

**BETTIS ATOMIC POWER LABORATORY**

**SAFETY AND HEALTH RULES**  
**FOR ON-SITE SERVICES**

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A. INTRODUCTION

A primary goal of the Bettis Laboratory is to provide a safe workplace for all employees, subcontractor personnel, and visitors so that work may be accomplished effectively while reducing occupational injuries, illnesses, and related property loss to the lowest possible level. This document furnishes requirements, guidelines, and background information to aid in achieving this goal.

The requirements of 29 CFR 1926, Construction Safety and Health Standards, are applicable to the Seller and its lower-tier subcontractors for all construction work performed on-site, and the requirements of 29 CFR 1910, General Safety and Health Standards, are applicable to the Seller and its lower-tier subcontractors for all non-construction work performed on-site. **The requirements of NFPA 70E, Standard for Electrical Safety in the Workplace, Article 130, Working On or Near Live Parts, are applicable to the Seller and its lower-tier subcontractors for all construction and non-construction work performed on-site.**

In addition to the above referenced standards, the requirements of this document are applicable to the Seller and its lower-tier subcontractors performing work at the Bettis Laboratory. This document includes requirements that are unique to the Bettis Laboratory. The Seller has prime responsibility for ensuring all lower-tier subcontractors are aware of OSHA safety requirements, including safety training and physical examinations, as well as the requirements of this document. Questions should be directed to the cognizant Bettis representative for the work. The Seller shall monitor for safety compliance. Monitoring for compliance may also be conducted by Bettis and Department of Energy (DOE) personnel.

B. SUBCONTRACTOR SAFETY COORDINATOR

1. A Safety Coordinator shall be appointed by the Seller to ensure Safety and Industrial Hygiene considerations are properly addressed.
2. Duties of the Safety Coordinator shall be as follows:
  - a. Certify the adequacy of the Seller's Safety and Health Management program for work under this order.
  - b. Be on-site during evolutions that involve significant risk to personnel. As a minimum, this shall include all evolutions which have been identified as requiring Supplemental Safety Plans.
  - c. Act as the point of contact for all safety issues or concerns regarding the Seller's work. As such, the Safety Coordinator should be readily available (in person or by phone) during all periods that work is in progress on-site.
  - d. Be responsible for ongoing and refresher safety training as the job progresses. Ensure all employees, including lower-tier subcontractors, have been trained on specific "Supplemental Safety Plans" that they are working to. Also, ensure all sections of this document that pertain to their work have been reviewed and understood by each worker.
  - e. Document safety training provided to the Seller's employees and lower-tier subcontractor employees. Copies of these training records shall be provided to the Bettis Representative.

C. UNPLANNED EVENTS

A formal inquiry process known as a critique shall be conducted by Bettis to determine facts and identify corrective actions associated with an occurrence resulting from a subcontractor operation. An "occurrence" is a general term applicable to an unexpected or unplanned event and which, in Bettis' opinion, will have a negative impact on the Bettis Laboratory or subcontractor operations. Following Bettis' determination that a critique is to be conducted, the subcontractor will be notified. The operation and equipment used which caused the occurrence shall be suspended until released by Bettis. Upon notification, the subcontractor supervisor, on-site safety coordinator, all subcontractor personnel directly involved in the occurrence, and witnesses shall attend the critique so that all pertinent facts associated with the occurrence can be formally documented. The subcontractor may be required to implement corrective actions derived from the critique at no cost to Bettis. The critique shall be held the same day as the occurrence, if practicable, or within one working day following the occurrence.

D. EMERGENCIES

1. In case of an emergency, such as a motor vehicle accident, property damage, or personal injury, promptly notify the cognizant Bettis representative for the job. Ensure proper medical attention is provided to any injured person first.
2. In case of fire, (1) activate the nearest fire alarm box, (2) if the user has been trained to use a fire extinguisher, attempt to extinguish the flames with a suitable fire extinguisher, provided that doing so does not place the user in danger, and (3) notify the cognizant Bettis representative.
3. In case of a spill of hazardous material or an accumulation of hazardous vapors, evacuate the immediate area, notify the cognizant Bettis representative, and keep personnel away until assistance arrives.
4. Ensure the integrity of any accident scene is maintained until a complete investigation has been conducted and the area is released by Bettis management.

E. EMERGENCY EQUIPMENT

1. Fire protection systems must be deactivated before any work on or near the systems is performed which could cause them to falsely activate or alarm. Examples of such work include internal work on the system itself or work which could result in bumping or vibration of the system. Deactivation and reactivation must be done by designated Bettis personnel upon notification by the cognizant Bettis representative. Fire protection systems and equipment (such as sprinklers and fire extinguishers) shall not be relocated until the cognizant Bettis representative has obtained concurrence from Protection Systems.
2. Safety equipment (such as eyewash fountains, safety showers, spill kits, or respirators) shall not be relocated or taken out of service without permission of the cognizant Bettis representative. Access to this equipment shall be maintained at all times.

NOTE

Permission to relocate emergency equipment consistent with specification requirements is specifically given by signature in the appropriate block of any drawing requiring the relocation.

F. SAFETY INSPECTIONS

Unless otherwise stated in the contract, construction subcontractors shall perform weekly inspections of their work operations, facilities, and equipment to assure compliance with the requirements of this document and all applicable State, Federal, and local regulations. Documentation shall be maintained for all inspections performed by the subcontractor. The subcontractor may consider inviting the Bettis representative to accompany the subcontractor on the inspections. Inspection records shall be made available for review by Bettis upon request.

G. EMPLOYEE SAFETY OR HEALTH CONCERNS

The DOE Occupational Safety and Health Protection Policy requires that subcontractors furnish subcontractor employees a place of employment which is free from occupational hazards. As a minimum, subcontractors shall inform their employees and lower-tier subcontractors that they:

Are encouraged to report to the subcontractor, either orally or using subcontractor-provided forms, any subcontractor conditions or practices which they consider detrimental to their safety or health or which they suspect are in violation of the prescribed Bettis safety and health standards. The subcontractor shall inform the employee promptly of the disposition of the employee concern.

H. REPORTS

The subcontractor shall assist the Bettis Representative in completing any reports or records required as the result of on-site occupational injuries/illnesses, motor vehicle accidents, or property damage accidents. The Bettis Representative shall be notified of any accident as soon as possible after aiding any injured employee.

I. SIGNS AND BARRICADES

1. Safety signs and barricades shall be obeyed by all personnel.
2. Appropriate safety signs and barricades shall be provided by Bettis and erected by the Seller. All signs shall provide for the warning of, or safety instructions to, employees and visitors who may be exposed to hazards. All signs for an area shall be consistent. The inserts shall be the same for each sign. Only one level of hazard (DANGER, CAUTION, or SAFETY FIRST) shall be assigned to an area.

3. Safety barricades shall be erected to isolate areas where potential safety hazards exist. Safety barricades may be constructed of yellow and black rope or tape or commercial-type stands.
  - a. When no specific safety information is posted on or at a barricade, personnel shall assume all safety barricades carry the following warning: **Authorized Personnel Only. Do Not Enter Without Knowledge of the Hazards and Without Necessary Protective Equipment.**
  - b. Construction and maintenance activities often restrict normal access along sidewalks, hallways, and paths, requiring pedestrians to select an alternate route. Signs should instruct those being diverted. Black and yellow rope or barricade tape should be secured between safety barricades to form a continuous barrier that warns, directs, and protects pedestrians.
  - c. For nighttime use, all safety barricades located near pedestrian walkways shall be equipped with flashing lights, unless high levels of illumination exist. When erecting safety barricades, evaluate each location for evidence of use by pedestrians and install flashing lights when necessary.
6. Additional information and guidance are available in 29 CFR 1926, Subpart G and 29 CFR 1910.145.

