



PROJECT SPECIFICATIONS

**VA Sierra Nevada Health Care System
Reno, Nevada**

B3 ICU Headwalls

Project 654-19-924

November 2, 2018

SECTION 01 00 00
GENERAL REQUIREMENTS

1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, tenant improvements and furnish labor and materials and perform work for the installation of headwalls in the Intensive Care Unit (ICU) as required by drawings and specifications. Contractor shall comply with the requirements noted in subparagraph G "Facility Specific Requirements".
- B. Visits to the site by Bidders may be made only by appointment with the Contracting Officer.
- C. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- D. Prior to commencing work, general contractor shall provide proof that a OSHA designated "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- E. Training:
 - 1. All employees of general contractor or subcontractors shall have the 10-hour and 30-hour (where applicable by position) OSHA Certified Construction Safety Course and/or other relevant competency training, as determined by VA CP with input from the ICRA team. The superintendent shall have the 30-hour OSHPD certified Construction Safety course.
 - 2. Submit training records of all such employees for approval before the start of work.
- F. VHA Directive 2011-36, Safety and Health during Construction, dated 9/22/2011 in its entirety is made a part of this section.
- G. Facility Specific Requirements:

1. Contractor shall set in place and maintain a confined space program for all applicable work as outlined in this section.

- a. Confined Space

Permit Required Confined Space. Permit form is required. Among other requirements, a person stationed at the entry point is required. Formal training for workers and entry person is required.

Locations:

Permit-required confined space:

Tunnel	Mech Room / Boiler Plant
Tunnel	CLC under flag pole to Bldg. 1D
Bldg. 1D Crawl Space	Begins at half-height door at each end
Bldg. 12 Crawl Space	Includes basement access BC100
Bldg. 1-1 Clinical Lab	Access to HVAC/Plumbing
Utility Chase	Boiler Plant routes under Kirman to east end of Bldg. 1 Center Wing
Heat Aerator	Bldg. 8 Boiler Plant
Condensate Tank in pit	Bldg. 8 Boiler Plant
Boiler Mud Drums (3ea)	Bldg. 8 Boiler Plant
Boiler Steam Drums(3ea)	Bldg. 8 Boiler Plant
Boiler Fire boxes (3ea)	Bldg. 8 Boiler Plant
Electrical Vaults	Adjacent to Bldgs. 1D & 12, Courtyard
Sewers/Storms Drains	Facility Grounds
Communication Vaults	Facility Grounds

Non-permit confined space:

This category does not apply to contractors - even for investigative purposes they must treat the area as permit required and implement their confined space program accordingly.

Exception: If a VA employee escorts the contractor and remains with them 100% of the investigative time then the permit will not be required. In general, we should not plan on being their escort except for very short durations.

Permit-required confined space:

Every space identified in the list above is to be treated as permit- required.

Implement an approved confined space program.

Contractor must submit for approval their confined space program.

2. "Rules for the Contractor" is set-up as a facility specific guide for the contractor.
 - a. Rules of the Facility for Construction Contractors Sierra Nevada Health Care System is a multi-faceted health care facility tasked with providing health care to the men and women who have served in the armed forces of the United States of America in order to provide for the defense of this county. At all times while working within the facility grounds all contractor's employees must follow the below listed rules of the facility and treat all patients who they may come in contact with utmost respect and dignity. Any contractor employee who mistreats a veteran or violates any of the rules listed below will be removed from the facility.

- 1. All patient information is private and cannot be disclosed to others.**

- If a contractor employee sees a friend, neighbor or other acquaintance receiving health care at the facility they are not to discuss who they saw at the facility with anyone regardless of the circumstances.
- Any information overheard or seen regarding a patient's medical condition is likewise not to be shared with anyone regardless of the circumstances.

2. Safety is a top priority for the facility.

- Contractor must present evidence that each on-site employee has completed the 10 hour OSHA safety training course and evidence that each supervisor has completed the 30 hour OSHA safety training course for supervisors.
- Contractor employees shall at all times wear proper safety attire for the work being accomplished. Further, all contractor equipment and work areas shall be observed at all times. Unattended ladders, doors to electrical closets or mechanical rooms being left open, access panels or manholes covers being moved and not protected are serious safety violations and could result in the dismissal of the responsible employee and a stand-down for the prime and all subs. The General or Controlling Contractor is responsible for site safety, and the employer is responsible for the performance of the tasks of his/her employees. Note that the extent of the measures that a controlling employer must take to satisfy its duty to exercise reasonable care to prevent and detect violations is less than what is required of an employer with respect to protecting its own employees.

3. Electrical: De-energized Panels and Lockout/Tagout

- All contracting firms have sole responsibility for the systems given that they install and maintain. If contractors work on energy producing systems that are normally serviced by FMS personnel, or need to control the energy to the systems for which they have responsibility, then the lockout/tagout operations will be performed by the contractor and overseen by

the primary COTR who validates that the contractors have applied their lockouts/tagouts in the appropriate locations.

- 0 Likewise, work on **electrical panels can only occur if the panel is de-energized**. Likewise, all utility systems are to be shut-down and certified as being off line prior to the contractor tapping into the system.
4. **Infection control is a top priority for the facility.** No work will be allowed to occur anywhere within the facility until an Infection Control Risk Assessment (ICRA) form has been filled out and all required work activities properly required by the completed ICRA have been implemented including, but not limited to construction of dust barriers and **installation of HEPA filters. The hospital side of job access points must be kept pristine; use of sticky mats and** continual sweeping/mopping and other appropriate measures to keep facility areas clean are to be provided by the contractor as needed.
 5. **Contractor employee parking.** No contractor is permitted to park on hospital property with either their personal or business vehicle - use the streets. Contractor's employees vehicles found parking on campus are subject to being ticketed (with fine) by VA Police with notification to the CEO of the prime.
 6. **Contractor discussions regarding project details or related impact** are **NOT** to occur with anyone at the VA without the permission or presence of the COTR or other authorized representative from FMS.
 7. **Contractor employee use of facility toilets and restrooms.** Unless otherwise specified in the contract drawings and/or specifications no contractor employees are to use facility toilets or restrooms.
 8. **Facility work hours.** The facility is an operating health care center and as such activities occur on a 24-7 basis. However the majority of services provided by the facility occur between the hours of 7a and 5p, Monday through Friday. The contractor is to schedule all work activities as necessary to minimize the impact

of the construction activities on the day-to-day operations of the facility. Unless otherwise arranged, contractor work hours are limited to 7:30a to 4p.

- 9. Utility shutdown.** No utility shutdowns will be allowed without proper prior coordination with the medical center. Minor utility shutdowns (those which in no way impact patient care activities) are to be scheduled no less than 72 hours in advance of the planned shutdown. Major utility shutdowns (those which do impact patient care activities) are to be formally requested no less than 21 days in advance of the requested shutdown.
- 10. Contractor's staging area.** There is limited space available for the contractor to use as a staging location. Unless otherwise noted in the contract drawings or specifications, all staging of equipment and materials is to occur within the boundaries of the limits of construction as shown on the contract documents. Dumpster/Storage Area on VA property is not permitted except within the boundaries of the construction project. Coordination for street use for dumpsters and storage is between the contractor and the City of Reno.
- 11. Crane Operations.** Crane Operations are not permitted over occupied areas. Crane operations should be scheduled when occupants are not routinely under the crane ops area.
- 12. Fire alarm or fire sprinkler work and/or tie-ins.** No removal, relocation, disconnection, disabling or connection to the existing facility fire alarm or fire sprinkler systems are to occur until the contractor has obtained the approval of the facility safety manager. It is recommended that wire guards be installed over sprinkler heads within construction boundaries. The contractor is responsible for paying the cost of any fire department response when said the response is due to negligence by the contractor.
- 13. Hot work.** No hot work is to occur until the contractor has received an approved hot work permit from the facility safety manager via the COR.

- 14. Firearms, knives, etc.** This facility is located on federal property. In accordance with federal law, no person, unless authorized to do so (Federal police and government agents only at this facility) are allowed to carry firearms or knives on property grounds.
- 15. Alcohol.** This facility is located on federal property. Therefore the possession, sale of or use of alcohol on the grounds is strictly prohibited.
- 16. Smoking.** Smoking is not allowed anywhere in the facility inside buildings and only in selected areas outside buildings as defined by marks on the pavement.
- 17. Fire Egress.** As a functioning medical facility it is imperative that, in the event of a disaster which requires evacuation, the evacuation routes are available to patients and staff. Blocking of stairwells, corridors, exit doors and other means of evacuation are strictly prohibited unless approved by the Facility Safety Manager as evidenced by his signature on a posted Interim Life Safety Measure (ISLM) document.
- 18. Handicap Accessibility.** As a functioning medical facility it is imperative that all handicap access areas, including ramps, sidewalks, handrails, etc. remain unobstructed at all times unless approved by the Facility Safety Manager as evidenced by his signature on a posted Interim Life Safety Measure (ISLM) document.
- 19. Debris removal.** All debris to be removed from a construction site off site for disposal is to be properly covered whenever it exits a construction area and enters an area occupied by the facility. Tossing of debris materials out of windows or off roof areas without proper use of a trash chute is strictly prohibited.
- 20. Use of electronic equipment.** As a medical facility there is a large amount of electronic equipment that is used by the facility to track patient condition. Hand held electronic equipment such as cell phones, walkie-talkies, radios, iPods, has the potential to impact the signals provided by the medical equipment thereby

impacting patient care. Therefore no hand held electronic equipment is to be used by any contractor employee in the vicinity of areas where health care is provided.

- 21. Badges.** Identification badges are provided for use of all contractor employees. These badges are to be worn by the employee at all times they are on facility grounds. Any contractor employee who is either not wearing or cannot, upon questioning, produce their badge is subject to be removed from the facility. A background check is performed for any employee who will be on-site more than seven days.
 - 22. Project Submittals on Site.** At all times when work is in progress the contractor is to have a set of approved submittals on site for verification that the specified and approved items are being installed. These are to be made available at any time per request of the Contracting Officer or the project COR.
 - 23. Confined Space.** Several areas within hospital grounds are considered Confined Spaces and some of those require Permit. You must have submitted and received COR approval of a contractor implemented Confined Space program prior to any access of these areas.
 - 24. Keys.** No VA key will be provided to a contractor. Access must either be via VA employee or through a contractor locking system. (Reminder: **DO NOT** prop open a door or tape the strike, etc. to get around the proper key use - such action may result in employee removal and contractor safety stand down.) The contractor must provide the COTR five spare keys to any contractor implemented locking system.
 - 25. COR Notification.** No contractor is permitted to perform on-site contract work without COTR knowledge.
3. **ASBESTOS PERMIT:** It is the responsibility of the contractor to obtain a permit from the Washoe County Health District, Air Quality Management Division (401 Ryland Street, Suite 331, Reno NV 89502) (775) 784-7200 prior to commencement of renovation/demolition activities. The Air Quality Management Division requires an asbestos

survey to be conducted by a U.S. EPA AHERA certified person before any potential asbestos containing materials are disturbed. The survey must be completed to the satisfaction of the Control Officer or additional samples may be required. A complete, signed copy of an asbestos survey report must be filed at the Washoe County District Health Department and an "Asbestos Assessment Acknowledgment Form" obtained before any permit for demolition or renovation, as noted above, is issued." The permit issued by the District must be provided to the government to begin work.

4. Weekly COR Construction Site Safety Inspection is to ensure the contractor is complying with safety and infectious controls. Complete the form below for each inspection.

1.2 STATEMENT OF BID ITEM(S)

- A. Work includes general construction, demolition, plumbing, and electrical work, necessary for installation of headwalls.

