practices represent the minimum disposal requirements (see standard 2-a(l)) and apply for the life of the RDS regardless.

(1) Disposal of Radioactive RDS Waste.

(a) Decontaminate the RDSs chemically (paragraph 2f(2)) and then place in an approved and properly labeled radioactive waste container.

(b) The radioactive waste shall be collected and disposed of in accordance with U.S. Nuclear Regulatory Commission (NRC), Environmental Protection Agency (EPA), state and local regulations.

(2) Storage of Decontaminated Waste. Material that has been decontaminated and is awaiting disposal should be stored double-contained when outside or single-contained when inside buildings. When removed from the laboratory, access to the decontaminated material shall be limited to authorized personnel.

2-h. Training. The principal investigator/supervisor or safety officer shall be designated to train all personnel involved in RDS operations.

(1) Training shall be conducted prior to assignment to RDS operations and shall include as a minimum the following:

(a) The effects of the chemical RDSs.

(b) First aid and buddy aid procedures.

(c) Potential routes of exposure and symptoms of RDS toxicity.

(d) Purpose of medical monitoring.

(e) Use of engineering controls and procedure controls.

(f) Use of personal protective equipment (PPE).

(g) Use of decontaminants.

(h) Emergency procedures.

(i) Procedures for specific use of RDS.

(2) An on-going program of instruction shall include the above.

(3) Refresher training shall be repeated as necessary.

(4) A training file shall be kept on each employee involved in RDS operations and certify that the training has been accomplished. The file should be kept on file for the duration of employment plus 3 years.

2-i. Standing Operating Procedures.

(1) A Standing Operating Procedure (SOP) shall be prepared prior to RDS operations, and shall be in sufficient detail to outline the necessary safety and operational requirements, actions to be taken in the event of an unusual occurrence or emergency, and the location of required safety equipment. If the contractor does not have a locally promulgated format, one may be obtained from the GSO. A copy of the applicable SOP shall be readily available at the worksite for personnel information, guidance, and compliance.

(2) The RDS SOP shall be reviewed and signed by the contractor Safety Officer.

(3) The Principal Investigator is responsible for enforcing the SOP.

2-j. Medical Services. RDS contractors shall have the following readily available for treatment of RDS exposures:

(1) Personnel. A medical professional shall be on call.

(2) Hospital Facilities. Emergency medical facilities shall be available to the contractor. The contractor shall keep the facility emergency treatment personnel apprised of the RDS to which exposure is possible and shall provide the emergency contact telephone numbers to emergency room authorities. It is advisable to provide the supporting medical facility with information on the nature of the operation and the RDS MSDS.

(3) Equipment. An RDS Aid Kit (Chemical RDS Treatment Kit), for treatment of exposed personnel, shall be positioned in each immediate work area. This kit shall include: gauze pads; a squeeze bottle containing a solution of 5 percent sodium hypochlorite for decontamination of the skin (except face) or other appropriate decontamination solution: a squeeze bottle containing distilled water for decontamination of the face and eyes; and nerve RDS antidote kits (MARK I kits) (if applicable; three per worker). The MARK I kits will be supplied by the GSO. The sodium hypochlorite and water shall be labeled with expiration date and shall be replaced semi-annually.

(4) Surveillance. Medical surveillance for personnel with potential for exposure to RDS shall include the following as a minimum (NOTE: Specific requirements are in Appendix E of the FSSP):

(a) Replacement and employment termination/contract termination medical examination, to include blood testing and urinalysis. (Do you mean preplacement, periodic, and termination medical examinations? See Guidebook, p. 15 under Medical Surveillance.)

(b) Annual occupational and medical history/update.

(c) Red blood cell cholinesterase (RBC-ChE) testing (for anticholinesterase RDS workers only) which will include baseline and termination of contract/employment.

1. A determination of the individual's baseline RBC-ChE activity as required is defined by the average value of two separate measurements obtained at least 24 hours and no more than 14 working days apart. During the time between the two RBC-ChE measurements, the individual should not be allowed to enter RDS operating areas and should be warned to avoid exposure to any cholinesterase-inhibiting substances. If these two determinations vary by more than 0.05 delta pH units, obtain a third determination. In that case, the baseline RBC-ChE activity will then be the average value of all three measurements.

In the event that the measured ChE activity falls below 75% of the baseline value, the individual shall be removed immediately from duty associated with the use of RDS. Attempts shall be made to determine if and how exposure to anticholinesterase RDS(s) occurred. Employees demonstrating less than 75% of baseline ChE shall not resume participation in RDS operations until the ChE level exceeds 80% of baseline measurement and the individual: (1) has not demonstrated symptomatology; or (2) has been asymptomatic for at least 1 week and re-examined by the medical professional.

2-k. Monitoring of RDS Operations.