J. HOUSEKEEPING

1. No refuse shall be allowed to accumulate at the work site, nor shall it hinder adjacent area work in progress or other Bettis operations. Passageways, stairs, walkways, and work areas shall be kept free of debris. Combustible scrap and debris shall be removed at the end of each work day.
2. Stored materials shall not block emergency equipment, aisles, doors, stairways, or exits.
3. Emergency equipment must be accessible at all times.
4. The Seller shall provide approved containers (with covers) for flammable wastes, oily rags, and hazardous wastes such as caustics, acids, and harmful dusts.
5. Protruding nails in scrap lumber shall be removed or bent down flush with the surface.
6. Oil, grease, dirt, and mud shall be removed from walking and working surfaces.
7. Additional information and guidance are available in 29 CFR 1926.25.

K. PERSONAL PROTECTIVE EQUIPMENT

1. The following general rules apply to personal protective equipment:
  - a. All protective equipment which is necessary to protect employees from any hazard which could cause injury or illness shall be maintained in a sanitary and reliable condition.

- b. Ensure that employees and visitors wear appropriate PPE when required.
  - c. PPE shall meet accepted national standards and specifications such as American National Standards Institute.
  - d. Defective or damaged PPE shall not be used.
2. Contractors who perform work at Bettis where personnel are exposed to noise levels greater than 85 dBA over an eight-hour, time-weighted average must be entered into a Hearing Conservation Program. Workers entered into a Hearing Conservation Program must receive an annual audiogram and annual noise training. Ear muffs or plugs are required in high noise areas. All noisy areas above 85 dBA must be posted.

Hearing protection (earplugs or muffs) shall be worn where noise exposure may exceed 85 dB(A) over an eight-hour time weighted average period. Some typical operations that require hearing protection are jackhammering, mechanical earth tamping, and working near some pumps and compressors. The Seller shall have a written hearing conservation program if any of his/her personnel will be exposed to 85 dBA or greater over an eight-hour TWA period. See 29 CFR 1926.52, 29 CFR 1926.101, and 29 CFR 1910.95 for additional information and guidance.

3. Hard hats shall be worn by employees working in areas where there is a possible danger of head injury from impact, or from falling or flying objects, or from electrical shock and burns.
4. Safety shoes must comply with ANSI Z41 - Latest Edition, and are required for handling heavy materials and other operations where workers are exposed to foot hazards. Workers in areas under construction, renovation, or demolition require safety shoes. Foot protection with metatarsal guards is required for jackhammering and earth tamping operations.
5. Eye and face protection is required when machines or operations present potential eye and face injuries from physical or chemical agents. The following are examples of operations requiring eye and/or face protection: welding and cutting, grinding, chipping, jackhammering, handling hazardous chemicals, rotating power tools, hammering, banding or unbanding cartons or material, and rolling or unrolling wire or cables. Face shields alone do not provide adequate eye protection.
6. Respirators are required for operations that create excessive dust or hazardous particulates, vapors, or fumes. Operations shall be evaluated to determine the need for respiratory protection. The type of respirator shall be suitable for the hazard involved. A Bettis approved "Supplemental Safety Plan" shall be used for operations requiring respirator protection. Also, the Material Safety Data Sheet (MSDS) must be reviewed for respirator requirements.
7. Safety harnesses, lifelines, lanyards and safety nets shall be used in accordance with 29 CFR 1926 Subpart M. Any work where the worker's feet are over six feet from the defined base shall be in accordance with an approved "Supplemental Safety Plan."

8. Personnel working on or near energized electrical equipment operating at 50 Volts or greater must follow the guidance of NFPA 70E, Standard for Electrical Safety in the Workplace, Article 130, Working On or Near Live Parts, to determine appropriate Shock and Arc Flash PPE as well as approach distances. (See Section R - General Electrical Safety.)
9. Additional information and guidance are available in 29 CFR 1926, Subpart E and 29 CFR 1910, Subpart I.

NOTE

As a minimum, the Seller shall provide and enforce utilization of personal protective equipment as needed.

L. FIRE PROTECTION AND PREVENTION

1. Seller personnel shall know the location of the nearest fire alarm boxes and emergency equipment such as fire extinguishers. Access to this equipment shall be kept clear.
2. Keep emergency exit paths clear at all times. Do not block fire doors either **open or closed**, and ensure that emergency signs on the doors are visible. Some fire doors are held open by devices that release the door automatically in a fire or smoke condition.
3. Keep clear access to extinguishers, hydrants, and Fire Department connections to sprinklers.
4. Noncompatible materials that may create a fire hazard shall be segregated by a barrier having a fire resistance of at least one hour or separated by at least 20 feet.
5. Approved safety cans shall be used when handling and using flammable liquids in quantities greater than one gallon. For quantities of one gallon or less, only the original container or metal safety cans shall be used for storing, using, and handling flammable liquids. All containers must be labelled as to contents.
6. Flammable liquids shall be kept in closed containers when not actually in use.
7. Flammable or combustible fuel for the Seller's equipment shall be stored in a tank or container in accordance with the provisions of NFPA No. 30. If the temporary fuel storage tank capacity exceeds 660 gallons, the tank shall be located in accordance with the provisions of 40 CFR 112, so as to prohibit the entry of fuel into the storm or sanitary drains in the event of a spill.
8. Cloth or paper that has been used or has been in contact with flammable or combustible liquids shall be placed in Oily Waste containers. Containers shall be emptied daily. Oily Waste shall be removed from Bettis on a daily basis.
9. Post NO SMOKING signs (available from Bettis) in areas where flammable vapors may be present, such as areas in which flammable liquids or gases are routinely used or stored.
10. The use of kerosene, gasoline, or propane fueled heaters indoors is prohibited except for emergencies. Approval by Protection Systems is required to use such heaters indoors or in tents.

11. The installation or modification of any system which includes the permanent piping of flammable gas from a cylinder into a building must be reviewed and approved by Protection Systems before the work is performed.
12. The following special rules apply for the construction and use of portable or temporary structures.
  - a. Definitions
    - (1) The term "portable structure" (relocatable structures) includes trailers, mobile homes, semi-trailer vans (box trailers), field and portable offices, portable buildings and sheds, P-stations and weather enclosures, and other relocatable structures. Specifically excluded from this definition are radiological enclosures.
    - (2) The term "temporary structure" includes storage sheds, shacks, lean-to's, trash dumpsters, and the like, which are either: 1) transient, or 2) not recognized as a permanent Bettis building or structure by Accounting's financial records. Also included as "temporary structures" are: asbestos control enclosures; and radiological enclosures, except for glove boxes, glove bags, and hot cells.
  - b. Location
    - (1) Portable and temporary structures shall be located a minimum of 10 feet from any other structure or important equipment. If it is necessary to locate a portable or temporary structure within 10 feet of another structure, Protection Systems (PS) concurrence must be obtained, except in the case of trailers and other such similar portable units, the distance may be reduced as follows; eight feet side-to-side, and six feet end-to-end. Concurrence will be granted by the Manager, PS, based on an assessment that the location does not create any undue fire hazard to either structure.
    - (2) Should the proposed location of a temporary structure create an exposure hazard to another structure, PS may require that the temporary structure be protected by automatic sprinklers or with suitable fire detection and alarm systems.
    - (3) Portable and temporary structures shall be located so as to allow adequate and proper fire department access. To assure unobstructed fire department operations, sufficient space shall be maintained to permit ready access to:
      - (a) the portable or temporary structure itself,
      - (b) all other structures in the vicinity,
      - (c) areas beyond the portable or temporary structure,
      - (d) hydrants,
      - (e) post-indicator valves (PIVs) and curb box valves, and
      - (f) fire department connections (FDC) to sprinkler systems.

Refer to the Fire Marshal for guidance on this requirement.