1.3 SOLICITATION AUTHORITY

- A. This is solicitation Request for Proposals (RFP) conducted under Far Part 15 contracting by negotiation where firms are offerors and shall submit offers. References to IFBS, bids, or bidders, in technical specification sections and technical drawings are strictly coincidental and strictly for purposes of administrative convenience and efficiency.

1.4 SOLICITATION CLAUSES AND PROVISIONS

Please note that RFP, and any resultant contract, Part I, Schedule, and all clauses and provisions located there, supersede and contain final authority. Those clauses and provisions that may be referenced in these technical specification sections and technical drawings are strictly coincidental and for purposes of administrative convenience and efficiency.

1.5 SOLICITATION DEFINITIONS

Throughout this RFP, and any resultant contract, the terms Contracting Officer's Representative (COR), Contracting Officer's Representative (COR), Project Engineer (PE), Contracting Officer's Representative (RE), and Project Manager (PM), all denote the same engineering official and may be

used equally and interchangeably as described by the Contracting Officer CO).

- A. Additional sets of drawings may be made by the Contractor, at Contractor's expense, from reproducible prints furnished by Issuing Office. Such prints shall be returned to the Issuing Office immediately after printing is completed.

1.6 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. Sets of specifications may be purchased by the Contractor, at Contractor's expense.

1.7 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:

- 1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
- 2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.

B. Security Procedures:

- 1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
- 2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days notice to the Contracting Officer's Representative so that security arrangements can be provided for the Contractor's employees. This notice is separate from any notices required for utility shutdown described later in this section.
- 3. No photography of VA premises is allowed without written permission of the Contracting Officer.
- 4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the

event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting Officer's Representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".

7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle are not authorized to park on VA property at any time. Access shall be restricted to picking up and dropping off materials and supplies.

1.8 FIRE SAFETY

A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

1. American Society for Testing and Materials (ASTM):
 - E84-2009.....Surface Burning Characteristics of Building Materials
2. National Fire Protection Association (NFPA):
 - 10-2010.....Standard for Portable Fire Extinguishers
 - 30-2008.....Flammable and Combustible Liquids Code
 - 51B-2009.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work
 - 70-2011.....National Electrical Code
 - 241-2009.....Standard for Safeguarding Construction, Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA):

29 CFR 1926.....Safety and Health Regulations for Construction

- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Contracting Officer's Representative (COR) for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the General Contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the Contracting Officer's Representative (COR) that individuals have undergone contractor's safety briefing.
- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- E. Temporary Construction Partitions:
 - 1. Install and maintain temporary construction partitions to provide smoke-tight separations between construction areas and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
 - 2. Install one-hour fire-rated temporary construction partitions as shown on drawings to maintain integrity of existing exit stair

enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.

3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.

- F. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- G. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer's Representative (COR) and facility Safety Manager.
- H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Contracting Officer's Representative (COR) and facility Safety Manager.
- I. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- J. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- K. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Contracting Officer's Representative (COR) and facility Safety Manager. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Contracting Officer's Representative (COR).

- L. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer's Representative (COR) and facility Safety Manager.
- M. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Contracting Officer's Representative (COR). Obtain permits from facility Safety Manager at least 48 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- N. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Contracting Officer's Representative (COR) and facility Safety Manager.
- O. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- P. Dispose of waste and debris in accordance with NFPA 241 and Sections 01 74 19 Construction Waste Management and 01 31 11 Sustainable Design Requirement. Remove from buildings daily.
- Q. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.
- R. If required, submit documentation to the Contracting Officer's Representative (COR) that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.9 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the

Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.
- D. Working space, material storage space, and dumpster space and space available for storing materials shall be limited to the interior of the construction boundary as shown on the drawings. Contractor must coordinate directly with the City of Reno regarding potential use of the adjacent streets.
- E. Workmen are subject to rules of Medical Center applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by Contracting Officer's Representative (COR) where required by limited working space.
 - 1. Do not store materials and equipment in other than assigned areas.

2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than five work days. Provide unobstructed access to Medical Center areas required to remain in operation.
 3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
- G. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Contracting Officer's Representative (COR). All such actions shall be coordinated with the Utility Company involved:
1. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- H. Building No. 12 will be occupied during performance of work but immediate areas of alterations will be vacated. The following criteria must be adhered to:
1. Maintain access to the portions of Building 12 which are not a part of this project.
 2. Maintain the functioning structural, mechanical, electrical, plumbing, IT, and life safety systems that feed the existing to remain portions of the building throughout the duration of the project.
 3. Minimize disruptions to the rest of the VA Reno campus.
 4. Deliver to the areas indicated, in the order and sequence as described to the COR in order to keep the remaining area of the third floor operational during construction.

- I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (seven feet) minimum height, around the construction area indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by Contracting Officer's Representative (COR).
1. Contractor may not place/park any materials, containers, trailers, vehicles etc. outside the construction fence except for very temporary and approved purposes.
- J. When a building is turned over to Contractor, Contractor shall accept entire responsibility therefore.
1. Contractor shall maintain a minimum temperature of 50 degrees F at all times, except as otherwise specified.
 2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with the Safety Manager, VA Fire Alarm Technician and VA maintenance, and a representative from the City of Reno Fire Department in attendance.
- K. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Contracting Officer's Representative (COR).
1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of Contracting Officer's

Representative (COR). Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.

2. Contractor shall submit a request to interrupt any such services to Contracting Officer's Representative (COR), in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 21 calendar days prior to the desired time and shall be performed as directed by the Contracting Officer's Representative (COR).
 - a. The System Interruption Request must include a plan of action, detailing:
 1. The specific work to be performed relative to this system interruption.
 2. Detailed list of what systems will be affected, and what work will be done on those systems.
 3. Description of backup plan in the event the work is delayed, including a detailed plan for maintaining facility operation during system outage.

5. In case of a contract construction emergency, service will be interrupted on approval of Resident Engineer. Such approval will be confirmed in writing as soon as practical.
 6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- L. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times.
 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the Contracting Officer's Representative (COR).
- N. Coordinate the work for this contract with other construction operations as directed by Contracting Officer's Representative (COR). This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.10 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Contracting Officer's Representative (COR) of areas of buildings in which alterations occur and areas which are

anticipated routes of access, and furnish a report to the Contracting Officer. This report shall list by rooms and spaces:

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of the building.
 2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
 3. Shall note any discrepancies between drawings and existing conditions at site.
 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and Contracting Officer's Representative (COR).
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of Contracting Officer's Representative (COR), to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Contracting Officer's Representative (COR) together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and,

will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.

D. Protection: Provide the following protective measures:

1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.11 INFECTION PREVENTION MEASURES

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.
- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to Contracting Officer's Representative (COR) and Facility ICRA team for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
 1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.

- C. Medical center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality. In addition:
1. The RE and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.
 2. In case of any problem, the medical center, along with assistance from the contractor, shall conduct an environmental assessment to find and eliminate the source.
- D. In general, following preventive measures shall be adopted during construction to keep down dust and prevent mold.
1. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by Contracting Officer's Representative (COR). Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
 2. Do not perform dust producing tasks within occupied areas without the approval of the Contracting Officer's Representative (COR). For construction in any areas that will remain jointly occupied by the Medical Center and Contractor's workers, the Contractor shall:
 - a. Provide dust proof one-hour fire-rated temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant

polystyrene, 6-mil thick or greater plastic barrier meeting local fire codes may be used where dust control is the only hazard, and an agreement is reached with the Contracting Officer's Representative (COR) and Medical Center.

- b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.
- c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24" x 36"), shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
- d. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.
- e. The contractor shall not haul debris through patient-care areas without prior approval of the Contracting Officer's Representative (COR) and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.

- f. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.
- g. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
- h. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

E. Final Cleanup:

- 1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
- 2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
- 3. All new air ducts shall be cleaned prior to final inspection.

1.12 DISPOSAL AND RETENTION

A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:

- 1. Reserved items which are to remain property of the Government are identified by attached tags or noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by Contracting Officer's Representative (COR).
- 2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.

3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

4. PCB Transformers and Capacitors: The Contractor shall be responsible for disposal of the Polychlorinated Biphenyl (PCB) transformers and capacitors. The transformers and capacitors shall be taken out of service and handled in accordance with the procedures of the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) as outlined in Code of Federal Regulation (CFR), Titled 40 and 49 respectively. The EPA's Toxic Substance Control Act (TSCA) Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7 also apply. Upon removal of PCB transformers and capacitors for disposal, the "originator" copy of the Uniform Hazardous Waste Manifest (EPA Form 8700-22), along with the Uniform Hazardous Waste Manifest Continuation Sheet (EPA Form 8700-22A) shall be returned to the Contracting Officer who will annotate the contract file and transmit the Manifest to the Medical Center's Chief.
 - a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:

40 CFR 261.....Identification and Listing of Hazardous Waste

40 CFR 262.....Standards Applicable to Generators of Hazardous Waste

40 CFR 263.....Standards Applicable to Transporters of Hazardous Waste

40 CFR 761.....PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions

49 CFR 172.....Hazardous Material tables and Hazardous Material Communications Regulations

49 CFR 173.....Shippers - General Requirements for Shipments
and Packaging

49 CFR 173.....Subpart A General

49 CFR 173.....Subpart B Preparation of Hazardous Material for
Transportation

49 CFR 173.....Subpart J Other Regulated Material; Definitions
and Preparation

TSCA.....Compliance Program Policy Nos. 6-PCB-6 and
6-PCB-7

1.13 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and

"Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.

1.14 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the Resident Engineer. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Contracting Officer's Representative (COR) before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are indicated on drawings and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.15 PHYSICAL DATA

- A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

SPEC WRITER NOTE: Insert name and address of testing facility performing the soils investigation work.

1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by

_____.

(FAR 52.236-4)

- B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are shown diagrammatically on drawings.
- C. A copy of the soil report will be made available for inspection by bidders upon request to the Engineering Officer at the VA Medical Center, _____ and shall be considered part of the contract documents.
- D. Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine site of work and logs of borings; and, after investigation, decide for themselves character of materials and make their bids accordingly. Upon proper application to Department of Veterans Affairs, bidders will be permitted to make subsurface explorations of their own at site.

1.16 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them.

If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236-17)

- B. Establish and plainly mark center lines for each building and/or addition to each existing building, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, are in accordance with lines and elevations shown on contract drawings.

- C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work. Survey shall include, but not be limited to, location of lines and grades of footings, exterior walls, center lines of columns in both directions, major utilities and elevations of floor slabs:
 - 1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the Contracting Officer's Representative (COR) before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.

- D. During progress of work, and particularly as work progresses from floor to floor, Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the Contracting Officer's Representative (COR) before any major items of concrete work are placed. In addition, Contractor shall also furnish to the Contracting Officer's Representative (COR) certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.

1. Lines of each building and/or addition.
 2. Elevations of bottoms of footings and tops of floors of each building and/or addition.
 3. Lines and elevations of sewers and of all outside distribution systems.
- E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to Contracting Officer's Representative (COR).
- F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.17 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the Resident Engineer's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the Contracting Officer's Representative (COR) within 15 calendar days after each completed phase and after the acceptance of the project by the Contracting Officer's Representative (COR).
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.18 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the Contracting Officer's Representative (COR), such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed by the Contractor at Contractor's expense. When necessary to cross

curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.