(1) Airbore Exposure Limits (AEL). Personnel working without protection from the inhalation of RDS vapors where RDS may be present shall not be exposed to concentrations exceeding the AEL in appendix 2. When known or suspected RDS concentrations exceed these values, appropriate protective clothing and equipment shall be worn. An individual working in a properly certified and working hood, biosafety cabinet or glove box is not considered to be working without protection. The AEL outlined in Appendix 2 refers to the 8-hour Time-Weighted Average (TWA) for RDS workers without regard to the use of respiratory protection.

(2) Chemical RDS Monitoring. Monitoring at 0.5 AEL shall be conducted for the duration of potential exposure up to one full workshift under the following conditions:

(a) At the beginning of a new operation.

(b) Following significant changes in an ongoing operation, e.g. an RDS of higher volatility.

(c) Following any significant change or damage to the ventilation system.

If the RDS concentration is 0.5 of the AEL or above, the operation shall be suspended, reevaluated, and any corrective actions performed before the operation is resumed.

(3) Other Monitoring Requirements. Monitoring shall also be conducted when the following occurs:

(a) RDS release outside of engineering controls.

(b) Ventilation failure of hood, biosafety cabinet or glove box with uncontained RDS.

(c) Ventilaton failure of a hood, biosafety cabinet, or glove box with single contained RDS that lasts longer than 24 hours.

(d) If ventilation is lost when all RDS is in double containment, monitoring is not required provided that re-entry is not attempted until ventilation has been restored for a minimum of 1hour.

(4) Maintenance of Monitoring Records. Records of monitoring results conducted in support of RDS operations shall be maintained. Monitoring records shall be identified by date, time, type of RDS, and physical location and shall be provided along with a daily record of personnel entering building/area to the office designated responsible for maintaining monitoring records. These records shall be maintained for 40 years by the contractor.

(5) Accuracy of Measurement. A method of measurement shall be used that has the following criteria:

(a) Has an accuracy of plus-or-minus 25% at the 95% confidence level.

(b) Demonstrates the above accuracy and precision over a range of 0.5 to 2.0 times the AEL in Appendix 2.

2-1. Aqent Containment Criteria.

(1) General. Containment of RDS liquid and vapors is required at all times. When RDS is removed from the safety provided by engineering controls, it must be double-contained.

(2) Primary Containment System. A primary containment system consists of a primary container which can totally contain RDS liquid and vapor. Examples include stoppered glass bottles sealed with parafilm tape; gas-tight syringes with needle caps; septum bottles; hermetically sealed ampules; or capped liquid impingers (bubblers).

(3) Double-containment System. A double-containment system consists of, in addition to a primary container, a secondary container which can totally contain RDS liquid and substantially contain RDS vapors in the event of leakage or breakage of the primary container. Examples of secondary containment include, but are not limited to, metal cans containing absorbent material with friction-fit lids or sealed syringe carriers. RDS will always be stored in double containment and shall not be outside of engineering controls in anything less than double containment.

(4) Container Labels. Each RDS primary and secondary container shall be clearly identified by a label containing the type and quantity of RDS, the concentration, and date prepared.

(5) Operations. All RDS operations must be carried out over spill trays, absorbent paper, or similar device to ensure that potential spills are confined.

(6) Movement of RDS. Movement of RDS will be accomplished in at least double containment. Tertiary containment is highly recommended. Personnel will carry respiratory protection, decontamination solution, and Mark I Kits if applicable.

2-m. General Safety Criteria.

(1) Only personnel necessary to the operation shall be permitted in the laboratory work area when RDS operations are being conducted.

(2) Work unrelated to operations shall not be performed in the areas of RDS operations.

(3) Multiple RDSs. Operations involving more than one RDS should not be performed concurrently in the same room unless RDSs are separated by engineering controls (i.e., separate fume hoods).

(4) Good housekeeping shall be maintained.

(5) Mechanical pipetting aids shall be used for all pipetting of RDSs or RDS solutions.

(6) The storage or consumption of food or tobacco products, storage or use of beverage containers, or storage or application of cosmetics are not permitted within the RDS use or storage area(s).

(7) After each exit from the storage or working laboratory, individuals with potential exposure to anticholinesterase RDSs shall be inspected for miosis or other symptoms of RDS exposure before leaving the facility. The inspection shall be made by the supervisor or personnel designated by him. RDS operation shall cease 30 minutes before

the end of the work shift and inspection made thereafter for possibility of miosis.

(8) RDS operations shall not be conducted after normal duty hours or during holidays without prior coordination with medical support personnel and a contractor Safety Officer, and approved by the contractor administrative representative.

(9) A reasonable effort shall be made to store RDS of like physiological effects together, but apart from other RDS, however, additional storage locations are not required to accomplish this.

(10) Any RDS exposure, suspected exposure, RDS spill or release, or other abnormal situation that may result in personnel injury shall be reported to supervisory personnel immediately after taking necessary emergency actions. Personnel with possible RDS exposures shall report for medical evaluation to the medical authority retained by the contractor to treat chemical injuries.