- (4) Portable or temporary structures inside permanent buildings:
  - (a) Portable structures located inside permanent buildings shall be protected by an active fire suppression system approved by PS. Distance spacing requirements do not apply to such portable structures.
  - (b) Temporary structures shall not be located inside permanent buildings, unless approved by the Manager, PS.
- (5) Grouped (two or more) portable structures at less than the standard fire separation distances of a. above, shall be located a minimum of 30 feet from any building and a minimum of 10 feet from any other portable or temporary structure, except as noted in b.(4)(1) above. Modular units consisting of more than one standard trailer shall be considered to be grouped portable structures.
- (6) Storage of combustibles is prohibited within 10 feet of any structure, except portable and temporary structures inside permanent buildings per d. above.
- (7) Outside storage of flammable gases, flammable liquids, and combustible liquids is prohibited within 10 feet of any structure. All storage of these items in permanent buildings must meet all the requirements of the Bettis Safety Engineering Manual. The cognizant Bettis representative will provide a copy of these requirements upon request.

c. Fire Extinguishers

- (1) Portable and temporary structures shall be equipped with at least one appropriate and adequate fire extinguisher, except portable and temporary structures of b(4), otherwise complying with the rules for fire extinguisher placement.
- (2) In the case of vendor-owned units, fire extinguishers, of a type acceptable to Bettis, shall be supplied by the vendor.
  - (a) Choice of the type of fire extinguisher for each application shall be in accordance with 29 CFR 1926 and NFPA 10.
  - (b) The selection of fire extinguishers shall be limited to the following:
    - CO<sub>2</sub>, 15 lbs or more
    - ABC dry chem, 10 lbs or more
    - 2 1/2 gallon pressurized water (plain)

d. Construction

This section is to be followed to the maximum extent feasible. PS concurrence is required for types of construction not meeting the requirements of this section.

- (1) Portable and temporary structures shall be fabricated of materials that have a maximum flame spread rating (FSR) per NFPA 255 of not more than 25.

For example, portable and temporary structures may be fabricated using one of the types of construction below.

- (a) Metal frame, corrugated metal skin (sides and roof) or
  - (b) Wood frame, wood skin (sides and roof), with fire-retardant intumescent paint on both interior and exterior. Portable and temporary structures located inside permanent buildings per b(4) do not require wood to be painted.
  - (c) A combination of (a) and (b) above.
  - (d) Other types of construction meeting the requirements of d(1) above may be acceptable. PS concurrence shall be obtained prior to fabrication of such units.
- (2) Excessive combustibles are prohibited in portable and temporary structures. Incidental or necessary combustibles (i.e. work papers, radiological postings, etc.) shall be minimized. Housekeeping shall be orderly and neat such that those combustibles in the portable or temporary structure do not present an unusual fire hazard.
  - (3) Additional special requirements for temporary radiological enclosures are in Section e. below. Asbestos control enclosures shall adhere to the special requirements mandated for radiological enclosures.

e. Radiological and Asbestos Enclosures

- (1) Enclosures shall be fabricated in accordance with the requirements of Section d. above, with the following exceptions and additional restrictions.
  - (a) Radiological enclosures may be fabricated of Herculite on either a metal frame or a wood frame. (See d(1)(b).)
  - (b) Combustible materials shall be strictly minimized in radiological enclosures.

- (c) Plastic materials used as lining or as partitions in these temporary structures shall meet at least two of the following:
    - (1) an FSR not greater than 25,
    - (2) producing no flaming drips upon subjection to flame,
    - (3) satisfactorily passing either the:
      - Factory Mutual Corner Test, or
      - UL94 test with the classification of 94V-O, and
    - (4) other industrial fire test results may be considered by PS on a case-specific basis.
  - (d) Except, small PVC windows may be installed in sheets of Herculite if through-viewing is necessary.
- f. Electrical Requirements

This section applies to portable and temporary structures supplied with electrical service.

- (1) Electrical services for each portable or temporary structure shall emanate from a single load center complex mounted on the exterior of the structure.
  - (a) All such load centers must be listed and approved by a nationally recognized testing laboratory.
  - (b) In the event it is not practical to mount the load center on the structure's exterior, the load center may be mounted exterior to, and in the immediate vicinity of, the structure. Such load center shall be clearly labeled to indicate the portable or temporary structure it services.
  - (c) Except, that load centers for essential security equipment may be appropriately secured. These shall be considered as essential devices per (2)(a) and (b) below.
- (2) Electrical power to portable and temporary structures shall be turned off at the load center at the end of each work day and prior to periods of inactivity of one day or more, except that:
  - (a) Power for certain devices may be continued if necessary to maintain safety, security, or radiological controls, and if no undue hazard is created thereby.

Such devices are hereinafter referred to as "essential" devices. Cognizant area management shall ensure that PS concurs in the designation of essential devices.
  - (b) Essential devices shall be on a dedicated branch circuit(s) controlled at the load center complex.

- (c) Electrical wiring used in temporary structures shall be permanent wiring, installed by persons regularly engaged in the trade. The use of temporary wiring in temporary structures is prohibited, except:
  - (1) On specific approval of PS, and
  - (2) Wiring for temporary work ('Bingo') lights.
- (d) Bettis site electrical requirements apply.
- g. Applicable Codes and Standards
  - (1) Portable and temporary structures shall comply with other applicable codes and standards including but not limited to:
    - (a) 29CFR 1910 and 1926
    - (b) NFPA National Fire Codes
    - (c) Underwriters Laboratories Standards, Listings, and Product Directories
    - (d) Factory Mutual Loss Prevention Data Sheets and Approval Guide.
    - (e) DOE-STD-1088-195, "Fire Protection for Relocatable Structures," should be used as a recommended practice and followed to the extent that it is practicable.
- h. Approval
  - (1) Portable structures
    - (a) Portable structures shall be approved by the Fire Marshal prior to provision of any electrical services, occupancy, use, or operation. The Fire Marshal's review may include a fire inspection as well as checks for compliance with this document.
    - (b) The Fire Marshal may reduce the 30-foot spacing requirement of b(5) above to not less than 10 feet from any other structure, provided the grouped portable structures are fully sprinklered.
    - (c) Excessive combustibles are prohibited in portable and temporary structures. Incidental or necessary combustibles (i.e. work papers, radiological postings, etc.) shall be minimized. Housekeeping shall be orderly and neat such that those combustibles in the portable or temporary structure do not present an unusual fire hazard. Combustible materials are prohibited to be stored under or within 10 feet of the temporary or portable structures located outdoors.
    - (d) Trailers used for any reason shall be identified with the name of the owner, and the name and phone number of the cognizant Bettis contact person. This information will be posted on the outside of the trailer near the main entrance.

(2) Temporary structures

- (a) The use of temporary structures for a particular application shall be reviewed and approved by PS prior to construction. Package documentation for review is to be submitted to the Manager, PS.
- (b) Prior to use, the temporary structure shall be inspected by the Fire Marshal. This inspection may include a general fire inspection as well as checks for compliance with this document.

13. Additional information and guidance are available in 29 CFR 1926, Subpart F and 29 CFR 1910, Subpart L.

M. COMPRESSED GAS CYLINDERS

- 1. Cylinders shall be considered full unless labeled as empty, and shall be handled or used with corresponding caution.
- 2. Cylinders (regardless of size) whether in use, in storage, or in transit, shall be secured upright by chains, rigid retaining bars, vertical compartmented storage structures, or similar substantial devices to prevent cylinders from falling or being knocked over. Nonmetallic (i. e., combustible) web, rope, strapping, or similar materials and wire lashings are not acceptable for securing cylinders. This requirement does not apply to air-conditioner charging cylinders or to self-contained breathing apparatus cylinders or fire extinguishers being used by a fire watch.
- 3. Protective valve caps shall be in place on all gas cylinders in storage or transit, except for cylinders that are not equipped for caps. The cap shall remain on the cylinder until the gas is ready for use, and shall be replaced when the cylinder is empty or not in use.
- 4. A regulator or a regulating manifold shall be used with gas cylinders. Regulators, gages, and manifolds are to be matched to the specific type of gas and the service for which the cylinders are being used. Adapters to connect cylinders of one type of gas to piping, manifolds, gages, or valves intended for other types of gases shall not be used. Do not use lubricants on valves or regulators or modify them in any way.
- 5. If a flammable or non-toxic cylinder leaks and the leak cannot be remedied by tightening a valve gland or packing nut, close the valve and move the leaking cylinder outside to a well-ventilated location. Notify the cognizant Bettis representative for the job and the Bettis Fire Marshal. If the gas is toxic, evacuate the area and rope off or barricade the area. Notify the cognizant Bettis representative and the Bettis Fire Marshal.
- 6. Cylinder contents shall be identified by means of a legible label or stencil or by identifying markings embossed on the cylinder by the supplier.
- 7. Cylinders shall not be subjected to a temperature above 125°F. A flame shall never be permitted to come in contact with any part of a compressed gas cylinder.