1.19 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:
1. Permission to use each unit or system must be given by Contracting Officer's Representative (COR). If the equipment is not installed and maintained in accordance with the following provisions, the Contracting Officer's Representative (COR) will withdraw permission for use of the equipment.
 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
 3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
 4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
 5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.
 6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to

- prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
 - C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

1.20 TEMPORARY USE OF EXISTING ELEVATORS

- A. The Contractor is authorized to use the facility Freight Elevators for material, equipment and tool transfer. The use of any other facility elevators is not allowed, unless specific approval is granted by the COTR. The access route from the work area to the Freight Elevators is shown on the attachment at the end of this Section. The contractor is required to keep the access route clean from dust and debris at all times.
- B. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
 - 1. Contractor makes all arrangements with the Contracting Officer's Representative (COR) for use of elevators. The Contracting Officers' Representative (COR) will ascertain that elevators are in proper condition. Contractor may use one elevator for exclusive use during construction. Exact location of Contractor's elevator shall be determined during the pre-construction meeting. Personnel for operating elevators will not be provided by the Department of Veterans Affairs.
 - 2. Contractor covers and provides maximum protection of following elevator components:
 - a. Entrance jambs, heads soffits and threshold plates.
 - b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
 - c. Finish flooring.

3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes.
4. If brake lining of elevators are excessively worn or damaged during temporary use, they shall be removed and replaced by new brake lining.
5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts, if recommended by elevator inspector after elevator is released by Contractor.
6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer.
7. Contractor shall retain the services of a licensed elevator inspector to inspect the elevator and certify for facility operation once the contractor has completed all construction related use of the elevator. Any repairs required to be made to the elevator in order to obtain the above referenced certification shall be accomplished by the contractor at his/her own cost.

1.21 TEMPORARY TOILETS

- A. Provide where directed, (for use of all Contractor's workmen) ample temporary sanitary toilet accommodations with suitable sewer and water connections; or, when approved by Contracting Officer's Representative (COR), provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.
- B. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain

satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.22 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.
- C. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.
- D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:
 - 1. Obtain heat by connecting to Medical Center heating distribution system.
 - a. Steam is available at no cost to Contractor.
- E. Electricity (for Construction and Testing): Furnish all temporary electric services.
 - 1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices

providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.

F. Water (for Construction and Testing): Furnish temporary water service.

1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. Water is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at Contracting Officer's Representative's discretion) of use of water from Medical Center's system.

G. Steam: Furnish steam system for testing required in various sections of specifications.

1. Obtain steam for testing by connecting to the Medical Center steam distribution system. Steam is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve steam-use so none is wasted. Failure to stop leakage or other waste will be cause for revocation (at Contracting Officer's Representative's discretion), of use of steam from the Medical Center's system.

1.23 NEW TELEPHONE EQUIPMENT

The contractor shall coordinate with the work of installation of telephone equipment by others. This work shall be completed before the building is turned over to VA.

1.24 TESTS

- A. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- B. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer.

Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.

- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a complex which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.
- D. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- E. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.25 MAINTENANCE AND OPERATING MANUALS & INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment shall be delivered to the Contracting Officer's Representative (COR) coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly

cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Contracting Officer's Representative (COR) and shall be considered concluded only when the Contracting Officer's Representative (COR) is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Resident Contracting Officer's Representative (COR), does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1. Contractor shall provide qualified, factory trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system shall be

given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Contracting Officer's Representative (COR) and shall be considered concluded only when the Contracting Officer's Representative (COR) is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Contracting Officer's Representative (COR), does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.26 GOVERNMENT-FURNISHED PROPERTY

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the drawings.
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.
- C. Contractor shall be prepared to receive this equipment from Government and store or place such equipment not less than 90 days before Completion Date of project.
- D. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.
 - 1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
 - 2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

- E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.
- F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
- G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

1.27 RELOCATED EQUIPMENT AND ITEMS

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the Contracting Officer's Representative (COR).
- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. Contractor shall employ services of an installation engineer, who is an authorized representative of the manufacturer of this equipment to supervise assembly and installation of existing, required to be relocated.

- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

1.28 CONSTRUCTION SIGN

- A. N/A

1.29 SAFETY SIGN

- A. N/A

1.30 PHOTOGRAPHIC DOCUMENTATION

- A. N/A

1.31 FINAL ELEVATION DIGITAL IMAGES

- A. N/A

1.32 HISTORIC PRESERVATION

Where the Contractor or any of the Contractor's employees, prior to, or during the construction work, are advised of or discover any possible archeological, historical and/or cultural resources, the Contractor shall immediately notify the Contracting Officer's Representative (COR) verbally, and then with a written follow up.

1.33 WORK DAYS AND HOURS AT PROJECT LOCATION

- A. The normal work days and hours for this project will be Monday through Friday, excluding federal holidays, from 7:30 a.m. to 4:00 p.m. Access to the work site may be restricted to these hours and days. Work during other than normal work days and hours may be required, but days and hours must still be coordinated in advance with the Contracting Officer through the COR.
- B. SNHCS, Reno, NV. Normal working hours are between 7:30 a.m. and 4:00 p.m., Monday through Friday. If the Contractor needs to perform work during hours or days other than the hours or work days stated, the Contractor shall submit a written request Seven (7) Calendar Days prior

to required start of work. The request shall include number of work days, work hours, elements, labor categories, and VA Master Specifications Construction Division Number, also starting times, ending times, and overall dates of proposed work. Work may begin during requested times only after approval of the request by the Contracting Officer.

1.34 SECURITY OF DOCUMENTS

Security requirements addressing the destructions of records, drawings, and specifications by the Contractor shall be accomplished in accordance with VA Directive 6371 dated 02 May 2008.

1.35 BRAND NAME OR EQUAL

Wherever a brand name is cited, contractor shall ensure, in any resultant contract, that any equal has the salient characteristics of the brand name. Lack of confirmation shall be grounds for Government inspection at any time and Government direction for replacement of materials or equipment by the Contractor at no increase in contract price or time.

1.36 SMOKE AND CARBON MONOXIDE MONITORING REQUIREMENTS

Contractor, his employees, his subcontractors, and their employees shall adhere to SNHCS Policies for these requirements. They are available upon request from COR.

1.37 ADDITIONAL PROJECT INFORMATION

- A. Project duration is 120 Calendar Days from Issuance of Notice to Proceed.

- B. Security Requirements. Contractors, contractor personnel, subcontractors, and subcontractor personnel shall be subject to the same Federal laws, regulations, standards, and VA Directives and Handbooks as VA and VA personnel regarding information and information system security.
- C. The Federal Government observes the following Holidays. New Year's Day, Martin Luther King's Birthday, President's Day, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day, and Christmas Day and, any other day specifically declared by the President of the United States.

1.38 ACCESS TO VA INFORMATION AND VA INFORMATION SYSTEMS.

A. GENERAL

Contractors, contractor personnel, subcontractors, and subcontractor personnel shall be subject to the same Federal laws, regulations, standards, and VA Directives and Handbooks as VA and VA personnel regarding information and information system security.

1. A contractor/subcontractor shall request logical (technical) or physical access to VA information and VA information systems for their employees, subcontractors, and affiliates only to the extent necessary to perform the services specified in the contract, agreement, or task order.
2. All contractors, subcontractors, and third-party servicers and associates working with VA information are subject to the same investigative requirements as those of VA appointees or employees who have access to the same types of information. The level and process of background security investigations for contractors must be in accordance with VA Directive and Handbook 0710, Personnel Suitability and Security Program. The Office for Operations, Security, and Preparedness is responsible for these policies and procedures.
3. Contract personnel who require access to national security programs must have a valid security clearance. National Industrial Security

Program (NISP) was established by Executive Order 12829 to ensure that cleared U.S. defense industry contract personnel safeguard the classified information in their possession while performing work on contracts, programs, bids, or research and development efforts. The Department of Veterans Affairs does not have a Memorandum of Agreement with Defense Security Service (DSS). Verification of a Security Clearance must be processed through the Special Security Officer located in the Planning and National Security Service within the Office of Operations, Security, and Preparedness.

4. Custom software development and outsourced operations must be located in the U.S. to the maximum extent practical. If such services are proposed to be performed abroad and are not disallowed by other VA policy or mandates, the contractor/subcontractor must state where all non-U.S. services are provided and detail a security plan, deemed to be acceptable by VA, specifically to address mitigation of the resulting problems of communication, control, data protection, and so forth. Location within the U.S. may be an evaluation factor.
5. The contractor or subcontractor must notify the Contracting Officer immediately when an employee working on a VA system or with access to VA information is reassigned or leaves the contractor or subcontractor's employ. The Contracting Officer must also be notified immediately by the contractor or subcontractor prior to an unfriendly termination.

B. VA INFORMATION CUSTODIAL LANGUAGE

1. Information made available to the contractor or subcontractor by VA for the performance or administration of this contract or information developed by the contractor/subcontractor in performance or administration of the contract shall be used only for those purposes and shall not be used in any other way without the prior written agreement of the VA.
2. VA information should not be co-mingled, if possible, with any other data on the contractors/subcontractor's information systems or media storage systems in order to ensure VA requirements related to data protection and media sanitization can be met. If co-mingling must be

allowed to meet the requirements of the business need, the contractor must ensure that VA's information is returned to the VA or destroyed in accordance with VA's sanitization requirements. VA reserves the right to conduct on-site inspections of contractor and subcontractor IT resources to ensure data security controls, separation of data and job duties, and destruction/media sanitization procedures are in compliance with VA directive requirements.

3. Prior to termination or completion of this contract, contractor/subcontractor must not destroy information received from VA, or gathered/created by the contractor in the course of performing this contract without prior written approval by the VA. Any data destruction done on behalf of VA by contractor/ subcontractor must be done in accordance with National Archives and Records Administration (NARA) requirements as outlined in VA Directive 6300, Records and Information Management and its Handbook 6300.1 Records Management Procedures, applicable VA Records Control Schedules, and VA Handbook 6500.1, Electronic Media Sanitization. Self-certification by the contractor that the data destruction requirements above have been met must be sent to the VA Contracting Officer within 30 days of termination of the contract.
4. The contractor/subcontractor must receive, gather, store, back up, maintain, use, disclose and dispose of VA information only in compliance with the terms of the contract and applicable Federal and VA information confidentiality and security laws, regulations and policies. If Federal or VA information confidentiality and security laws, regulations and policies become applicable to the VA information or information systems after execution of the contract, or if NIST issues or updates applicable FIPS or Special Publications (SP) after execution of this contract, the parties agree to negotiate in good faith to implement the information confidentiality and security laws, regulations and policies in this contract.
5. The contractor/subcontractor shall not make copies of VA information except as authorized and necessary to perform the terms of the agreement or to preserve electronic information stored on contractor/subcontractor electronic storage media for restoration in

case any electronic equipment or data used by the contractor/
subcontractor needs to be restored to an operating state. If copies are
made for restoration purposes, after the restoration is complete, the
copies must be appropriately destroyed.

6. If VA determines that the contractor has violated any of the
information confidentiality, privacy, and security provisions of the
contract, it shall be sufficient grounds for VA to withhold payment to
the contractor or third party or terminate the contract for default or
terminate for cause under Federal Acquisition Regulation (FAR) part 12.