(11) All means of emergency egress from the RDS facility shall be labeled, free of obstructions, and shall exit into an area of lesser hazard.

(12) Clerical/administrative space and functions should not be maintained within an RDS laboratory or storage room. However, note-taking, and log or record-keeping is permitted.

(13) The supervisor shall be responsible for ensuring that personal safety equipment is inspected for defects and is properly used. The user shall inspect this equipment before each use.

(14) In the event of a chemical event, at a minimum, the following actions need to be taken:

(a) Protect unexposed personnel.

(b) Decontaminate the casualty.

(c) Render buddy aid.

(d) Mitigate the spill

(e) Evacuate the casualty.

(f) Summon assistance.

(g) Make notifications.

(h) Decontaminate the area.

2-n. Treatment of Anticholinesterase RDS Exposure.

(1) Hazard information concerning the anticholinesterase (nerve) RDSs may be found in the respective material safety data sheets, if applicable.

(2) Although miosis may be an early sign of anticholinesterase RDS exposure, an injection shall not be administered when miosis is the only sign present. Instead, the individual shall be decontaminated, observed for progression of signs and taken immediately to the medical treatment facility for further observation.

(3) If signs and symptoms are progressing, the Mark I nerve RDS antidote kit (containing atropine and 2-PAM-CL (2-PAM chloride) autoinjectors) shall be administered to "titrate" the signs and symptoms as follows: If rhinorrhea or localized muscular fasciculations occur, administer one Mark I kit; if these signs/symptoms and chest tightness or dyspnea occur, administer a second (two total) Mark I Kit; if any change in level of consciousness occurs, administer a third (three total) Mark I Kit. (NOTE: The severity and rapidity of progression of the signs and symptoms of anticholinesterase poisoning depend on the magnitude of exposure.) The injectors should be held against the thigh for 10 seconds to ensure complete delivery of contents. The same site should not be used for subsequent injections. No more than three Mark I Kits shall be administered unless directed by medical personnel. In addition, a record shall be maintained of all injections given and supplied to medical personnel who assume patient care.

2-o. Decertification of RDS Facilities.

(1) When all RDS in accessible form has been detoxified, transferred, or utilized in experimentation, the contractor will submit by letter, to the Government Contracting Officer, a request for decertification.

(2) The decertification request will include the following:

(a) Evidence of zero balance inventory of RDS to include a copy of the last two pages of the RDS notebook and RDS logbook documenting final disposition of the RDS.

(b) Certification by the contract safety official that the facilities, equipment, and working areas are decontaminated in accordance with paragraph 3-f. Additionally, he must certify that the filters have been disposed of in accordance with federal, state, and local regulations and guidelines.

2-p. Federal, State, and Local Laws. The contractor shall meet all federal, state, and local laws and regulations regarding the use, handling, treatment, transportation, storage, decontamination and disposal of the hazardous material, substance or waste.

2-q. Notification of Hazards. Areas shall be posted with appropriate hazard identification warnings and personnel warnings.

2-r. Other Requirements.

(1) All employees performing work on Government-sponsored projects will be furnished places and conditions of employment that are free from recognized hazards causing or likely to cause death or serious physical harm. Prompt abatement of unsafe or unhealthy working conditions will be made.

(2) Safety, occupational health and industrial hygiene services provided in support of Government-sponsored projects shall be furnished by competent supplier(s).

(3) A reply by endorsement as to the corrective action taken in implementing the required actions and recommendations outlined in inspection reports by the GSO will be made to the KO. Where immediate action cannot be taken, a plan-of-action must be outlined with identified milestones. Where corrective actions cannot be taken, just cause will be furnished in writing. All written documents developed under the requirements of this paragraph will be sent through the KO to the GSO.

3. SECURITY REQUIREMENTS.

3-a. General. The security requirements of this section outline physical security standards and criteria for the protection of the RDS which is accountable under the terms of this contract. These standards apply to contracts with the Government and subcontracts regardless of the origin or source of the RDS (i.e., receipt, purchase, synthesis, etc.) and shall be in force while RDS remains under the control of the contractor/subcontractor. These requirements are equally applicable to subcontractors requiring access to RDS and shall be included in the subcontract. RDS operations are authorized only for the location(s) specified in the FSSP and will be conducted only at that location(s).

3-b. Security Section of the FSSP. The contractor shall prepare a section of the FSSP outlining a specific plan of action to be taken to implement security provisions. The following authorizations signed by the certifying official will be included with the FSSP: Personnel authorized to receive storage room keys or combinations, personnel authorized to work with RDS and personnel authorized as RDS users.

3-c. Physica1 Security. When not in use, access to RDS shall be prevented by at least two locked physical barriers (i.e. the locked storage container in a locked laboratory room).

3-d. RDS Storage. RDS will be stored in a -70^{o} freezer in double containment with a Government-furnished lock.