8. Compressed gas cylinders should not be dropped, bumped, or handled roughly. Cylinders are not to be used as rollers to move equipment or material. Caution shall be exercised to protect cylinders from sources that could cut or damage the metal surface.
9. Cylinder valves shall be closed when not in use. This is especially important at the end of the day's work or on "empty" cylinders.
10. Cylinder valves without fixed valve handles shall have keys or handles on valve stems while cylinders are in service to permit immediate emergency shutdown.
11. Storage areas and manifold installations for flammable gas cylinders shall have conspicuously posted signs warning against smoking, open flames, or open lights.
12. No flammable gas cylinders shall be used inside a building unless approved by Fire Protection personnel. Oxy-acetylene rigs are exempt from this requirement. Cylinders containing flammable or oxidizing gases inside buildings shall be stored at least 20 feet from combustible materials, and are not to be exposed to an excessive rise in temperature or physical damage.
13. Oxygen cylinders in storage shall be separated from fuel gas cylinders or combustible materials by a minimum distance of 20 feet or by a noncombustible barrier at least five feet high having a fire-resistance rating of at least 1/2 hour, as identified in the NFPA Codes.
14. Hydrogen cylinders shall not be used inside buildings unless authorized by the Fire Protection Engineer.
15. For transporting and moving gas cylinders, use a suitable hand truck, fork truck, roll platform, or similar device with the cylinder firmly secured. This requirement does not apply to air conditioner charging cylinders, or self-contained breathing apparatus cylinders.
16. Hydrogen cylinder valves shall not be cracked to blow out dirt since hydrogen can self-ignite.
17. Acetylene cylinders shall be stored and used upright. Acetylene shall not be used at pressures greater than 15 pounds per square inch gage (psig).
18. Grease or oil shall not be used to lubricate valves or joints of compressed gas cylinders, especially oxygen cylinders.
19. Because oxygen under pressure may react violently with oil or grease, precautions shall be taken to prevent oxygen from coming into contact with oil or grease. Oxygen cylinders, valves, regulators, hose, and other apparatus shall be kept free from oil or grease and shall not be handled with oily hands, oily gloves, or with greasy equipment.
20. Additional information and guidance are available in 29 CFR 1910.101, compressed gases (general requirements). Also, see 29 CFR 1910, Subpart M.

N. HAND TOOLS

The use of hand tools shall meet the following requirements:

1. Tools shall be used for the applications for which they were designed. For example, screwdrivers shall **not** be used as chisels.
2. Tools shall be used with their proper handles. Split, cracked, or broken handles shall be replaced. Files are required to have handles when in use. Files in storage (on racks or in drawers) are not required to have handles.
3. Hand tools with mushroomed heads or excessively worn working surfaces shall be redressed or replaced.
4. When tools are used so that they are struck against one another (e.g. hammer and chisel) or when a tool is used for striking a surface, eye protection shall be worn.
5. When bars or other hand tools may contact underground electric power lines, insulated protective gloves and leather work gloves shall be worn.

O. POWER-OPERATED HAND TOOLS

1. Electric power tools shall be either double-insulated or grounded by means of a three-wire cord and three-prong plug. If double-insulated tools are used, they shall display the UL seal and shall be conspicuously marked "Double Insulated".
2. Gasoline or propane powered tools shall not be used inside buildings at Bettis unless specifically approved by the Safety Department and Protection Systems.
3. Powder-actuated tools are tools that use an explosive charge (normally powder) to drive studs, fasteners, or pins onto or into metal or other material or objects. These tools may be used at Bettis only with the written concurrence of the cognizant Bettis representative. Powder-actuated tools must be used in accordance with the manufacturer's requirements. A copy of the manufacturer's requirements must be on-site when the tool is used. These tools shall meet the requirements of ANSI A10.3 and 29 CFR 1910.243(d).
4. Pneumatic power tools shall be secured to the hose in a positive manner to prevent accidental disconnection.

Safety clips or retainers shall be securely installed and maintained on pneumatic impact tools to prevent attachments from being accidentally expelled.

The manufacturer's safe operating pressure for all fittings shall not be exceeded.

All hoses exceeding 1/2-inch (1.27 centimeters) inside diameter shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure.

5. Additional information and guidance are available on hand and power tools in 29 CFR 1926, Subpart I and 29 CFR 1910, Subpart P.

P. WELDING, BURNING, OPEN FLAME OPERATIONS

Obtain from the cognizant Bettis representative, a Welding/Burning Permit, Form 73756, before welding, burning, open flame soldering operations, or other open flame work are performed. The cognizant Bettis representative shall obtain the necessary signatures on the form.

Additional information and guidance are available in 29 CFR 1926, Subpart J and 29 CFR 1910, Subpart Q.

Q. CHEMICAL SUBSTANCES (Hazard Communication)

1. All containers (liquids, solids, or gases) shall be identified as to contents by means of a label or stencil. Labels shall be in conformance with 29 CFR 1910.1200 and contain health hazard information.
2. If containers of chemicals are located that are obviously old, decomposed or crystallized, notify the cognizant Bettis representative, who shall contact Safety Engineering. This requirement is especially applicable to ethers, picric, and perchloric acids.
3. Products that contain hazardous or acutely hazardous chemicals, as defined by OSHA, the EPA, or the Commonwealth of Pennsylvania, shall be approved by Bettis prior to use.
4. Material Safety Data Sheets (MSDS) for all hazardous products must be available on-site for unrestricted access for subcontractor personnel and for review by Bettis. The use of the personal protective equipment that is listed on an MSDS is required when handling the product.
5. The use of products containing carcinogens or suspect carcinogens is not permitted when less toxic products are available.
6. Exposure to hazardous substances in excess of OSHA Permissible Exposure Limits (PELs) or ACGIH Threshold Limit Values (TLVs), whichever is less, is not permitted.
7. The Seller and its lower tier subcontractors must be in compliance with 29 CFR 1926.59 or 29 CFR 1910.1200, Hazard Communication Requirements.
8. The Seller's Safety Coordinator is responsible for the on-the-job health and safety of his or her employees and visitors and for maintaining a healthful work environment. In fulfilling this health and safety responsibility, the Safety Coordinator shall:
  - (a) Train employees on the chemical and physical hazards associated with the materials in their work area. This training shall be conducted prior to exposure. The purpose of this training is to prevent employee exposure to hazardous working conditions.
  - (b) Periodically instruct employees, through the use of workplace meetings or individual discussion, on precautions, procedures, and practices to eliminate accidental exposure to potentially harmful agents. This training is required whenever a new hazard is introduced to the workplace.