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AA	Aluminum Association Inc. http://www.aluminum.org
AABC	Associated Air Balance Council http://www.aabchq.com
AAMA	American Architectural Manufacturer's Association http://www.aamanet.org
AAN	American Nursery and Landscape Association http://www.anla.org
AASHTO	American Association of State Highway and Transportation Officials http://www.aashto.org
AATCC	American Association of Textile Chemists and Colorists http://www.aatcc.org
ACGIH	American Conference of Governmental Industrial Hygienists http://www.acgih.org
ACI	American Concrete Institute http://www.aci-int.net
ACPA	American Concrete Pipe Association http://www.concrete-pipe.org
ACPPA	American Concrete Pressure Pipe Association http://www.acppa.org
ADC	Air Diffusion Council http://flexibleduct.org
AGA	American Gas Association http://www.aga.org
AGC	Associated General Contractors of America http://www.agc.org
AGMA	American Gear Manufacturers Association, Inc. http://www.agma.org
AHAM	Association of Home Appliance Manufacturers http://www.aham.org
AISC	American Institute of Steel Construction http://www.aisc.org
AISI	American Iron and Steel Institute http://www.steel.org
AITC	American Institute of Timber Construction http://www.aitc-glulam.org
AMCA	Air Movement and Control Association, Inc. http://www.amca.org
ANLA	American Nursery & Landscape Association http://www.anla.org

ANSI	American National Standards Institute, Inc. http://www.ansi.org
APA	The Engineered Wood Association http://www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute http://www.ari.org
ASAE	American Society of Agricultural Engineers http://www.asae.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers http://www.ashrae.org
ASME	American Society of Mechanical Engineers http://www.asme.org
ASSE	American Society of Sanitary Engineering http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials http://www.astm.org
AWI	Architectural Woodwork Institute http://www.awinet.org
AWS	American Welding Society http://www.aws.org
AWWA	American Water Works Association http://www.awwa.org
BHMA	Builders Hardware Manufacturers Association http://www.buildershardware.com
BIA	Brick Institute of America http://www.bia.org
CAGI	Compressed Air and Gas Institute http://www.cagi.org
CGA	Compressed Gas Association, Inc. http://www.cganet.com
CI	The Chlorine Institute, Inc. http://www.chlorineinstitute.org
CISCA	Ceilings and Interior Systems Construction Association http://www.cisca.org
CISPI	Cast Iron Soil Pipe Institute http://www.cispi.org
CLFMI	Chain Link Fence Manufacturers Institute http://www.chainlinkinfo.org

CPMB	Concrete Plant Manufacturers Bureau http://www.cpmb.org
CRA	California Redwood Association http://www.calredwood.org
CRSI	Concrete Reinforcing Steel Institute http://www.crsi.org
CTI	Cooling Technology Institute http://www.cti.org
DHI	Door and Hardware Institute http://www.dhi.org
EGSA	Electrical Generating Systems Association http://www.egsa.org
EEI	Edison Electric Institute http://www.eei.org
EPA	Environmental Protection Agency http://www.epa.gov
ETL	ETL Testing Laboratories, Inc. http://www.etl.com
FAA	Federal Aviation Administration http://www.faa.gov
FCC	Federal Communications Commission http://www.fcc.gov
FPS	The Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America http://www.cssinfo.com/info/gana.html/
FM	Factory Mutual Insurance http://www.fmglobal.com
GA	Gypsum Association http://www.gypsum.org
GSA	General Services Administration http://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
HPVA	Hardwood Plywood & Veneer Association http://www.hpva.org
ICBO	International Conference of Building Officials http://www.icbo.org
ICEA	Insulated Cable Engineers Association Inc. http://www.icea.net

\ICAC Institute of Clean Air Companies
<http://www.icac.com>

IEEE Institute of Electrical and Electronics Engineers
<http://www.ieee.org/>

IMSA International Municipal Signal Association
<http://www.imsasafety.org>

IPCEA Insulated Power Cable Engineers Association

NBMA Metal Buildings Manufacturers Association
<http://www.mbma.com>

MSS Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
<http://www.mss-hq.com>

NAAMM National Association of Architectural Metal Manufacturers
<http://www.naamm.org>

NAPHCC Plumbing-Heating-Cooling Contractors Association
<http://www.phccweb.org.org>

NBS National Bureau of Standards
See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors
<http://www.nationboard.org>

NEC National Electric Code
See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
<http://www.nema.org>

NFPA National Fire Protection Association
<http://www.nfpa.org>

NHLA National Hardwood Lumber Association
<http://www.natlhardwood.org>

NIH National Institute of Health
<http://www.nih.gov>

NIST National Institute of Standards and Technology
<http://www.nist.gov>

NLMA Northeastern Lumber Manufacturers Association, Inc.
<http://www.nelma.org>

NPA National Particleboard Association
18928 Premiere Court
Gaithersburg, MD 20879
(301) 670-0604

NSF National Sanitation Foundation
<http://www.nsf.org>

NWWDA	Window and Door Manufacturers Association http://www.nwwda.org
OSHA	Occupational Safety and Health Administration Department of Labor http://www.osha.gov
PCA	Portland Cement Association http://www.portcement.org
PCI	Precast Prestressed Concrete Institute http://www.pci.org
PPI	The Plastic Pipe Institute http://www.plasticpipe.org
PEI	Porcelain Enamel Institute, Inc. http://www.porcelainenamel.com
PTI	Post-Tensioning Institute http://www.post-tensioning.org
RFCI	The Resilient Floor Covering Institute http://www.rfci.com
RIS	Redwood Inspection Service See - CRA
RMA	Rubber Manufacturers Association, Inc. http://www.rma.org
SCMA	Southern Cypress Manufacturers Association http://www.cypressinfo.org
SDI	Steel Door Institute http://www.steeldoor.org
IGMA	Insulating Glass Manufacturers Alliance http://www.igmaonline.org
SJI	Steel Joist Institute http://www.steeljoist.org
SMACNA	Sheet Metal and Air-Conditioning Contractors National Association, Inc. http://www.smacna.org
SSPC	The Society for Protective Coatings http://www.sspc.org
STI	Steel Tank Institute http://www.steel tank.com
SWI	Steel Window Institute http://www.steelwindows.com
TCA	Tile Council of America, Inc. http://www.tileusa.com

TEMA Tubular Exchange Manufacturers Association
<http://www.tema.org>

TPI Truss Plate Institute, Inc.
583 D'Onofrio Drive; Suite 200
Madison, WI 53719
(608) 833-5900

UBC The Uniform Building Code
See ICBO

UL Underwriters' Laboratories Incorporated
<http://www.ul.com>

ULC Underwriters' Laboratories of Canada
<http://www.ulc.ca>

WCLIB West Coast Lumber Inspection Bureau
6980 SW Varns Road, P.O. Box 23145
Portland, OR 97223
(503) 639-0651

WRCLA Western Red Cedar Lumber Association
P.O. Box 120786
New Brighton, MN 55112
(612) 633-4334

WWPA Western Wood Products Association
<http://www.wwpa.org>

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**SECTION 01 52 50
SAFETY REQUIREMENTS**

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI A10.14 (1991) Construction and Demolition **Operations - Requirements for Safety Belts**, Harnesses, Lanyards and Lifelines for Construction and Demolition Use
- ANSI Z359.1 (1992) Safety Requirements for Personal Fall Arrest Systems

CODE OF FEDERAL REGULATIONS (CFR)

- 29 CFR 1910.94 Ventilation
- 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
- 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
- 29 CFR 1926.502(f) Warning Line Systems

CORPS OF ENGINEERS (COE)

- COE EM-385-1-1 (1996) Safety and Health Requirements Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 70 (1996) National Electrical Code
- NFPA 241 (1996) Safeguarding Construction, Alteration, and Demolition Operations

1.2 DEFINITIONS

- A. Certified Industrial Hygienist. An industrial hygienist is an individual who is certified by the American Board of Industrial Hygiene.
- B. Certified Safety Professional. A safety manager, safety specialist, or safety engineer that has passed the CSP exam administered by the Board of Certified Safety Professionals.
- C. Confined Space. A space which by design has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy, engulfment or any other recognized safety or health hazard. Confined spaces include, but are not limited to storage tanks, process vessels, pits, silos, vats, degreasers, reaction vessels,

boilers, ventilation and exhaust ducts, sewers, tunnels, underground utility vaults, and pipelines.

- D. Multi-employer work site (MEWS). The prime contractor is the "controlling authority" for all work site safety and health of the subcontractors.
- E. Recordable Occupational Injuries or Illness. An occupational injury or illnesses which result in serious injuries, lost workday cases, non-fatal cases or significant mishaps.
- F. Serious Injuries & Fatalities. Regardless of the time between the injury and death or the length of the illness; hospitalization of three or more employees; or property damage in excess of \$200,000.
- G. Lost Workday Cases. Injuries, other than fatalities, that result in lost workdays.
- H. Non-Fatal Cases. Cases without lost workdays which result in transfer to another job or termination of employment, or require medical treatment (other than first aid) or involve property damage in excess of \$10,000 but less than \$200,000 or involve: loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the employer but are not classified as fatalities or lost workday cases.
- I. Health and Safety Plan (HASP). The HASP is the VA equivalent Army term of SHP or SSHP used in COE EM-385-1-1. "USACE" property and equipment specified in COE EM-385-1-1 should be interpreted as Government property and equipment.
- J. Safety Officer. The superintendent or QC Manager who is responsible, qualified and competent for the on-site safety required for the project.
- K. Significant Contractor Mishap. A contractor mishap which involves falls of 4 feet or more, electrical mishaps, confined space mishaps, diving mishaps, equipment mishaps, and fire mishaps which result in a lost time injury, or property damage of \$10,000 or more, but less than \$200,000; or when fire department or emergency medical treatment (EMT) assistance is required.
- L. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment provided by a physician or registered personnel.
- M. First Aid. A one-time treatment, and follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care, even though provided by a physician or registered professional personnel.

N. Lost Workdays. The number of days (consecutive or not) after, but not including, the day of injury or illness during which the employee would have worked but could not do so; that is, could not perform all or part of his normal assignment during all or any part of the workday or shift; because of the occupational injury or illness.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

1. Infectious Control Risk Assessment
2. Health and Safety Plan (HASP)

B. Infectious Control Risk Assessment.

1. The Contractor shall prepare an Infectious Control Risk Assessment for each area and phase of construction. The attached for shall be used for this assessment.

C. Health and Safety Plan (HASP)

1. Allow 30 calendar days for review by the VA.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Qualifications of Safety Officer:

- a. Ability to manage the on-site contractor safety program through appropriate management controls,
- b. Ability to identify hazards and have the capability to expend resources necessary to abate the hazards.
- c. Must have worked on similar types of projects that are equal to or exceed the scope of the project assigned with the same responsibilities.

2. Qualifications of Qualified Person, Confined Space Entry. The qualified person shall be capable (by education and specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety.

3. Qualification of Crane Operators. Crane operators shall meet the requirements in COE EM-385-1-1, Appendix G.

B. Qualifications of Qualified Person, Confined Space Entry The qualified person shall be capable (by education and specialized training) of anticipating, recognizing, and evaluating employee exposure to hazardous substances or other unsafe conditions in a confined space. This person shall be capable of specifying necessary control and protective action to ensure worker safety.

C. Qualification of Crane Operators. Crane operators shall meet the requirements in COE EM-385-1-1, Appendix G.

D. Meetings

1. Preconstruction Conference

a. The Contractor's Safety Officer shall attend the preconstruction conference.

2. Meeting on Work Procedures

a. Meet with Contracting Officer to discuss work procedures and safety precautions required by the HASP. Ensure the participation of the Contractor's superintendent, the Quality Control, and the CSP or CIH.

3. Weekly Safety Meetings

a. Hold weekly. Attach minutes showing contract title, signatures of attendees and a list of topics discussed to the QC Contractor Quality Control daily report.

1.5 INFECTIOUS CONTROL RISK ASSESSEMENT

Prepare for each phase of the work. As a minimum, define activity being performed, sequence of work, specific hazards anticipated, control measures to eliminate or reduce each hazard to acceptable levels, training requirements for all involved, and the competent person in charge of that phase of work.

1.6 HEALTH AND SAFETY PLAN (HASP)

Prepare as required by 29 CFR 1910.120 and COE EM-385-1-1.

A. Qualified Personnel

1. Retain a Certified Industrial Hygienist (CIH) or a Certified Safety Professional (CSP) to prepare the HASP, conduct activity hazard analyses, and prepare detailed plan for demolition, removal, and disposal of materials.