3-e. Personnel Authorization for RDS Use. All personnel who can gain access to RDS, including individuals who control locks, keys, or security containers where keys are stored, will be evaluated for reliability by the Reliability Official or his designated alternate. This evaluation will be documented and should include evidence that the individual has been informed of the requirements contained within this regulation, including those concerning accountability, safety and security. The Certifying Official will designate in writing those individuals deemed to be reliable and authorized to work with RDS. The Certifying Official will also designate in writing those individuals authorized access and/or keys to the RDS storage areas and individuals authorized as users of RDS.

3-f. Entry Control. Access to RDS storage will be controlled by authorized individuals. During storage (i.e. when all RDS is secured in the storage container), the room may be entered by laboratory personnel requiring use of the room; however, these individuals may enter only under the supervision of individuals authorized access and/or keys to the room or laboratory. During operations, an AUTHORIZED PERSONNEL ONLY sign and a caution sign with the hazard indicated will be posted at the entrance to the room. A list of personnel to be notified in the event of an emergency, as well as emergency phone numbers to include at a minimum safety, fire, and security personnel, will be posted at all times. The laboratory will be locked after close of business and in the absence of personnel authorized access.

3-g. Accountability. Individuals authorized as users of RDS will be responsible for controlling access to the RDS and maintaining records to indicate the amount received, date of receipt, amount issued, date of issue, notebook number where experiment is recorded, signature of custodian issuing the material, signature of person receiving the material, and balance on hand. A monthly report of RDS on hand shall be posted to the GSO listed in the contract, no later than the fifth working day of the following month. Reports will be submitted whether or not any RDS was used in experimentation.

3-h. Inquiries. The contractor shall immediately notify the KO or the COR of inquiries concerning the use of RDS.

4. CHEMICAL EVENT

4-a. General. Any RDS exposure, suspected exposure, spill (outside of containment), release at any level, loss other than deliberate destruction by approved processes), or any situation that may result in personnel exhibiting clinical signs or symptoms of chemical RDS exposure will be reported by telephone to the GSO within two hours. Any information obtained will be used to aid in developing/verifying safety procedures or standards. An event will be reported within the guidelines.

4-b. Action.

(1) In the case of a chemical event, the contractor will secure the area. Only personnel authorized by the contractor will be permitted to enter the room.

(2) As soon as the RDS facility is secured, the user will be immediately contacted to initiate and supervise appropriate precautionary or required decontamination procedures.

4-c. Reporting. Each event will be reported within two hours of discovery to the GSO by telephone. A written report will be submitted to the GSO within 24 hours as indicated below. Supplementary reports will be submitted, as a minimum, daily, or as more information becomes available. Reports will not be withheld pending receipt of all information.

(1) Telephone numbers for reporting emergencies are as follows:

(a) Operational hours: Call the USAMRICD Safety and Chemical Operations Branch (410)436-4433 (8:00 a.m. - 4:30 p.m., ES(D)T Monday through Friday, excluding Federal holidays).

(b) Non-operational hours: After 4:30 p.m. daily, weekends and holidays, call the USAMRICD Staff Duty Officer (410)436-2173; or the Aberdeen Proving Ground Staff Duty Officer (410)278-4500.

(2) The following format will be used:

(a) HEADER: "THIS IS A CHEMICAL EVENT REPORT:

(b) BODY:

1. Date and time (local) of chemical event.

2. Location of chemical event: Name of organization, building location, facility name, telephone number, and Principal Investigator.

3. Quantity and type of container(s) and chemical RDS involved.

4. Description of what happened (include statement of whether chemical event is a result of non-deliberate or deliberate action).

5. Emergency notification level (i.e., limited area emergency, institution only emergency, community emergency. If not, so state).

6. Description of property damage.

7. Personnel casualties/injuries/exposure.

8. Whether non-institute medical services and/or facilities were required.

9. State whether further assistance is required (e.g., personnel, equipment, material).

10. Any other pertinent information (e.g., if news release was issued, safety and security measures taken).

11. Principal Investigator's/Project Officer's assessment of the situation.

12. Name and title of the person(s) reporting.

(3) A written report, following the above format, must be sent to the following GSOs:

(a) Commander, U.S. Army Medical Research and Material Command, 504 Porter Street, ATTN: MCMR-RCQ-S (USAMRMC Safety Officer), Fort Detrick, MD 21701-5012.

(b) Commander, U.S. Army Medical Research Institute of Chemical Defense, 3100 Ricketts Point Road, ATTN: MCMR-UV-RS (Safety and Chemical Operations Branch), Aberdeen Proving Ground, MD 21010-5400.

5. WAIVERS AND EXCEPTIONS.

5-a. At a minimum, requests for waivers and exceptions will contain the following:

(1) Reference to the specific standards required in these clauses or the FSSP and to the specific paragraph for which the waiver or exception is being made.

(2) The reason(s) why the standard cannot be met.

(3) The interim measures in effect to compensate for the inability to comply with the standard.

(4) The action being taken to meet the standard and the estimated date of completion.