- (c) Make certain that edibles and tobacco are not stored or consumed in work areas where toxic materials may be present.
  - (d) Promptly inform the cognizant Bettis representative of any operation or condition that appears to be a health hazard.
  - (e) Inform Bettis Medical promptly in case of exposure to harmful agents.
  - (f) Furnish employees with proper personal protective equipment, instruct them in its proper use, and enforce wearing of such equipment.
  - (g) Inform each employee that he or she has an obligation to (1) notify his or her supervisor immediately when conditions or practices may cause personal injury or property damage, (2) observe all health and safety rules, (3) make maximum use of all prescribed personal protective equipment, (4) immediately report to his or her supervisor any accidental exposures to harmful agents, and (5) develop and practice good habits of personal hygiene and housekeeping.
9. The Seller is required to measure the employee's exposure to any regulated substance if there is reason to believe that exposure levels for that substance may exceed the Permissible Exposure Limit (PEL) or the action level. If monitoring results exceed the PEL or action level, further monitoring may need to be conducted. All monitoring documentation shall be available for Bettis review upon request.
- In addition to sampling required to be performed by the subcontractor, subcontractor personnel may be required to wear Bettis personal sampling equipment for industrial hygiene measurements (for example, air samplers for measuring dust, asbestos fibers, and hazardous chemicals).
10. Additional information and guidance are available in 29 CFR 1910, Subparts H and Z. Also, see 29 CFR 1926, Subpart D.

R. GENERAL ELECTRICAL SAFETY

- 1. General Rules and Precautions
  - a. A "Supplemental Safety Plan" is required when working on or near exposed energized conductors. As a result, electrical work is to be performed as much as possible in a deenergized condition. Working on or near exposed energized conductors means within the limited approach boundary as defined in NFPA-70E. **The Supplemental Safety Plan shall include Shock and Arc Flash PPE requirements, as well as Approach Boundaries per NFPA 70E, Article 130. If Bettis has labeled the equipment with the Shock and Arc Flash PPE requirements, and identified all appropriate boundaries, then those may be followed.**
  - b. Indoor electrical equipment that has been wet shall be shut off and then inspected by an electrician before power is restored. The electrician shall ensure that the equipment has not been damaged and is liquid-free prior to reenergizing the equipment.

- c. Cheaters (two-wire to three-wire adapters) and power cords that have been spliced are not permitted at the Bettis Laboratory.
  - d. Portable electric lights used in wet locations (e.g., areas containing drums, tanks, and vessels) shall be operated at a maximum of 12 volts.
  - e. Branch circuit switches inside distribution panels shall be labeled to indicated their purpose.
  - f. Temporary lights shall be equipped with guards to prevent the bulb from being broken.
  - g. Electrical "knockouts" shall not be left open when not in use. Knockout plugs shall be installed.
  - h. Metal "handy boxes" or metal junction-type outlet boxes with knockout-style openings shall not be attached to extension cords. These boxes are designed for use as rigid mounted outlet boxes only.
  - i. All exposed, non-current-carrying metal parts of portable and fixed equipment operated at 50 volts or higher shall be grounded if those parts are liable to become energized under abnormal conditions.
  - j. Ground Fault Circuit Interrupters (GFCIs) shall be used during all Bettis construction operations.
2. Temporary Wiring

The rules for temporary wiring as addressed in Article 305 of the National Electric Code (NFPA 70) shall be followed.

3. Overhead Lines

Outdoor overhead power lines shall be treated as if they are not insulated. When working within the limited approach boundary, as defined in NFPA70E, a "Supplemental Safety Plan" is required unless the lines are de-energized and grounded, or other protective measures are provided before work is started. If the lines are to be de-energized, arrangements shall be made with the person or organization that operates or controls the electric circuits involved to de-energize and ground them. If protective measures are provided such as guarding, isolating, or insulating, these precautions shall prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment.

See 29 CFR 1926, Subpart K and 29 CFR 1910, Subpart S for additional electrical requirements.

S. HAZARDOUS ENERGY CONTROL PROGRAM (Lockout/Tagout)

1. Purpose

The Hazardous Energy Control Program is comprised of equipment, procedures, employee training, and periodic inspections. This program ensures that before any employee performs servicing or maintenance work where the unexpected energizing, startup, or release of hazardous energy could occur and cause injury, the machine, equipment, system, or component is isolated and rendered safe.

Hazardous energy may come from various sources including electrical, mechanical, hydraulic, pneumatic, chemical, thermal and compressed systems, non-ionizing radiation, and gravity.

This Hazardous Energy Control Program establishes requirements for the lockout/tagout of energy-isolating devices and systems, and presents general rules to permit safe servicing and maintenance of systems and equipment.

Requirements in this section are based on 29 CFR 1910.147, "The Control of Hazardous Energy (Lockout/Tagout)" and 29 CFR 1910.333, "Selection and Use of Work Practices (Lockout and Tagging)."

2. Exceptions

a. The following are not controlled by the requirements of this section in accordance with 29 CFR 1910.147.

- (1) Installations under the exclusive control of electric utilities for the purpose of power generation, transmission and distribution, including related equipment for communication or metering.
- (2) Work on cord or plug connected electric equipment for which exposure to the hazards of unexpected energization startup of the equipment is controlled by the unplugging of the equipment from the energy source and the plug is under the exclusive control of the person performing the servicing or maintenance.

CAUTION: Cord or plug connected equipment may require the release of stored or residual energy if this energy could endanger personnel.

(3) Hot tap operations involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines, provided that the following requirements are demonstrated.

- (a) Continuity of service is essential.
- (b) Shutdown of the system is impractical.
- (c) Documented procedures are followed.

- (d) Special equipment is used which provides proven effective protection for employees.
- (4) Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, are not covered if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection from injury. Minor tool changes, etc. do not include the following:
  - (a) An employee is required to remove or bypass a guard or other safety device;  
or
  - (b) An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is actually performed upon the material being processed (point of operation) or where an associated danger zone exists during a machine operating cycle.

3. Hazardous Energy Control Program (Lockout/Tagout)

The following control requirements shall be in place to ensure employee safety.

- a. Energy isolation shall be in accordance with the lockout and tagout procedure outlined in Subsection 7.
- b. For complex systems, involving intricate or multi-phase lockout arrangements, where Subsection 7 cannot be followed or where lockouts are not feasible, specific written procedures are required. Bettis Safety Engineering shall review and concur with these procedures.
- c. Protective materials such as chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided and used when needed for isolating, securing, or blocking machines or equipment from energy sources.
- d. Personnel shall proceed with extreme caution when initially breaching the locked and tagged machine or component to permit personnel to verify expected conditions.
- e. Any person witnessing an indication that the machine or component has not been adequately isolated shall immediately ensure the machine or component is returned to a safe condition and shall notify cognizant management.

4. Lockout and Tagout Devices

Lockout and tagout devices (Lockout Locks and "Danger Tags") shall be used for controlling energy for personnel protection and shall not be used for other purposes.

5. Training and Communication

The subcontractor shall ensure hazardous energy control training is provided to employees prior to permitting work on the equipment. Initial training records shall be maintained as long as the employee is assigned this work.

- a. Each authorized employee shall receive training in the recognition of hazardous energy sources, the type and magnitude of the energy in the workplace, and the methods and means necessary to control and isolate this energy.
- b. Each affected employee shall be instructed in the purpose and use of the energy control procedure.
- c. All other employees whose work operations are or may be in the area where energy control procedures are utilized, shall be instructed about the procedure, and the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out and/or tagged out.

6. Re-training

- a. Re-training shall be provided for all authorized and affected employees whenever there is a change in machines, equipment, or processes that present a new hazard. Re-training is also required when there is a change in the energy control procedure.
- b. Re-training shall be conducted when the subcontractor has reason to believe that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.
- c. Certification may be required that shows employee training has been accomplished and is being kept up-to-date. This certification shall contain each employee's name and dates of training.

7. Lockout and Tagout Procedure

This procedure identifies lockout/tagout methods for electrical, steam, chemical, hydraulic, thermal, pneumatic, mechanical, or other energy where bodily injury could occur if the equipment or machinery was inadvertently energized or stored energy was released during maintenance, repair, installation, or adjustment. This procedure is for locks and tags used together. A written procedure approved by Bettis Safety Engineering is required for using a tag without a lock. Each authorized employee shall read and follow this procedure.

a. Lockout Locks

A Lockout Lock is used to protect people from injury by preventing equipment operation when a component, system, machine, or portion of a system is isolated or in an abnormal condition.

When a lockout is used, it means the equipment is not to be operated or used until the lockout is cleared. When a Lockout Lock is used, the lockout is cleared when the lock is removed.