B. Contents

1. In addition to the requirements of COE EM-385-1-1, Table 28-1, the HASP must include:

- a. Location, size, and details of control areas.
- b. Location and details of decontamination systems.
- c. Interface of trades involved in the construction.
- d. Sequencing of work.
- e. Disposal plan.
- f. Sampling protocols.
- g. Testing labs.
- h. Protective equipment.
- i. Pollution control.
- j. Evidence of compliance with 29 CFR 1910.120 and 29 CFR 1926.65.

- k. Training and certifications of CIH, CSP or other competent persons.

1.7 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employees either use illegal drugs or consume alcohol during work hours. Ensure no employees under the influence of drugs or alcohol during work hours.

1.8 DUTIES OF THE SAFETY OFFICER

- A. Ensure construction hazards are identified and corrected.
- B. Maintain applicable safety reference material on the job site.
- C. Maintain a log of safety inspections performed.
- D. Attend the pre-construction conference.

1.9 DISPLAY OF SAFETY INFORMATION

Display the following information in clear view of the on-site construction personnel:

- A. Map denoting the route to the nearest emergency care facility with emergency phone numbers.
- B. Confined space entry permit.
- C. Sign with number of hours worked since last lost workday accident.

1.10 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturers' manuals.

1.11 HIGH HAZARD WORK AND LONG DURATION

Work under this contract is potentially hazardous. Pursuant to contract clause "FAR 52.236-13, Accident Prevention, Alternate I," submit in writing additional proposals for effecting accident prevention under hazardous conditions. Meet in conference with Contracting Officer to discuss and develop mutual understanding relative to the administration of the overall safety program.

1.12 EMERGENCY MEDICAL TREATMENT

Contractors shall arrange for their own emergency medical treatment. Government has no responsibility to provide. However, if emergency medical care is rendered by VA medical services, charges will be billed to Contractor's workmen's compensation insurance company at prevailing rates.

1.13 SITE CONDITIONS

- A. Noise
 - 1. Enforce hearing protection protecting Contractor's site personnel from Government or Contractor produced noise.

1.14 REPORTS

A. Reporting Reports

1. For OSHA recordable accidents, the prime contractor shall conduct a suitable investigation, and provide a written report to the Contracting Officer within 5 calendar days of the accident.

B. Notification

1. Notify Contracting Officer, within 4 hours, of any accident meeting the definition of OSHA recordable occupational injury or illness. Information shall include Contractor name; contract title; type of contract; name of activity, installation or location where mishap occurred; date and time of mishap; names of personnel injured; extent of property damage, if any; and brief description of mishap (to include type of construction equipment used, PPE used, etc.) In addition to OSHA reporting requirements, initial notification shall be made of any accident involving significant mishaps.

C. OSHA Citations and Violations

1. Provide the Contracting Officer with a copy of each OSHA citation, OSHA report and Contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

PART 2 PRODUCTS

2.1 FALL PROTECTION ANCHORAGE

Fall protection anchorages, used by contractors to protect their people, shall be left in place and so identified for continued customer use.

2.2 CONFINED SPACE SIGNAGE

Provide permanent signs integral to or securely attached to access covers for new confined spaces. Signs wording: "DANGER--PERMIT REQUIRED CONFINED SPACE - DO NOT ENTER -" on bold letters a minimum of one inch in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" and shall be red and readable from 5 feet.

PART 3 EXECUTION

3.1 CONSTRUCTION

Comply with COE EM-385-1-1, NFPA 241, the Infectious Control Risk Assessment and other related submittals and activity fire and safety regulations.

- A. Hazardous Material Exclusions. Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/nonionizing radiation as well as materials

which contain asbestos, mercury or polychlorinated biphenyls, diisocyanates, lead-based paint are prohibited. Exceptions to the use of any of the above excluded materials may be considered by Contracting Officer upon written request by Contractor.

- B. Unforeseen Hazardous Material. The design should have identified materials such as PCB, lead paint, and friable and nonfriable asbestos. If additional material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PERSONNEL PROTECTION

- A. Hazardous Noise. Provide hazardous noise signs, and hearing protection, wherever equipment and work procedures produce sound-pressure levels greater than 85 dBA steady state or 140 dBA impulse, regardless of the duration of the exposure.
- B. Fall Protection. Enforce use of the fall protection device named for each activity in the AHA all times when an employee is on a surface 6 feet or more above lower levels. Personal fall arrest systems are required when working from an articulating or extendible boom, scissor lifts, swing stages, or suspended platform. Fall protection must comply with ANSI A10.14.
 - 1. Personal Fall Arrest Device. Equipment, subsystems, and components shall meet ANSI Z359.1, Personal Fall Arrest Systems. Only a full-body harness with a shock absorbing lanyard is an acceptable personal fall arrest device. Body belts may only be used as positioning devices only such as for steel reinforcing assembly. Body belts are not authorized as a personal fall arrest device. Harnesses must have upper middle back "D" rings for proper body suspension during a fall. Lanyard must be fitted with a double locking snap hook attachment. Webbing, straps, and ropes must be of synthetic fiber or wire rope.
 - 2. Fall Protection for Roofs
 - a. For work within 6 feet of an edge, on low-pitched roofs, personnel shall be protected by use of personal fall arrest systems, guardrails, and safety nets. Safety monitoring system is not adequate fall protection and is not authorized.

- b. For work greater than 6 feet from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.502(f).
 - c. Work on steep roofs requires personal fall arrest, guardrails with toe boards, or safety nets. This requirement includes residential or housing type construction.
 - 3. Safety Nets. Safety nets shall be provided in unguarded workplaces over water, machinery, dangerous operations, or more than 25 feet above surface.
- C. Scaffolding. Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Contractor shall ensure that employees that are qualified perform scaffold erection. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection plan. Minimum platform size shall be based on the platform not being greater in height than four times the dimension of the smallest width dimension for rolling scaffold. Some Baker type scaffolding has been found not to meet these requirements. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. The first tie-in shall be at the height equal to 4 times the width of the scaffold base.
- D. Use of Material Handling Equipment
 - 1. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufactures printed operating instructions. Crane supported work platforms shall only be used in extreme conditions if the Contractor proves that using any other access to the work location would provide a greater hazard to the workers.
 - 2. Cranes must be equipped with Load Indicating Devices, anti-two blocks devices, load, and boom angle moment indicating indicators.
 - 3. Christmas-tree lifting (multiple rigged materials) is not allowed.
- E. Excavations. The competent person for excavation shall be on site when work is being performed in excavation, and shall inspect excavations prior to entry by workers. Individual must evaluate for all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly.
- F. Conduct of Electrical Work. Underground electrical spaces must be certified safe for entry before entering to conduct work. Cable intended to be cut must be positively identified and de-energized prior to

performing each cut. Perform all high voltage cutting remotely. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personnel protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses.

- G. Work in Manholes. Contractor shall provide mechanical ventilation for all work accomplished in manholes, unless other hazards are present like friable asbestos.
- H. Work in Confined Spaces. Comply with the requirements in Section 06.I of COE EM-385-1-1. Any potential for a hazard in the confined space requires a permit system to be used.
 - 1. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of COE EM-385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.
 - 2. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained.
 - 3. Ensure the use of rescue and retrieval devices in confined spaces greater than 5 feet in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of COE EM-385-1-1.
 - 4. Sewer west walls require continuous atmosphere monitoring with audible alarm for toxic gas detection.
 - 5. Include training information for employees who will be involved as entrant attendants for the work. Conform to Section 06.I.06 of COE EM-385-1-1.
 - 6. Entry Permit. Use ENIFORM 5044-R or other form with the same minimum information for the Daily Confined Space Entry Permit, completed by the qualified person. Post the permit in a conspicuous place close to the confined space entrance.

- I. Crystalline Silica. Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and COE EM-385-1-1, (Appendix C). The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.3 ACCIDENT SCENE PRESERVATION

- A. For serious accidents, ensure the accident site is secured and evidence is protected remaining undisturbed until released by the Contracting Officer.

3.4 FIELD QUALITY CONTROL

- A. Inspections. Include safety inspection as a part of the daily Quality Control inspections.

- - - E N D - - -

SECTION 22 62 00
VACUUM SYSTEMS FOR HEALTHCARE FACILITIES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Healthcare Vacuum Systems: This section describes the labor, equipment, and services necessary for and incidental to the installation of piped medical vacuum systems. Medical vacuum systems shall be installed started, tested, and ready for use. The scope of work shall include all necessary piping, fittings, valves, cabinets, station outlets and inlets, rough ins, ceiling services, gages, alarms including low voltage wiring, receivers, and all necessary parts, accessories, connections and equipment. Match existing station inlet terminal connections.
- B. The contractor shall provide all elements and accessories required for a complete system according to the most recent edition of NFPA 99C, Gas and Vacuum Systems.
- C. All necessary connections to owner furnished equipment shall be made as indicated on the documents. A separate construction isolation valve shall be made at the point of connection to an existing vacuum system.
- E. Pressure testing, cross connection testing and final testing per NFPA 99 most recent edition and using procedures shall be performed.
- F. Coordinate with owner retained verifier for final verification of the systems. Make corrections as required, including additional testing if necessary to attain full and unqualified certification.

1.2 RELATED WORK

- A. Section 07 84 00, FIRESTOPPING: Sealing around pipe penetrations to maintain the integrity of time rated construction.
- B. Section 07 92 00, JOINT SEALANTS: Sealing around pipe penetrations through the floor to prevent moisture migration.
- C. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING: General requirements and items common to more than one section of Division 22.
- D. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Alarm interface with ECC.
- E. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduit.
- F. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Control wiring.
- G. Section 26 27 26, WIRING DEVICES: Electrical wiring and accessories.

- H. Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS: Motor starters.
- I. Section 10 25 13, PATIENT BED SERVICE WALLS: Prefabricated bedside patient units.
- J. Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES: Laboratory and Healthcare Gases and Vacuum Alarms.

1.3 QUALITY ASSURANCE

- A. Installation and Start-up: The manufacturer will provide factory authorized representatives to review installation and perform initial start-up of system.
- B. Contractor shall include with submittals an affidavit attesting to compliance with all relevant paragraphs of NFPA 99 most recent edition. Personnel assembling medical vacuum and WAGD system shall meet NFPA 99 5.1.10.10.11 "Qualification of Installers" and hold medical gas endorsements as under ASSE 6010. The Contractor shall furnish documentation attesting that all installed piping materials were purchased cleaned and complied with the requirements of NFPA 99 5.1.10.1 and 5.1.10.2. Electrical Control systems and Medical vacuum Alarms are to be UL listed as assemblies with label affixed. Medical vacuum and WAGD controls are to be wired in accordance with NEC.
- C. Equipment Installer: The equipment installer shall show documentation proving that the personnel installing the equipment meet the standards set by the American Society of Sanitary Engineers (ASSE) 6010 Professional Qualification Standards for Medical Gas System Installers. Show technical qualifications and previous experience in installing medical gas equipment on three similar projects. Submit names and addresses of referenced projects. The equipment install shall perform the following coordination functions:
 - 1. Coordinate with other trades to ensure timely installations and avoid conflicts and interferences.
 - 2. Work with the metal stud partition installer and/or mason to ensure anchors, sleeves and similar items are provided in sufficient time to avoid delays; chases and openings are properly sized and prepared.
 - 3. Coordinate with VA to ensure medical vacuum inlets, whether owner supplied or contractor supplied, in walls, ceiling and all equipment is provided by the same Medical Vacuum Equipment Manufacturer satisfactory to the owner.
 - 4. The contractor shall coordinate with the Medical Vacuum System

Verifier to deliver a complete, tested medical gas installation ready for owner's use.