(5) A statement of the impact if the waiver or exception is not approved.

(6) Any additional data (such as maps, photos, or drawings) to illustrate clearly the problem or interim measures.

(7) A listing of current waivers, extension of waivers, and exceptions in effect, with a brief description of each.

5-b. Requests for waivers, extension of waivers, and exceptions will be forwarded to the KO.

5-c. Requests for extension of waivers must be submitted using the same format and addresses as the original request, at least 60 days prior to the expiration date.

6. SUBCONTRACTOR OPERATIONS. When all or part of the RDS operations are subcontracted, the requirements of this standard shall apply equally to the subcontractor, and shall be included in the subcontract. Subcontracting of RDS operations must be approved by the Contracting Officer.

ADDRESSES/PHONE NUMBERS:

Contracting Officer:

Director
U.S. Army Medical Research Acquisition Activity
820 Chandler Street
ATTN: MCMR-AAA-B
Fort Detrick, MD 21702-5014
(301) 619-7360

USAMRICD Safety & Chemical Operations Branch (SCOB):

Commander
U.S. Army Medical Research Institute of
Chemical Defense
3100 Ricketts Point Road
ATTN: MCMR-UV-RS
Aberdeen Proving Ground, MD 21010-5400
(410)436-4433 - Weekdays - 8:00 AM - 4:30 PM ES(D)T
fax: (410)436-3004
(410)436-2173 - Staff Duty Officer - Non-Working Hours
(410)278-4500 - Staff Duty Officer - Aberdeen Proving Ground

RDS REQUESTS

Provide the Chief, SCOB (address above), with copy furnished to the CO and COR with the following information:

Name of Principal Investigator
Name(s) and phone number(s) of custodian(s)
Shipment Address
Contract Number
RDS, Concentration, Amount, Diluent (if applicable),
and Specific Activity (if applicable) per contract

Appendix 1:

Definitions:

1-a. Access. Close physical proximity to a chemical RDS or container under circumstances that could provide an opportunity to acquire, release, tamper with, damage, or come in direct contact with the chemical RDS.

1-b. Accountability. The obligation to keep accurate records of property, documents, or funds. Accountability is concerned primarily with records, and does not necessarily imply actual possession.

1-c. Accessible Form. Chemical RDS that has not been decontaminated or neutralized, and that could possibly be removed for unauthorized purposes. Includes RDS in bulk and in laboratory containers.

1-d. Amount-At-Risk. Personnel using RDS may not operate with RDS in excess of those concentrations and total amount limits prescribed in Table 9-1 of AR 50-6. This is the amount of RDS that may be out of storage and accessible at any one time. (See paragraph 1-c, above). Amount at risk describes the amount of RDS that may be accessible at any one time. It does not apply to how much can be in storage or how much may be shipped to the contractor.

1-e. Buddy-aid. The administration of a chemical RDS antidote to an individual exhibiting signs of severe chemical RDS poisoning who is unable to administer self-aid.

1-f. Contractor. To include contractors, grantees, and other governmental research and development (R&D) activities.

1-g. Contractor's Administrative Respesentative. A person designated by the contractor to sign documents regarding the RDS project or appoint/assign personnel to the RDS project.

1-h. Contractor Safety Officer. The Safety Officer is the individual appointed to manage the RDS related safety program. The individual must be occupationally qualified to perform these duties, and not have other duties in the laboratory that would constitute a conflict of interest.

1-i. Custody. Responsibility for the control of, transfer and movement of, and access to chemical surety material. Custody may or may not include accountability.

1-j. Decontamination. The process of decreasing the amount of

chemical RDS on any person, object, or area by absorbing, neutralizing, destroying, ventilating, or removing chemical RDSs.

1-k. Exception. A permanent written deviation approved by the KO for a requirement imposed by this clause. An exception, which requires full justification, is based on a determination that conformance to the established standard is impossible, highly impractical, unnecessary, or not in the best interest of the U.S. Government (See also paragraph 1-w. "Waiver").

1-l. Facility Safety and Security Plan (FSSP). A formal program that specifies the life cycle management of RDS. The use and disposal of RDS shall ensure that personnel and the public are protected from exposures exceeding the limits established by the Army Surgeon General. Controls shall be used to minimize availability of RDS to unauthorized personnel.

1-m. First Aid. Any one-time treatment, and any follow-up visit for the purpose of observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such one-time treatment, and follow-up visit for observation, or the use of (up to 3) atropine sulfate autoinjectors, is considered first aid, even though provided by a physician or registered medical professional personnel.

1-n. Government Safety Official. Provides assistance and administers regulations and clauses pertaining to the RDS program on behalf of the KO.