- (1) The subcontractor shall provide authorized employees with the safety lock or locks needed to perform the assigned lockout work. The key for each assigned lock shall be given to the authorized employee.
- (2) Each authorized employee shall identify the lock(s) under his or her control by placing their last name on the lock(s).

b. Lockout Tags

- (1) Lockout Tags shall not be used for identifying valves, marking leaks, or providing operational precautions.
- (2) A Lockout Tag shall be used with each Lockout Lock or group of locks for information about the lockout.
- (3) Lockout Tags shall be capable of withstanding the environment to which they are exposed. The tags shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible. Tags shall not deteriorate when used in corrosive environments such as areas where acid and alkali chemicals are handled or stored.
- (4) Lockout Tags, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Lockout Tag attachment devices shall be non-reusable, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds and having the general design and basic characteristics of being at least equivalent to a one-piece, all-environment-tolerant nylon cable tie.

c. Responsibility for Lockout Locks and Tags

- (1) Authorized employees who will be performing the lockout/tagout procedure may initiate the lockout. These authorized persons shall make entries in the Lockout Log, assign tag numbers, and complete and install the tags. Tags, as a minimum, require the name(s) of the authorized person(s) and the date. Lockouts that are placed and then removed during the course of one shift do not require the use of the Lockout Log or the assignment of a tag number. However, if it becomes necessary to leave the lockout in place into the next shift or workday, log entries and the assignment of tag numbers shall be initiated.
- (2) Authorized employees who installed the locks and tags may remove them after ascertaining that they are no longer required.
- (3) Enough locks shall be used to completely isolate the components, equipment units, piping, or circuit being worked on. System diagrams or circuit schematics should be used to determine the adequacy of lockout actions and consequences. For electrical systems, care must be taken to ensure that all sources of energy are locked out, including any remote controls.

d. Removing the Lockout Devices

- (1) Before the lockout devices are removed and energy is restored, the authorized employee(s) shall inspect the work area to ensure non-essential items have been removed and to ensure that machine and equipment components are operationally intact. Restore guards, panel covers, breaker doors, junction box covers, etc. prior to re-energizing circuits.
- (2) The work area shall also be checked to ensure all affected employees have been safely positioned or removed. Affected employees shall be notified that lockout devices will be removed and machines, circuits, or equipment will be re-energized. Affected employees shall provide assistance as necessary to safely energize the circuits, machines, or equipment.
- (3) Verify that circuits and equipment are in a condition to energize. Before electric circuits and equipment are re-energized, appropriate test and visual inspections shall be conducted to verify that tools, mechanical restraints and electrical jumpers, shorts and grounds have been removed, so that the circuits and equipment are in a condition to be safely energized. Complete the Tagout Log if required.

e. Shift or Personnel Changes

- (1) During shift or personnel changes, the oncoming and off-going workers shall coordinate the orderly transfer of lockout/tagout devices. This is essential for the protection of all employees, in order to minimize exposure to the hazards of unexpected energization on the startup of the machines or equipment being worked on.

f. Removing the Lockout Devices by Personnel Other than Employee Affixing Lockout

- (1) Each lockout device shall be removed by the employee who applied the device. An exception to this rule applies when the employee who applied the lockout is not available to remove it. The device may then be removed under the direction of management, provided that this procedure is followed.
- (2) Subcontractor management shall verify that the employee who applied the device is not at the Laboratory.
- (3) Make reasonable effort to contact (at home) the employee identified on the lockout device to determine if unknown dangerous conditions exist. Ensure that these conditions (if any) are eliminated.
- (4) Make all reasonable efforts to contact the employee to inform him/her that his/her lockout device will be removed.
- (5) Ensure that the employee has knowledge that his/her lockout device was removed prior to that employee resuming work at the Laboratory.
- (6) Obtain the approval of Bettis management.

(7) If neither the employee's key nor the master key is available, remove the lock by force. Submit a letter of explanation to Bettis management for any lock removed by force or with the master key, with copies to:

- (a) Employee whose name appears on the lockout device;
- (b) Manager, Facilities; and
- (c) Safety Engineering.

g. Testing or Positioning of Machines, Equipment, or Components

(1) In situations where lockout devices must be temporarily removed from the energy-isolating device and the machine or equipment energized to test or position the machine or equipment, special rules must be imposed to ensure protection of the workers.

- (a) The same tag may be reused provided the same person(s) is working on the system.

(2) Clear the machine or equipment of tools and materials.

(3) Remove or safely position employees from the machine or equipment.

(4) Remove the lockout and tagout devices.

(5) Energize and proceed with testing or positioning.

(6) De-energize all systems and reapply energy controls before continuing the servicing and/or maintenance.

T. LADDERS AND SCAFFOLDS

1. See 29 CFR 1926 Subparts X and L and 29 CFR 1910 Subpart D.

a. Inspections of Scaffolds

(1) Competent persons shall inspect erected scaffolds and any defects shall be corrected prior to releasing the scaffold for work.

(2) Daily inspections of all scaffolds and scaffolding work shall be conducted by competent persons or cognizant supervisors.

(3) Scaffolds shall be posted as either "Under Construction" or "Approved for Use."

(4) Scaffolds erected where the working platform is 15 feet or higher must be accompanied by the following inspection checklist.

## INSPECTION CHECKLIST

### FOR SCAFFOLDING

This inspection checklist is to assist the contractor who has the ultimate responsibility for erecting the scaffolding to all applicable requirements. The checklist provides common-sense points designed to promote safety in the use of scaffolding. This checklist does not purport to be all-inclusive, or to supplant or replace additional safety and precautionary measures or good work practices. The checklist is not intended to conflict with, or supersede any state or local statutes or federal regulations.

Each point should be checked prior to using the scaffolding.\*

Checked By: \_\_\_\_\_  
(OSHA defined "Competent Person")\*\*

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

\* This checklist is required when the working level of any scaffold is 15 feet or higher and shall be part of the "Supplemental Safety Plan" for work over six feet. The use of this checklist is optional between six feet and 15 feet.

\*\* "Competent person" means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

## CHECKLIST FOR SCAFFOLD ERECTION

### GENERAL

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
1. Is all the required scaffold material available and is the scaffold being built to the manufacturer's recommendations?	_____	_____	_____
2. a. Have all components been inspected for defects such as broken welds, missing locks, bent or dented tubes, corroded members?	_____	_____	_____
b. Have all defective items been replaced or repaired?	_____	_____	_____
3. Has everyone who will erect the scaffold equipment received, read, and understood the manufacturer's erection instructions?	_____	_____	_____
4. Are the erection supervisor and erecting personnel experienced and qualified to oversee erection of the scaffolding being used?	_____	_____	_____
5. Are the "Codes of Safe Practice" posted at the job site?	_____	_____	_____
6. a. Has the job site been surveyed for hazards such as earth fills, ditches, debris, electric wires, unguarded openings, or hazardous conditions created by other trades, etc.?	_____	_____	_____
b. Have these hazards been corrected?	_____	_____	_____

CHECKLIST (Cont'd)

**FOUNDATIONS & SOIL CONDITIONS**

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
7. Was fill or compaction required? If so, was the required type of fill used, and was it tested after compaction?	_____	_____	_____
8. a. Is the ground frozen? Susceptible to washout, etc.?	_____	_____	_____
b. If so, have appropriate precautions been implemented?	_____	_____	_____
9. Have the sills and sill supports been designed to transfer the load to the foundation without settling, cracking, etc?	_____	_____	_____

**PLANKING MATERIAL**

10. Is all the lumber scaffold grade?	_____	_____	_____
11. Is the lumber free of cracks, splits, knots, or damage due to other means prior to use?	_____	_____	_____
12. If fabricated metal planks are used, are they free of corrosion, kinks, bends, or acid damage?	_____	_____	_____
13. Are all the planks assembled in such a way that any overlap and cantilever distance over a support is neither too great nor too small?	_____	_____	_____
14. Have all planks been assembled in such a way that the gaps between adjoining planks do not exceed one inch?	_____	_____	_____