- D. Equipment Supplier: The Equipment supplier shall demonstrate evidence of installing equivalent product at three installations similar to this project that has been in satisfactory and efficient operation for three years. Names and addresses where the product is installed shall be submitted for verification.
- E. Medical Gas System Testing Organization: The Medical vacuum verifier shall show documentation proving that the medical gas verifier meet the standards set by the American Society of Sanitary Engineers (ASSE) 6010 Professional Qualification Standards for Medical Gas System Verifiers. The testing shall be conducted by a party technically competent and experienced in the field of medical gas pipeline testing. Such testing shall be performed by a party other than the installing contractor.
- F. Names of three projects where testing of vacuum systems has been performed by the testing agency shall be provided. The name of the project, names of such persons at that project who supervised the work for the project owner, or who accepted the report for the project owner, and a written statement that the projects listed required work of similar scope to that set forth in this specification shall be included in the documentation.
- G. The testing agency's detailed procedure which will be followed in the testing of this project shall be submitted. In the testing agency's procedure documentation, include details of the testing sequence, procedures for cross connection tests, outlet function tests, alarm tests, purity tests, etc., as required by this specification. For purity test procedures, data on test methods, types of equipment to be used, calibration sources and method references shall be submitted.
- H. Installation and Start-up: The manufacturer shall provide factory authorized representatives to review the installation and perform the initial startup of the system. The factory authorized representatives shall submit a report to the Contracting Officer Representative and to the Contractor. The Contractor shall make all corrections identified by the factory authorized representative.
- I. Certification: The Final inspection documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and

a certification that all results of tests were within limits allowed by this specification.

- J. The installing contractor shall maintain as-built drawings of each completed phases for verification; and, shall provide the complete set at the time of final systems certification testing, for certification by the Third Party Testing Company. As-built drawings shall be provided, and a copy of them on Auto-Cad version (R-14 or later) provided on compact disk.

1.4 SUBMITTALS

- A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
1. Complete specifications for the product intended to be installed, dimensional drawings, and wiring schematics.
 2. Package drawing indicating package style, dimensions when complete, method of disassembly and sizes of subsections for rigging and installation.
 3. Piping.
 4. Valves.
 5. Inlet and outlet cocks
 6. Valve cabinets.
 7. Gages.
 8. Station inlets, and rough in assemblies.
 9. Ceiling services.
 10. Alarm controls and panels.
 11. Vacuum switches.
 12. Vacuum bottle brackets.
- C. Station Inlets: A letter from manufacturer shall be submitted stating that inlets are designed and manufactured to comply with NFPA 99. Inlet shall bear label of approval as an assembly, of Underwriters Laboratories, Inc., or Associated Factory Mutual Research Corporation. In lieu of above labels, certificate may be submitted by a nationally recognized independent testing laboratory, satisfactory to the Contracting Officer, certifying that materials, appliances and assemblies conform to published standards, including methods of tests, of above organizations.
- D. Certification: The completed systems have been installed, tested, purged and analyzed in accordance with the requirements of this

specification. Certification shall be submitted to Contracting Officer Representative.

- E. A notarized affidavit from the verifier stating that the verifier undertakes to verify this project and thus agrees to disqualify themselves from supplying any equipment which will be included in the scope of their verification. No verifier who supplies equipment shall be permitted to verify that equipment. Statement declaring that the vacuum system manufacturer has no fiduciary interest in the verifier and that the verifier is not an agent or representative of the vacuum system manufacturer. Statement declaring that the contractor has no fiduciary interest in the third party verifier and that the third party verifier has no fiduciary interest in the contractor.

1.5 TRAINING

- A. The services of a competent instructor shall be provided for not less than two four-hour periods for instructing medical personnel in the operation and maintenance of the vacuum systems, on the dates requested by COR (Contracting Officer Representative).
- B. The other training requirements specified in Section 01 00 00, GENERALREQUIREMENTS shall be coordinated with the above paragraph

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the test by the basic designation only.
- B. American National Standards Institute (ANSI):
 - A13.1-2007.....Scheme for Identification of Piping Systems
 - B16.22-01 (R2005).....Wrought Copper and Bronze Solder-Joint Pressure Fittings
 - B40.1-(2005)..... Pressure Gauges and Gauge Attachments
- C. American Society for Testing and Materials (ASTM):
 - B819-00 (R2006).....Standard Specification for Seamless Copper Tube for Medical Gas Systems
- D. American Society of Mechanical Engineers (ASME):
 - Section IX-10.....Welding and Brazing Qualifications
- E. American Welding Society (AWS):
 - AWS A5.8/A5.8M-11.....Brazing Filler Metal
 - AWS B2.2/B2.2M-10.....Standard for Brazing Procedure and Performance Qualification (Modified per NFPA 99)

- F. National Electrical Manufacturers Association (NEMA):
ICS-6-1993 (R 2006).....Industrial Controls and Systems Enclosures
- G. National Fire Protection Association (NFPA):
99-2012.....Health Care Facilities with 2005 errata
- H. National Electrical Code 70, edition (2011)
- I. Manufacturing Standardization Society (MSS):
MSS-SP-72-99.....Ball Valves With Flanged or Butt Welding For
General Purpose
MSS-SP-110-96.....Ball Valve Threaded, Socket Welding, Solder
Joint, Grooved and Flared Ends
MSS-SP-73-03.....Brazing Joints for Copper and Copper Alloy
Solder Pressure Fittings

1.7 WARRANTY

- A. Warranty will be expressly complete, include all components of the system and be the responsibility of the vacuum system manufacturer of record only. Warranties limiting the responsibility of the vacuum system for any system component or which pass through to another manufacturer are not acceptable.
- B. Warranties shall include on site repairs including travel, labor and parts. Warranties requiring return of equipment for adjustment are not acceptable.

1.8. MAINTENANCE SUPPORT

- A. The medical vacuum equipment manufacturer shall demonstrate a national factory direct service capability able to perform major overhauls. The medical vacuum equipment manufacturer shall provide factory direct preventative maintenance contract. The medical vacuum equipment manufacturer shall provide formal maintenance training courses.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. One Medical Vacuum Equipment Manufacturer shall supply the medical vacuum system(s) and equipment to include outlets, valves and gauges, valve boxes, alarm panels, manifolds, medical air, instrument air, vacuum and WAGD sources.

2.2 PIPING

- A. Copper Tubing: Copper tubing shall be type "K" , ASTM B819, seamless copper tube, hard drawn temper, with wrought copper fittings conforming to ANSI B16.22 or brazing fittings complying with MSS SP-73. The

copper tubing size designated reflects nominal inside diameter. All tubing and fittings shall be labeled "ACR/OXY", "OXY", "OXY/MED", "ACR/MED", or "MED".

- B. Brazing Alloy: The brazing alloy shall comply with AWS A5.8, Classification BCuP, greater than 537 °C (1000 °F) melting temperature. Flux shall be strictly prohibited for copper to copper connections.
- C. Screw Joints: Screw joints shall use polytetrafluoroethylene (teflon) tape.
- D. Use only copper or stainless steel pipes for discharge from vacuum product (exhaust pipes).
- E. Memory metal couplings shall have temperature and pressure ratings not less than that of a brazed joint.
- F. Piping identification labels shall be applied at time of installation in accordance with current NFPA. Supplementary color identification shall be in accordance with CGA Pamphlet C-9.
- G. Special **Fittings:** The following special fittings shall be permitted to be used in lieu of brazed joints:
 - 1. Memory-metal couplings having temperature and pressure ratings joints not less than that of a brazed joint.
 - 2. **Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint.**
 - 3. Dielectric fittings where required by the manufacturer of special medical equipment to electrically isolate the equipment from the piping distribution system.
 - 4. Axially swaged, elastic strain preload fittings providing metal to metal seal having pressure and temperature ratings not less than that of a brazed joint and when complete are permanent and non-separable.

2.3 EXPOSED HEALTHCARE VACUUM PIPING

- A. Finished Room: Use full iron pipe size chrome plated brass piping shall be used for exposed laboratory and healthcare vacuum piping connecting fixtures, casework, cabinets, equipment and reagent racks when not concealed by apron including those furnished by the Government or specified in other sections.
 - 1. Pipe: Fed. Spec. WW-P-351, standard weight.
 - 2. Fittings: Fittings shall comply with ANSI B16.15 cast bronze threaded fittings with chrome finish, (125 and 250).

3. Nipples: Nipples shall comply with ASTM B 687, Chromium-plated.
4. Unions: Unions shall comply with Mss SP-72, SP-110, Brass or Bronze with chrome finish. Unions 65 mm (2-1/2 inches) and larger shall be flange type with approved gaskets.
5. Valves: Valves shall comply with Mss SP-72, SP-110, Brass or bronze with chrome finish.

2.4 VALVES

A. Ball: Ball valves shall be in line, other than zone valves in cabinets.

1. Sixty five millimeter or DN65 (2-1/2 inches) and smaller: Ball valves shall be bronze/ brass body, Fed. Spec. MSS SP72 & SP 110 , Type II, Class 150, Style 1, with tubing extensions for brazed connections, full ported, three piece or double union end connections, teflon seat seals, full flow, 4125 kPa (600 psi) WOG minimum working pressure, with locking type handle.
2. Eighty millimeter or DN80 to 100 millimeter or DN100 (3" to 4" inches): Ball valves shall be bronze/ brass body, Fed. Spec. MSS SP72 & SP 110, Type II, Class 150, Style 1 with tubing extensions brazed to flanges, full ported, three piece, double seal, teflon seals, full flow, 4125 kPa (600 psi) WOG minimum working pressure, with locking type handle.

B. Check:

1. Check valves eighty millimeters (DN80) (3 inches) and smaller: brass and Bronze body, straight through design for minimum pressure drop, spring loaded, self-aligning with teflon cone seat, vibration free, silent operation, supplied NPT female threads at each end with flow direction arrow permanently cast into, 2750 kPa (400 psi) WOG minimum working pressure.
2. One hundred millimeter or DN100 (4 inches) and larger check valves shall be iron body, bronze trim, swing type, vertical or horizontal installation, flange connection, 1025 kPa (150 psi) WSP.

C. Zone valve in cabinet shall be ball valve with bronze/ brass body, double seal, three piece or double union end connections, replaceable teflon seat seals, teflon stem seal, 4125 kPa (600 psi) WOG, cold, non shock gas working pressure or vacuum service to 29 inch Hg, blowout proof stem, one quarter turn of handle to completely open or close. Tubing extensions, factory brazed, pressure tested, cleaned for oxygen service shall be provided. A 3 mm (1/8 inches) NPT gauge port shall be provided for a 50mm (2 inch) diameter monitoring gauge downstream of

the shut off valve. Zone valves shall be securely attached to the cabinet and provided with type-K copper tube extensions for making connection to system piping outside the cabinet. Zone valves shall be products of one manufacturer, and uniform throughout in pattern, overall size and appearance. Trim with color coded plastic inserts or color coded stick on labels. Valves shall be in cabinets such that cover window cannot be in place when any valve is in the closed position. Color coding for identification plates and labels is as follows:

SERVICE LABEL	IDENTIFICATION COLORS	MFG. STD. CLR.
MEDICAL VACUUM	Black letters on white background	WHITE
Evacuation (Waste Gas)	White letters on purple background	PURPLE

2.5 VALVE CABINETS

- A. Valve cabinets shall be flush mounted, commercially available item for use with medical gas services, constructed from steel not lighter than 1.3 mm (18 gage) steel or extruded aluminum not lighter than 1.9 mm (14 gage). The valve cabinets shall be rigidly assembled, of adequate size to accommodate all valve(s) and fittings indicated. Holes shall be predrilled to receive pipe connections. These pipe connections shall be made outside of the valve box. Anchors shall be provided to secure cabinet to wall construction. Openings in cabinet shall be sealed to be dust tight. Bottom of cabinet shall be located 1375 mm (4 foot 6 inches) above finished floor.
- B. Engraved rigid plastic identification plate shall be mounted on the wall above or adjacent to the cabinet. Color code identification plate to match gas identification colors as indicated above. Identification plate shall be clearly visible at all times. Inscriptions shall be provided on plate to read in substance: "VALVE CONTROL SUPPLY TO ROOMS." The final wording must be approved by the VA project manager.
- C. Cover plate: The cover plate shall be fabricated from 1.3 mm (18 gage) sheet metal with satin chromed finish, extruded anodized aluminum, or .85 mm (22 gage) stainless steel. A cover window shall be provided of replaceable plastic, with a corrosion resistant device or lever secured to window for emergency window removal. The following shall be

permanently painted or stenciled on window: "FOR EMERGENCY SHUT-OFF VALVES ONLY, SHUT OFF VALVES FOR PIPED GASES", or equivalent wording. The valve cabinet shall be configured such that it is not possible to install window with any valve in the closed position. Each valve shall have a pressure gauge upstream of valve and this pressure gauge shall be inside valve box.