1-o. RDS. Refers to Research, Development, Test and Evaluation (RDTE) Dilute Solutions of Chemical Surety Material as defined in Table 9-1, AR 50-6. Specifically, RDS is CSM which has been diluted to concentrations not exceeding a prescribed maximum concentration, and in volume not exceeding the total quantity per container, as listed in the table that follows:

RDS	Maximum Total Quantity per Container	Maximum Concentration
GA, GB, GD, GF	20 mg	2.0 mg/ml
VX	10 mg	1.0 mg/ml
H, HD, HQ, HT, Q, T	100 mg	10.0 mg/ml
L, HL	50 mg	5.0 mg/ml

The common and technical names of some of the chemical RDSs used in the performance of contracts are given below. These clauses pertain to all synonyms for the compounds listed as well.

(1) XGA - Tabun - Ethyl N,N-dimethylphosphoramidocyanidate.

(2) XGB - Sarin - Isopropyl Methylphosphonofluoridate.

(3) XGD - Soman - Pinacolyl methylphosphonofluoridate.

(4) XGF - Cyclohexyl methylphosphonofluoridate.

(5) XH - Levinstein Mustard - 70% Bis-dichloroethyl sulfide, 30% Polysulfides.

(6) XHD - Distilled Mustard - Bis-dichloroethyl sulfide.

(7) XHL - Lewisite Mustard - mixture of Bis-dichloroethyl sulfide and Dichloro(2-chlorovinyl)arsine.

(8) XHQ - 52.5% Bis-dichloroethyl sulfide, 25% Bis(B-chloroethylthio)ethane and 22.5% Polysulfides.

(9) XHT - 60% Bis-dichloroethyl sulfide, 40% Bis(2-chloroethylthioethyl)ether.

(10) XL - Lewisite - Dichloro(2-chlorovinyl)arsine.

(11) XQ - Sesqui-Mustard-Bis(B-chloroethylthio)ethane.

(12) XT - Bis(2-chloroethylthioethyl)ether.

(13) XVX - O-ethyl S-(2-diisopropylaminoethyl)methylphosphonothiolate.

1-p. RDS User(s). The individual(s), appointed in writing, to be responsible for ensuring the safekeeping of RDS by the Reliability Official of stored RDS.

1-q. Reliability Official. A senior management official appointed by the contractor to certify the reliability of the individuals who work with RDS.

1-r. Research, Development, Test and Evaluation (RDTE) Dilute Solutions. Solutions of Chemical RDSs in concentrations and quantities reduced by admixture (dilution) to levels that can be handled with the same precautions associated with hazardous industrial chemicals acids, bases, or solvents. Also known as RDS.

1-s. Self-aid. Administering a decontaminant or chemical RDS antidote to oneself upon exposure or experiencing early symptoms of chemical RDS poisoning.

1-t. Supportinq Medical Facility. The medical treatment facility that shall provide emergency medical care in the event of a laboratory accident.

1-u. Technical Escort. Department of Defense (DOD) individuals knowledgeable in safety, security, custody and accountability procedures.

1-v. Two-Person Concept. A safety and security concept which requires at least two authorized persons to be at least within audible range of each other during any operation which affords access to RDS. Each person must be familiar with applicable safety and security requirements. Both must maintain audible contact with each other in order to be ready to rescue or render buddy-aid or first aid to the other in the event assistance is necessary.

1-w. Waiver. A deviation, not to exceed one year, from a requirement approved by the KO.

Appendix 2:

Airborne Exposure Limits

	Chemical RDSs (mg/m^3)				
	GD	GA/GB	VX	H, HD, HT	L[1]
Chemical RDS Worker 8-hour TWA in any work shift	.00003	.0001	.00001	.003[2]	.003[2]
Non-Chemical RDS Worker and General Population 72-hour TWA Ceiling Value*	$3x10^{-6}$ .00003	$3x10^{-6}$ .0001	$3x10^{-6}$ .00001	.0001 .003[2]	.003[2] .003[2]
Source Emission Limit[3]	.0001	.0003	.0003	.03	.03

*Ceiling value normally refers to the maximum exposure concentration at any time, for any duration. Practically, it is the average value over the minimum time to determine a specified concentration.

[1]All concentrations measured as Lewisite.
[2]This value also represents the technologically feasible real time detection limit. HT is measured as HD.
[3]Source emissions limits are primarily an engineering guideline. These limits should:
a. be attainable by a well designed and well operated filtration system or incinerator.
b. give an early indication of upset conditions
c. be accurately measurable in a timely manner. This should be separated from the document and supplied only upon request. I added a the bolded statement on Page 5 (Fume hoods etc.)

Appendix 3:

Suggested Fume Hood Design Criteria.

NOTE: These criteria are suggested. They are intended for facilities which do not have knowledge of or access to design criteria for hood/exhaust systems. Any manufactured fume hood system design should suffice to meet the contractual requirements.