CHECKLIST (Cont'd)

**MISCELLANEOUS**

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
15. Are all putlogs properly supported at either end and braced in accordance with the manufacturer's recommendations?	_____	_____	_____
16. Are all brackets parallel to the frame for side brackets and at 90 degrees to the frame for end brackets?	_____	_____	_____
17. Are all ties in position and securely tied to a structure capable of withstanding the loads?	_____	_____	_____
18. Are all locking devices engaged and secured properly?	_____	_____	_____
19. Are all toeboards in position and of the correct size?	_____	_____	_____
20. Has all bracing been properly installed in accordance with manufacturer's recommendations?	_____	_____	_____
21. Are all adjusting and attachment devices properly installed and tightened?	_____	_____	_____
22. a. Have all job site revisions been made by a person qualified to make such changes?	_____	_____	_____
b. Are all job site revisions made properly and are they safe to work on?	_____	_____	_____
23. Are all connectors and toggle pins installed where required?	_____	_____	_____
24. a. Is the scaffold and its components capable of supporting without failure at least four times the maximum intended load?	_____	_____	_____
b. Are the manufacturer's recommended loads being strictly applied and adhered to in all planned circumstances?	_____	_____	_____
25. Are access ladders or equivalent safe access provided?	_____	_____	_____

CHECKLIST (Cont'd)

**WIND**

	<u>YES</u>	<u>NO</u>	<u>N/A</u>
26. Are all lateral braces and ties installed and sufficient in size and configuration to withstand all expected lateral loads such as those developed due to wind, etc....?	_____	_____	_____
27. Have all planks been properly secured to the scaffold structure to prevent them blowing off in the event of a high wind?	_____	_____	_____

**ROLLING TOWERS**

28. Is the height to base ratio correct on the rolling tower?	_____	_____	_____
29. Are casters installed and pinned to prevent falling out?	_____	_____	_____
30. Is the extension of screwjacks, where used, less than 12 inches?	_____	_____	_____
31. Are horizontal braces used as close as possible to the casters and at appropriate intermediate levels?	_____	_____	_____
32. Are crossbraces installed at every level of frames?	_____	_____	_____
33. Have guardrails, midrails, and toeboards been installed?	_____	_____	_____
34. Has the area where the rolling tower is to be used been checked for obstructions, unlevel ground, or holes in the floor?	_____	_____	_____

U. AERIAL LIFTS

1. See 29 CFR 1926.453.
2. Ensure manufacturer's operating and use instructions are kept in the lift and employees are trained to these requirements.

V. FALL PROTECTION AND WALKING-WORKING SURFACES

1. See 29 CFR 1926 Subpart M and 29 CFR1910 Subpart D.
2. Safety monitoring systems are not permitted at Bettis without the concurrence of Safety Engineering. This concurrence must be addressed on an Approval Request (AR), i.e. "Supplemental Safety Plan" for work over six feet.

W. CRANES AND LIFTING EQUIPMENT (e.g. Forklifts)

1. Any mobile crane brought on-site must have protection against two-blocking or supervisory controls must be provided to ensure the crane operator does not two-block the crane. In addition to the two-blocking protection, the crane operator is not permitted to render any safety devices inoperative (e.g. turn off or disconnect a limit switch). If supervisory controls are used in lieu of a two-block protection device, the person assigned this duty must be in constant contact with the crane operator at all times the crane is in operation. This person must not be assigned other duties during crane operation.
2. Only lifting and handling equipment that is identified with a rated capacity shall be used. Lifting and handling equipment shall not be loaded beyond its rated capacity except for load tests.
3. Bettis Safety Engineering shall be notified prior to the initial use of a mobile crane by a subcontractor at the Bettis Laboratory. The working area around a mobile crane shall be barricaded and appropriate signs posted such as: "Men Working Above" and "Hard Hat Area."
4. Standard crane signals shall be accepted by the crane operator only from a designated signalperson. In the event of an emergency, however, STOP signals shall be accepted from anyone. When more than one crane or hoist is being used on a single lift, the crane/hoist operators shall act together and take their signals from only one person.
5. Loads shall not be lifted or transported over people (including occupied buildings).
6. Any accidents or any irregularities observed in the operation of lifting and handling equipment must be reported immediately to your Bettis representative. An accident is defined as any personnel injury or damage to equipment, the load, or adjacent structures. If an accident involving any piece of lifting or handling equipment should occur, the equipment shall be secured and shall not be moved, operated, or in any way disturbed, except for rescue work or prevention of a subsequent cascade-type accident or emergency, until a thorough investigation has been conducted and a release is issued by Bettis Safety Engineering.

8. If any doubt exists concerning the safety of any situation or condition, the operator shall not move the equipment until the unsatisfactory condition is corrected and the supervisor of the operation and the Bettis representative have decided that the situation is safe.
9. Crane operators shall not eat, smoke, or read while actually engaged in the operation of a crane.
10. The operator shall not tie in, block, or in any other manner render any circuit breakers, limit switches, or other safety devices inoperative.
11. Before moving loads, the brakes should be tested by moving the controller to the OFF position after the load is raised a few inches. If the hoist brakes do not hold, the load shall be lowered immediately and the brakes shall be adjusted or repaired before the crane is again used.
12. Before lifting machinery or any other apparatus or material, the operator shall make sure that all bolts or other clamping devices have been removed.
13. Mobile cranes, derricks, and similar equipment shall not be operated within 10 feet of overhead electric power lines unless the lines are de-energized and grounded at the point of work. Where lines cannot be de-energized, operations must be reviewed and approved on a case basis by the cognizant Bettis representative and Bettis Safety. Travel clearance for mobile cranes is a minimum of four feet from energized lines.
14. Handling equipment (rigging) shall be checked for defects before it is used and again when it is returned to storage. When in doubt about the safety of any equipment, consult the supervisor of the operations.
15. Slings shall be protected by the use of saddles, wood, rubber, or other padding at the sharp edges of a load.
16. Loose pieces of material such as pipe, wood blocks, lifting gear, etc., shall be removed from the load before it is lifted.
17. Only slings of proper length shall be used. No one shall twist or tie knots in a sling as a means of shortening it. Short slings shall not be tied together to make a longer sling nor be lengthened by passing one sling through the end fitting or eye of another sling or by suspending one sling from another. Only shackles shall be used to lengthen slings if required.
18. Cranes may be used as work platforms only when specifically approved for such work. The cognizant Bettis representative will furnish the Seller with the Crane Access Procedure.

X. EXCAVATIONS

1. A Bettis Excavation Permit is required for all ground penetrations greater than six inches and floor penetrations greater than two inches. The Bettis Representative is responsible to provide the contractor with an Excavation Permit with appropriate approvals.
2. Cognizant supervisors must conduct frequent inspections of all excavations.
3. See 29 CFR 1926 Subpart P for excavation requirements.

Y. VEHICLES

1. Do not block exits, walkways, fire hydrants, or Fire Department sprinkler connections.
2. Do not exceed 15 mph on the Bettis Site property. This limit applies to all Bettis Site property (inside the fence and parking lot).
3. Personnel shall not ride on the outside of trucks.
4. Rollover protective structures shall be provided, whether for construction or maintenance services, on those vehicles covered by 29CFR 1926. Seat belts are required and must be worn when vehicles with rollover protection are driven.
5. When loads project beyond the rear of the truck, the end of the load shall be provided with a red flag by day and a red light at night.
6. Trucks shall be backed only under the direction of a signalman if the view to the rear of the truck is obstructed.
7. Before a dump truck bed is raised, the driver shall be sure there is overhead clearance.
8. Truck drivers should remain in the truck cab while the truck is being loaded or unloaded or a safe location shall be designated for the driver to wait.
9. Employees exposed to vehicular traffic shall be provided with and shall wear warning vests marked with or made of reflectorized or high visibility material.
10. All-terrain vehicles (ATVs) are not permitted to be brought onto the Bettis-Pittsburgh site without the permission of Safety Engineering.
11. Any vehicle with an obstructed view to the rear shall have a reverse signal alarm audible above the surrounding noise level or the vehicle shall be backed up under the direction of a signal person.
12. See 29 CFR 1926, Subpart O for additional information and guidance on vehicle requirements.