- D. Cabinets and isolation valves shall be located and piped as shown, and at a minimum, so as to allow the isolation of each smoke compartment separately. Each cabinet shall serve no more than one smoke compartment.

2.6 GAGES

A. Vacuum Gages:

1. For vacuum line adjacent to source equipment the vacuum gages shall comply with ANSI B40.1, vacuum gage type, size 115 mm (4-1/2 inches), gage listed for vacuum, accurate to within 2-1/2 percent, with metal case. The vacuum gage range shall be 0 to-100 kPa (0-30 inches Hg). Dial graduations and figures shall be black on a white background, or white on a black background. Label shall be for vacuum service. A gage cock shall be installed. Compound gages shall be installed for Vacuum system.
2. For vacuum service upstream of main shutoff valve: A 40 mm (1-1/2 inches) diameter gage shall be provided with steel case, bourdon tube and brass movement, dial range 0 to -100 kPa (0-30 inches Hg). Compound gages shall be provided for Vacuum system.

2.7 STATION INLETS

A. Vacuum Station inlets:

1. Station inlets shall be for designated service, consisting of a quick coupler, quick disconnect type with inlet supply tube.
2. The outlet station shall be made, cleaned, and packaged to NFPA 99 standards and shall be UL listed and CSA certified.
3. A coupler shall be provided that is non-interchangeable with other services, and leak proof under three times normal working pressure.
4. Each station inlet shall be equipped with an automatic valve to conform with NFPA 99. Valves shall be placed in the assembly to provide easy access after installation for servicing and replacement, and to facilitate line blow-out, purging, and testing.
5. Each inlet shall be securely fastened to rough-in to prevent floating and provide each with a capped stub length of 6 mm (1/4

inches) (10 mm outside diameter) (3/8 inches outside diameter) tubing for connection to supply tubing. Stub tubing shall be labeled for appropriate service. Rough in shall be indexed and gas specified latch vale with non-interchangeable safety keying with color coded gas service identification.

6. Rough-in kits and test plugs for Prefabricated Bedside Patient Units (PBPU) shall be furnished under this specification but installed by manufacturer of PBPUs before initial test specified herein.
7. Completion kits (valve body and face plate) shall be installed for the remainder of required tests.

B. For Ceiling Hose Drops:

1. Brass, stainless steel or chromed metal non interchangeable DISS connections for appropriate service to conform with CGA V-5.
2. Hose assemblies shall be furnished for all ceiling stations for the finished ceiling height as indicated on the drawings. Each hose shall be provided with a heavy chain type dual retractor for vacuum. Retractors made of stainless steel are not acceptable. An extra 450 millimeters (18 inches) of hose length shall be provided for retractors.
3. Each station inlet shall be equipped with an automatic valve to conform with NFPA 99. Valves shall be placed in the assembly to provide easy access after installation, for servicing and replacement, and to facilitate line blow-out, purging, and testing.
4. Each inlet shall be securely to rough-in to prevent floating, and provide each with a capped stub length of 6 mm (1/4 inches) (10 mm (3/8 inches) outside diameter) tubing for connection to supply tubing. Stub tubing shall be labeled for appropriate service. to the installation shall be adjusted compensate for variations in plaster or cover thickness.

2.8 STATION INLETS

A. Vacuum Station inlets:

1. Station inlets shall be brass, stainless steel or chromed metal non-interchangeable DISS connections for appropriate service to conform with CGA V-5.
2. The outlet station shall be made, cleaned, and packaged to NFPA 99 standards and shall be UL listed and CSA certified.

3. A coupler shall be provided that is non-interchangeable with other services, and leak proof under three times normal working pressure. Threaded DISS connector shall be per CGA standards
4. Each station inlet shall be equipped with an automatic valve to conform with NFPA 99. Valves shall be placed in the assembly to provide easy access after installation for servicing and replacement, and to facilitate line blow-out, purging, and testing.
5. Each inlet shall be securely fastened to rough-in to prevent floating and provide each with a capped stub length of 6 mm (1/4-inch) 10 mm outside diameter (3/8-inch outside diameter) tubing for connection to supply tubing. Stub tubing shall be labeled for appropriate service. Rough in shall be indexed and gas specified latch valve with non-interchangeable safety keying with color coded gas service identification.
6. Rough-in kits and test plugs for Prefabricated Bedside Patient Units (PBPU) shall be furnished under this specification but installed by manufacturer of PBPUs before initial test specified herein.
7. Completion kits (valve body and face plate) shall be installed for the remainder of required tests.

2.9 STATION INLET ROUGH-IN

- A. Station inlet rough in shall be flush mounted, and protected against corrosion. Rough in shall be anchored securely to unit or wall construction.
- B. The modular cover plate shall be constructed from die cast plate, two piece .85 mm (22 gage) stainless steel or 1.6 mm (16 gage) chromium plated metal, secured to rough in with stainless steel or chromium plated countersunk screws. The latch mechanism shall be designed for one handed, single thrust mounting and one handed fingertip release of secondary equipment.
- C. Cover Plate for Prefabricated Bedside Patient Units (PBPU) shall be One piece with construction and material as indicated for modular cover plate.
- D. Permanent, metal or plastic, identification plates shall be provided securely fastened at each inlet opening, with inscription for appropriate service using color coded letters and background. Metal plates shall have letters embossed on baked on enamel background. Color coding for identification plates is as follows:

SERVICE LABEL	IDENTIFICATION PLATE COLORS
MEDICAL VACUUM	Black letters on white background

2.10 VACUUM SWITCHES

- A. Vacuum switches shall be general purpose, contact or mercury type, allowing both high and low set points, with contact type provided with a protective dust cover. The vacuum switch shall have an adjustable range set by inside or outside adjustment. Vacuum switches shall activate when indicated by alarm requirements. One orifice nipple (or DISS demand check valve) shall be used for each sensor switch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All installation shall be performed in strict accordance with NFPA 99 5.1.10. Brazing procedures shall be as detailed in NFPA 99 5.1.10.5. Brazing shall be performed only by brazers qualified under NFPA 99 5.1.10.10.11. Where piping runs underground, the installation shall be made in accordance with NFPA 99 5.1.10.10.5.
- B. Cast escutcheon shall be installed with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
- C. Open ends of tube shall be capped or plugged at all times or otherwise sealed until final assembly.
- D. Piping shall be cut square and accurately with a tube cutter (sawing not permitted) to measurements determined at place of installation. the tubing shall be reamed to remove burrs, being careful not to expand tube, and so no chips of copper remain in the tube. The tubing shall be worked into place without springing or forcing. The tubing shall be bottomed in socket so there are no gaps between tube and fitting. Care shall be exercised in handling equipment and tools used in cutting or reaming of tube to prevent oil or grease from being introduced into the tubing. Where contamination has occurred, material shall be no longer suitable for vacuum service and new, sealed tube sections used..
- E. Piping shall be supported with pipe trays or hangers at intervals as shown on the drawings or as defined in NFPA 99 Table 5.1.10.10.4.5. Piping shall not be supported by other piping. Isolation of copper

piping from dissimilar metals shall be of a firm, positive nature. Duct tape is not acceptable as an isolation material..

- F. Valves and other equipment shall be rigidly supported to prevent strain on tube or joints.
- G. Piping exposed to physical damage shall be protected.
- H. During any brazing operation, the interior of the pipe shall be purged continuously with oil free, dry nitrogen NF, following the procedure in NFPA 99 5.1.10.5.5. At the completion of any section, all open pipe ends shall be capped using an EXTERNAL cap. The flow of purged gas shall be maintained until joint is cool to touch. The use of flux is prohibited when making of joints between copper to copper pipes and fittings.
- I. Threaded joints in piping systems shall be avoided whenever possible. Where unavoidable, make up the male threads with polytetrafluorofethylene (such as Teflon) tape. Liquid sealants shall not be used.
- J. Tubing shall not be bent. Fittings shall be used in all change of direction or angle.
- K. After installation of the piping, but before installation of the outlet valves, blow lines clear using nitrogen NF.
- L. Two 25 mm (1 inch) minimum conduits shall be provided from ceiling column assembly to the adjacent corridor, one for mass spectrometer tubing and wiring and one for monitor wiring, and for connection to signal cabling network.
- M. Pressure and vacuum switches, transmitter and gauges shall be installed to be easily accessed, and provide access panel where installed above plaster ceiling. Pressure switch and sensors shall be installed with orifice nipple between the pipe line and switches/sensors.
- N. Pipe labeling shall be applied during installation process and not after installation is completed. Size of legend letters shall be in accordance with ANSI A13.1.
- O. After initial leakage testing is completed, the piping shall be allowed to remain pressurized with testing gas until testing agency performs final tests.
- P. Penetrations:
 - 1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoked partitions, or floors, fire stopping shall be installed that provides an effective barrier against the spread of fire, smoke and

- gases as specified in Section 07 84 00, FIRESTOPPING, Clearances between raceways and openings with the fire stopping material shall be completely filled and sealed..
2. Water proofing: At floor penetrations, clearances shall be completely sealed around the pipe and made watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.
- Q. A vacuum gage 40mm (1 1/2 inch) diameter line shall be installed downstream of each zone valve in cabinets.
- R. Zone valves shall be provided in cabinets where indicated and outside each Operating Room and a minimum one zone valve assembly for each 18 outlets.
- S. Piping shall be labeled with name of service, identification color and direction of flow. Where non-standard pressures are piped, pressure shall be labeled. Labels shall be placed at least once every 20 feet of linear run or once in each story (whichever is more frequent). A label shall additionally be placed immediately on each side of all wall or floor penetrations. Pipe labels shall be self-adhesive vinyl type or other water resistant material with permanent adhesive colored in accordance with NFPA 99 Table 5.1.11 and shall be visible on all sides of the pipe. Each master alarm signal shall be labeled for function after ring out. Each zone valve shall be labeled and each area alarm labeled for the area of control or surveillance after test. Labels shall be permanent and of a type approved by the VAMC
- T. Alarms and valves shall be labeled for service and areas monitored or controlled. Coordinate with the VAMC for final room or area designations. Valves shall be labeled with name and identification color of the gas and direction of flow

3.2 INSTALLER TESTING

- A. Prior to declaring the lines ready for final verification, the installing contractor shall strictly follow the procedures for verification as described in NFPA 99 5.1.12.2 and attest in writing over the notarized signature of an officer of the installing company the following;
1. That all brazing was conducted by brazers qualified to ASSE 6010 and holding current medical gas endorsements.
 2. That all brazing was conducted with nitrogen purging. (Procedure per NFPA 99 5.1.10.5.5).