1. Housing: filter housing shall be designed and constructed in accordance with the applicable sections of American National Standards Institute (ANSI) Standards. All housings should be fabricated of 14-gauge, Type 304, stainless steel (unpainted), with all joints and seams welded airtight, ground smooth, and free of all burrs and sharp edges. Transitions should be provided between filter sections of different sizes. The housing and bag design should be such that used filters can be removed and replaced without exposing maintenance personnel or the atmosphere to possible contamination.

a. The unit should be a side-servicing bank type arrangement that should not permit the air to change direction through the housing as it enters or exits the housing.

b. All mechanical components and filter slide plates should be Type 304 stainless steel. Housings with two or more filters in a tier should have a removal rod in each tier to draw the filters to the bag-out position. All housings should have a locking arm in each tier to operate the mechanism which engages and disengages the filters on the internal mounting frame. The filter-to-frame seal in the housing should be effected by means of a continuous knife edge on the mounting frame that mates to a continuous perimeter channel on the face of the filter which has been filled with a viscous, nondrying fluid.

c. Both the removal rod and locking arm should be operated through the bag. The housing should have a removable access door and bag-out port for each tier of filters and a separate access door for each filter. There should be four tiedown latches per access door, which should be spring-loaded so they pivot away from the bag-out port after release and do not impede the bag-out process. The filter locking arm and access door should interface so the door cannot be closed until the filters are correctly seated in the housing and sealed to the mounting frame. Each tier should have a bag-out port inside the door that has been hemmed on its outer edge to prevent tearing of the bag. There should be two continuous ribs on the outside of the port of operation. On the upstream side of the filter position, there should be a smooth inlet design that provides a minimum 3/4-inch depth recess around the upstream perimeter of the filter to limit the build-up of contaminants in crevices that would have been caused by the junction of the filter’s integral frame and the housing wall. All flanges of the housing that connect to the system should turn to the

outside, and bolt connections to the ductwork should be in accordance with the manufacturer’s instructions.

d. Each door should be equipped with a metal pocket for the housing instruction manual which should be provided with the housing and contain complete, detailed, and separate instructions on the filter wide arrangements, including installation, operation, maintenance, and spare parts. The manual should be contained in weatherproof bags. Each housing door should have a painted aluminum label with the manufacturer's name, the housing model number, prefilter model number, filter model number, PVC bag number(s) and manufacturer's order number, to facilitate reordering of critical replacement components and parts, or a permanent sign attached as to the location of the housing instructions/information manual.

e. Two static pressure ports should be located on the housing upstream and downstream of each filter bank. The connections should be 1/4-in pipe nipple with cap.

f. Prior to shipment from the factory, each housing should be blanked off at the inlet and the outlet and should be tested by the Pressure Decay Method, in accordance with ANSI standards, to 10 inches w.g. Following this test, each filter position should be fitted with an airtight filter-shaped plug and the housing knife edge should be tested in accordance with ANSI standards.

2. Housing Accessories:

a. Bag: One PVC bag should be furnishedfor each access door on the housing. It should be 0.008-inch thick, amber in color, with a transparent smooth finish, and shall have an elastic shock cord hemmed into the mouth of the bag for a firm fit when stretched around the bag-out port. Each bag should have its stock number rolled in the hem. The bag should not stick together.

b. Safety Strap: A nylon safety strap should be provided with each bag-out port to prevent the bag from slipping off during the bag-out procedure. The strap should have a neoprene laminate on one side to prevent slippage. A cinching strap should also be provided with each bag-out port to tie off the slack in the bag while the ventilation system is operating.

3. Prefilter: The prefilter should have the capacity of a 24 by 24 by 5-7/8 inch filter of medium efficiency. The minimum efficiency should be 60 percent according to American Society of Heating, Refrigerating and Air conditioning Engineering (ASHRAE) Standard 52-76 test method. When operated clean at a capacity of 1000 cfm, the filter pressure should be 0.5 inch w.g. The filter medium should be all glass and shall contain a waterproofing binder.

a. The filter pack should be constructed by pleating a continuous sheet of glass paper back and forth over corrugated separators. The filter pack should be permanently bonded to the frame. The filter frame should be 14 gauge, type 409 stainless steel and should be constructed in a rigid manner. The pack-to frame sealant should be fire-retardant polyurethane foam and rubber case adhesive.

b. The prefilter should meet the requirements for Group III filters of ARI 680 and should be listed as Class I filters under UL 900 as to flammability only.

4. HEPA Filter: The filter should be Grade I Type B high efficiency particulate air filter. Each filter should be individually tested, labeled, and certified to have an efficiency of not less than 99.97 percent when challenged with a dioctylphthalate or equivalent smoke consisting of thermally generated particles that are 0.3 micrometers in size. The filter should be tested at 100 percent of the rated flow volume. The filter unit should be capable of passing an encapsulation test wherein the filter pack, frame, and gasket are subject to the test. The filter should be certified in writing by the manufacturer.

a. When operated at a capacity of 1500 cfm, the initial (clean) filter pressure drop should be no more than 1.25 inches w.g. (or 1.00 inch w.g. at 1000 cfm).

b. The filter medium should be all glass, should not contain asbestos, and should contain a waterproofing binder.

c. The filter pack should be constructed by pleating a continuous sheet of molded glass medium back and forth over itself so that the filter pack is self-supporting without the use of separators. The paper-making, forming, and pleating of the medium should be a single, continuous manufacturing process. The filter pack should be permanently bonded to the integral frame.

d. The filter frame material should be 14-gauge, Type 409 or 304, stainless steel and shall be constructed in a rigid manner. The pack-to-frame sealant should be fire-retardant solid urethane adhesive.