Z. SAFETY REQUIREMENTS FOR ENTERING AND WORKING IN CONFINED SPACES

All work performed in confined spaces requires a Supplemental Safety Plan. Bettis uses the requirements of ANSI Z117.1, Safety Requirements for Confined Spaces, for all non-permit required confined spaces, and the requirements of 29 CFR 1926.146 for Permit-Required Confined Spaces. Bettis will provide the contractor the latest evaluation of any confined space to be entered. For permit-required confined space entries, Bettis will provide the permit to the contractor. The contractor shall provide documentation to Bettis that contractor employees have been trained for working in confined spaces, trained in atmospheric monitoring (as required), and the physical and psychological suitability of each worker has been considered. Documentation of training for supervisors of confined spaces is also required.

AA. RELEASE OF POLLUTANTS

The Seller shall strictly adhere to all air and water pollution, chemical waste disposal and spill prevention and control requirements of the Laboratory applicable to work under this contract, as identified by the cognizant Bettis representative. The Seller is prohibited from permitting any emission of pollutants without specific prior approval of the cognizant Bettis representative. In particular, the Seller is prohibited from discharging any substances into on-site sewers (sanitary or storm) without specific, prior approval of the cognizant Bettis representative. See the section on Environmental Control Requirements in the "Special Conditions" document for additional information and guidance.

BB. ASBESTOS CONTROLS

All building materials used at Bettis shall be asbestos free. The removal, encapsulation, renovation, or demolition of previously installed building materials that might contain asbestos requires that the cognizant Bettis representative obtain the approval of Radiological Controls and Engineering and that the Seller comply with the work controls listed below. If the asbestos content of suspect building materials is not known, the substance will be assumed to be asbestos and all work controls, including a "Supplemental Safety Plan" and indoctrination, shall apply.

The abatement, renovation, demolition, and encapsulation of asbestos-containing building materials at Bettis is controlled through the issuance of an Asbestos Work Permit by Bettis Environmental Controls. This permit should be applied for well in advance of the proposed work. This is required so that all the asbestos requirements of the Allegheny County Health Department, Bureau of Air Pollution Control, Article XX, Chapter X, Section 1001 Asbestos Abatement; Environmental Protection Agency National Emission Standards for Hazardous Air Pollutants; Asbestos 40CFR61, OSHA Asbestos Construction Standard 29 CFR 1926.58; and the PA Department of Labor and Industry 1990 Act 194 Asbestos Occupations Accreditation and Certification Act and any subsequent regulations from this Act will be met.

CC. HEAT STRESS

The American Conference of Governmental Industrial Hygienists threshold limit values for heat stress conditions have been adopted for all work performed at Bettis in hot environments. These limits were developed for workers wearing light clothing. For situations where workers must wear special clothing (e.g. protective clothing) which further

reduces the body's dissipation of heat, the permissible heat exposure limit (work-rest regimen) shall be established by the subcontractor, subject to review by Bettis. This limit shall be developed on the basis of work load and environmental conditions specific to the task at the time the task is to be performed.

DD. JACKHAMMERS/PAVEMENT BREAKERS

The following personal protective equipment shall be worn in conjunction with jackhammering or rotohammering operations:

1. Safety glasses with side shields.
2. Foot protection with metatarsal guards.
3. Ear plugs and/or muffs shall be worn while jackhammering or assisting the jackhammer operator.
4. Insulated protective gloves with leather work gloves covering the insulated gloves shall be worn when jackhammering concrete or other material where the location of underground electric powerlines is unknown or where the powerlines are identified in the proximity of the jackhammering operation. If there is any doubt as to the reliability of the drawings or if there is any visual evidence that conduit(s) entered the ground in the vicinity of the jackhammering operation, the insulated gloves shall be worn.
5. Insulated protective gloves with cover leather work gloves also shall be worn when working with bars or other hand tools.
6. The insulated protective gloves described in 4. and 5. above shall be, as a minimum Class II-20,000 volts AC proof-tested linemen's gloves. They shall be visually inspected by the wearer prior to each day's work. The visual inspection shall include checking for snags or holes, age and sun cracking, and swelling caused by oils and petroleum compounds.

EE. INTERNAL COMBUSTION MOBILE EQUIPMENT

1. Equipment with internal combustion engines can cause high levels of carbon monoxide to be generated. It does not matter if the fuel is gasoline or propane, both produce carbon monoxide. Priority consideration should be given to using electrically operated mobile equipment inside of buildings. The use of internal combustion equipment such as forklifts and aerial lifts is prohibited within buildings except as noted below:
  - a. The delivery or pickup of material with such mobile equipment is permitted through truck doors provided the doors remain open to provide ventilation. The pickup or delivery should be performed as expeditiously as possible, minimizing the time the equipment is operating within the building. If there are exhaust fans in the immediate area, these fans are to be operating to help ventilate the area. If a delay occurs, the equipment shall be turned off or moved outside to prevent carbon monoxide from accumulating within the building.

- b. Protection Systems must approve the parking of internal combustion mobile equipment inside any building at Bettis. Propane-powered equipment shall also have the propane valve on the cylinder turned off.
- c. Mobile equipment may be used indoors for extended periods of time (greater than five minutes total time) if its exhaust is vented directly to the outside using a hose or hose and fan combination, as appropriate. Ensure the exhaust outlet is not near ventilation intakes. If the exhaust cannot be readily vented outside in this manner, contact the cognizant Bettis representative to determine if monitoring for carbon monoxide is required. If monitoring is approved, the time-weighted average (TWA) must be less than 25 PPM.

FF. COMPRESSED AIR

1. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi, and then only with effective chip guarding and personal protective equipment.
2. Compressed air shall never be used to clean the clothing or skin of personnel. It shall never be directed at a person's face or body.

GG. LEAD CONTROLS

A "Supplemental Safety Plan" is required for lead operations. Examples of operations requiring lead controls include:

handling bare lead;

removal of lead-bearing paints;

welding, cutting, brazing, or grinding with lead alloys or on lead-painted surfaces; and

construction, renovation, or demolition activities unless walls and other surfaces are verified lead-free.

Additional information and requirements are available in 29 CFR 1926.62.

HH. CRYSTALLINE SILICA EXPOSURE CONTROLS

Inhalation exposure to crystalline silica in excess of  $.05 \text{ mg/m}^3$  from dust-generating activities may occur from silica-bearing materials. Examples that may create silica exposure include, but are not limited to, cutting, grinding, jack-hammering, and similar operations on concrete and/or dry wall or other silica-containing materials. Appropriate controls to prevent worker exposure to crystalline silica are required and shall be approved by Bettis Safety Engineering prior to performance of work. The contractor is responsible for ensuring their employees are trained, qualified, and indoctrinated to prepared procedures for this work.

## II. RESTRICTED USE MATERIALS

### 1. General

It is a Laboratory objective to minimize the use of highly toxic substances where technically feasible. Substitution of less toxic materials is a highly desirable health and safety practice.

A restricted use material is one that requires specific approval by Safety Engineering and/or Environmental Engineering prior to its use at the Laboratory.

### 2. Restricted Use Materials

The usage of the following substances at the Laboratory requires specific Safety Engineering or Environmental Engineering approval.

asbestos	hexane
benzene	hydrazine
beryllium	lead
cadmium oxide	lead-based paints
carbon tetrachloride	mercury
chloroform	methylene chloride
ethers and peroxides	perchloroethylene (tetrachloroethylene)
formaldehyde	picric and perchloric acids and their salts
freon TF (Freon 113)	Rapid tap cutting fluid