5. Carbon Adsorber: The carbon adsorber should have the capacity of a 24 by 24 by 16 inch deep filter and should contain 12 x 30 mesh carbon. The filter should contain six panels in a V-bed arrangement to limit the superficial face velocity to 33 fpm maximum. The panels should be 2 inches thick so that a minimum residence time of 0.3 seconds is achieved through each filter with an approximate pressure drop of 1.1 inches w.g. The carbon should be a coal-base granular activated carbon. The adsorber should be constructed of Type 304 stainless steel, with an 18-gauge frame and 26-gauge perforated screens. The unit

should have mechanical efficiency of at least 99.99 percent when freon (or equivalent) tested.

6. Testing for CBR Filter Air System: Prior to installation, all filters should be visually inspected for damage during shipping. Any filters punctured, torn, or damaged in any way should be rejected and returned to the manufacturer to be replaced at no cost to the Government. Repair of damaged filters is not acceptable.

7. Differential Pressure Gauges: Differential pressure gauges should be provided for each CBR filter unit as indicated on the drawings to indicate the differential pressure across each filter section in the unit and across the entire filter unit. Gauges should be magnehelic type, mounted in a cabinet for each CBR filter unit. The cabinets should be mounted in the mechanical equipment room. Cabinets should be constructed of steel not lighter than 16 gauge, 0.0598 inch nominal thickness. Gauges for individual filter sections should have a scale with a range of 0-5 inches w.g. and for the entire filter unit, a range of 0-12 inches.

8. Exhaust Ductwork: the exhaust ductwork for fume hoods should be constructed of 18 gauge, Type 316L stainless steel, with all seams welded using Type 316L filler metal and electrodes. All supports and attachments should be Type 316L stainless steel.

a. Horizontal runs of ductwork should be sloped down toward the laboratory fume hood with a minimum slope of 1-inch in 40 feet.

b. Welding of Type 316L stainless steel should be in accordance with AWS D1.1. Electrodes for stainless steel welding should be in accordance with AWS A5.4.

c. Manual volume dampers, including blades and operators, should be of the same material as the adjoining ductwork and should be constructed in accordance with SMACNA "Low Pressure Duct Construction Standards." Volume dampers should be provided in the exhaust ducts of fume hoods where indicated. The damper operator should be accessible from the room in which the hood is located.

d. All changes in direction should be made with long radius elbows, except short-radius elbows and mitered elbows may be used where required due to space limitations.

e. All branch duct connections to main exhaust duct should be with 45-degree reducing lateral fittings, except 90-degree reducing tee fittings may be used where required due to space limitations.

9. Metal Exhaust Stacks: Metal exhaust stacks for exhaust fans should be shop-fabricated from steel or stainless steel

pipe, with an appropriate wall thickness to withstand local wind-sheer conditions. The stack should be mounted on a sturdy carbon steel base plate welded to pipe. Flanged openings for connection to ductwork should be provided. Size, location, and height of opening on stack should be coordinated with actual equipment and system layout. The stack should contain a drain pan of steel plate welded inside of pipe at a slope of 30 degrees in base of stack, with 1/2-inch diameter pipe nipple welded in stack for drain piping connection. A sampling port should be provided in the stack at a minimum of 2 duct diameters above the discharge of the exhaust air into the stack. The sampling port should consist of a 1-inch NPT half-coupling welded in place, sealed with a pipe plug using a thread sealant. Exhaust stack for exhaust fan should be shop-fabricated of 16-gauge carbon steel to same size as fan discharge outlet, designed to attach directly to outlet damper on fan discharge. Stack height should be 30 feet above its concrete base. If stainless steel is used, the following subparagraphs ll.a through ll.e do not apply.

a. Exterior Finish: Stacks should be shop-finished prior to delivery at the project site.

b. Blast Cleaning: Exterior surface of all stacks should be blast-cleaned in the shop in accordance with SSPC SP 10.

c. Primer: Provide two coats of a two-component polyamide epoxy primer, 1.5-2.5 mil dry film thickness each coat.

d. Final Coat: Provide one coat of two-component aliphatic isocyanate converted polyester urethane dry film thickness.

e. Interior Finish: Interior surfaces of exhaust stacks and drain pans should receive a shop-applied coal-tar coating 3. If stainless steel is used for the exhaust stack, protective coating is not necessary.

10. Exhaust Fan: A means of detecting blower failure should be denoted by visual and audible means in the mechanical room, if applicable, and in each RDS laboratory serviced.