3. That the lines have been blown clear of any construction debris using oil free dry nitrogen or air are clean and ready for use. (Procedure per NFPA 99 5.1.12.2.2).
 4. That the assembled piping, prior to the installation of any devices, maintained a test pressure 1 1/2 times the standard pressures listed in NFPA 99 Table 5.1.11 without leaks. (Procedure per NFPA 99 5.1.12.2.3).
 5. That after installation of all devices, the pipeline was proven leak free for 24hours at a pressure 20% above the standard pressures listed in NFPA 99 Table 5.1.11. (Procedure per NFPA 99 5.1.12.2.2.6)
 6. That the systems have been checked for cross connections and none were found. (Procedure per NFPA 99 5.1.12.2.4)
 7. That the manufacturer has started up all medical air compressors, medical vacuum pumps WAGD producers, liquid oxygen system(s) and manifolds, and that they are in operating order.
- B. Four originals of the affidavit, shall be distributed; (1) to the resident engineer, (1) to the contracting officer representative, (1) to the general contractor and (1) to the verifier (www.mgpho.org).

3.3 VERIFIER TESTING

- A. Prior to handing over the systems to VAMC, the contractor shall retain a Verifier acceptable to the engineer and owner who shall follow strictly the procedures for verification as described in NFPA 99 5.1.12.3 and provide a written report and certificate bearing the notarized signature of an officer of the verification company which contains at least the following:
1. A current ACORD insurance certificate indicating professional liability coverage in the minimum amount of \$1 Million per occurrence, and general aggregate liability in the minimum amount of \$1 Million, valid and in force when the project is to be verified. General liability insurance is not alone acceptable.
 2. An affidavit bearing the notarized signature of an officer of the verification company stating that the verification company is not the supplier of any equipment used on this project or tested in this report and that the verification contractor has no relationship to, or pecuniary interest in, the manufacturer, seller, or installer of any equipment used on this project or tested in this report
 3. A listing of all tests performed, listing each source, outlet, valve and alarm included in the testing.

4. An assertion that all tests were performed by a Medical Vacuum System Certified Medical Gas or vacuum Verifier or by individuals qualified to perform the work and holding valid qualifications to ASSE 6030 and under the immediate supervision a Verifier. Include the names, credential numbers and expiration dates for all individuals working on the project.
5. A statement that equipment used was calibrated at least within the last six months by a method traceable to a National Bureau of Standard Reference and enclosing certificates or other evidence of such calibration(s). Where outside laboratories are used in lieu of on-site equipment, those laboratories shall be named and their original reports enclosed.
6. A statement that where and when needed, equipment was re calibrated during the verification process and describing the method(s) used.
7. A statement that the systems were tested and found to be free of debris to a procedure per NFPA 99 5.1.12.3.7.
8. The flow from each outlet when tested to a procedure per NFPA 99-5.1.12.3.10.
9. A statement that the systems were tested and found to have no cross-connections to a procedure per NFPA 99 5.1.12.3.3.
10. A statement that the systems were tested and found to be free of contaminants to a procedure per NFPA 99 5.1.12.3.8 except that the purity standard shall be 2 ppm difference for halogenated hydrocarbons and 1 ppm total hydrocarbons (as methane).
11. Statement that all local signals function as required under NFPA 99 5.1.3.4.7 and as per the relevant NFPA 99 sections relating to the sources.
12. A listing of local alarms, their function and activation per NFPA 99 5.1.12.3.14.
13. A listing of master alarms, their function and activation, including pressures for high and low alarms per NFPA 99 5.1.12.3.5.2.
14. A listing of area alarms, their function and activation pressures per NFPA 99 5.1.12.3.5.3.
15. A statement that the sources include all alarms required by NFPA 99 Table A.5.1.9.5.
16. The concentration of each component of NFPA 99 Table 5.1.12.3.12 in the medical air after 24hours of operation of the medical air source.

17. The concentration of each gas at each outlet as specified in NFPA 99 5.1.12.3.11.
 18. A statement that all valves and alarms are accurately labeled as to zone of control.
- B. Perform and document all cross connection tests, labeling verification, supply system operation, and valve and alarm operation tests as required by, and in accordance with, current NFPA and the procedures set forth in pre-qualification documentation.
 - C. Verify that the systems, as installed, meet or exceed the requirements of current NFPA, this specification, and that the systems operate as required.
 - D. Piping purge test: For each positive pressure gas system, verify cleanliness of piping system. Filter a minimum of 1000 liters (35 cubic feet) of gas through a clean white 0.45 micron filter at a minimum velocity of 100 mps (3.5 fpm). Filter shall show no discoloration, and shall accrue no more than 0.1 mg of matter. Test each zone at the outlet most remote from the source. Perform test with the use of an inert gas as described in CGA P-9.
 - E. Inlet flow test:
 1. Test all inlets for flow. Perform test with the use of an inert gas as described in CGA P-9.
 2. Needle valve vacuum inlets must draw no less than 1.0 scfm with adjacent inlet flowing, at a dynamic inlet pressure of 40kPa (12-inches Hg), and a static vacuum of 10kPa (15-inches Hg)
 3. Vacuum inlets must draw no less than 85 Lpm (3.0 scfm) with adjacent inlet flowing, at a dynamic inlet pressure of 40 kPa (12-inches Hg), and a static vacuum of 50 kPa (15-inches Hg).
 4. Anesthesia evacuation inlets must draw no less than 1 L/mm (1.0 scfm) at a dynamic inlet pressure of 40 kPa (12-inches Hg), and a static vacuum of 50 kPa (15-inches Hg).

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**SECTION 22 63 00
GAS SYSTEMS FOR HEALTHCARE FACILITIES**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Central Laboratory and Healthcare Gas Systems: Consisting of oxygen and compressed air services; complete, ready for operation, including all necessary piping, fittings, valves, cabinets, station outlets, rough-ins, ceiling services, gages, alarms including low voltage wiring, cylinder manifolds, and all necessary parts, accessories, connections and equipment. Match existing station outlet and inlet terminal connections.
- B. Laboratory and healthcare gas system alarm wiring from equipment to alarm panels.

1.2 RELATED WORK

- A. Sealing around pipe penetrations to maintain the integrity of time rated construction: Section 07 84 00, FIRESTOPPING.
- B. Sealing around pipe penetrations through the floor to prevent moisture migration: Section 07 92 00, JOINT SEALANTS.
- C. General requirements and items common to more than one section of Division 22. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- D. Alarm interface with ECC. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
- E. Conduit: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.
- F. Control wiring: Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).
- G. Electrical wiring and accessories: Section 26 27 26, WIRING DEVICES.
- H. Prefabricated bedside patient units: Section 10 25 13, PATIENT BED SERVICE WALLS.
- I. Vacuum Piping and Equipment: SECTION 22 62 00, VACUUM SYSTEMS FOR HEALTHCARE FACILITIES
- J. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.
Requirements for commissioning, systems readiness checklist, and training.

1.3 QUALITY ASSURANCE

- A. Materials and Installation: In accordance with NFPA 99, (2005) and as specified.
- B. Equipment Installer: Show technical qualifications and previous experience in installing laboratory and healthcare equipment on three similar projects. Submit names and addresses of referenced projects. Installers shall meet the qualifications of ANSI/ASSE Standard 6010.

- C. Equipment Supplier: Show evidence of equivalent product installed at three installations similar to this project that has been in satisfactory and efficient operation for three years. Submit names and addresses where the product is installed.
- D. Laboratory and healthcare System Testing Organization: The testing shall be conducted by a party technically competent and experienced in the field of laboratory and healthcare pipeline testing. Testing and systems verification shall be performed by personnel meeting the qualifications of ANSI/ASSE Standard 6030. Such testing shall be performed by a party other than the installing contractor.
- E. Provide names of three projects where testing of medical or laboratory gases systems has been performed by the testing agency. Include the name of the project, names of such persons at that project who supervised the work for the project owner, or who accepted the report for the project owner, and a written statement that the projects listed required work of similar scope to that set forth in this specification.
- F. Submit the testing agency's detailed procedure which will be followed in the testing of this project. Include details of the testing sequence, procedures for cross connection tests, outlet function tests, alarm tests, purity tests, etc., as required by this specification. For purity test procedures, include data on test methods, types of equipment to be used, calibration sources and method references.
- G. Certification: Provide documentation prior to submitting request for final inspection to include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits allowed by this specification.
- H. Installing contractor shall maintain as-built drawings of each completed phases for verification; and, shall provide the complete set at the time of final systems certification testing, for certification by the Third Party Testing Company. As-built drawings shall be provided on prints and in digital format. The digital format shall be in the native CAD system required for the project design. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- I. "Hot taps" are not permitted for operating medical oxygen systems. Methods for connection and extension of active and pressurized medical gas systems without subsequent medical gas testing and verification are not allowed.

1.4 SUBMITTALS

- A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Piping.
 - 2. Valves.
 - 3. Inlet and outlet cocks
 - 4. Valve cabinets.
 - 5. Gages.
 - 6. Station outlets and rough-in assemblies.
 - 7. Ceiling services.
 - 8. Alarm controls and panels.
 - 9. Pressure Switches.
- C. Station Outlets: Submit letter from manufacturer stating that outlets are designed and manufactured to comply with NFPA 99. Outlet shall bear label of approval as an assembly, of Underwriters Laboratories, Inc., or Associated Factory Mutual Research Corporation. In lieu of above labels, certificate may be submitted by a nationally recognized independent testing laboratory, satisfactory to the Contracting Officer, certifying that materials, appliances and assemblies conform to published standards, including methods of tests, of above organizations.
- D. Certification: The completed systems have been installed, tested, purged, analyzed and verified in accordance with the requirements of this specification.
- E. Completed System Readiness Checklist provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion, in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

1.5 TRAINING

- A. Furnish the services of a competent instructor for not less than two four-hour periods for instructing personnel in the operation and maintenance of the laboratory and healthcare gas systems, on the dates requested by COTR.
- B. Coordinate with other requirements specified in Section 01 00 00, GENERAL REQUIREMENTS.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the test by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
B819-(R2006).....Seamless Copper Tube for Medical Gas Systems

- C. American Society of Mechanical Engineers (ASME):
 - A13.1-07.....Scheme for Identification of Piping Systems
 - B16.22-01(R2005).....Wrought Copper and Bronze Solder-Joint Pressure Fittings
 - B40.100 (2005)Pressure Gauges and Gauge Attachments Boiler and Pressure Vessel Code -
Section VIII-07.....Pressure Vessels, Division I
 - Section IX-07.....Welding and Brazing Qualifications
- D. American Welding Society (AWS):
 - AWS A5.8-04.....Brazing Filler Metal
 - AWS B2.2-91.....Standard for Brazing Procedure and Performance Qualification (Modified per NFPA 99)
- E. Compressed Gas Association (CGA):
 - C-9-04.....Standard Color Marking of Compressed Gas Cylinders
 - G-4.1 (2009).....Cleaning Equipment for Oxygen Service
 - G-10.1(2008)Nitrogen, Commodity
 - P-9-01.....Inert Gases Argon, Nitrogen and Helium
 - V-1-05.....Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections
- F. National Electrical Manufacturers Association (NEMA):
 - ICS-6-93(R2006).....Industrial Controls and Systems Enclosures
- G. National Fire Protection Association (NFPA):
 - 99-05.....Health Care Facilities
- H. United States Pharmacopoeia XXI/National Formulary XVI (USP/NF)
- I. Manufacturing Standardization Society (MSS):
 - MSS-SP-72-99.....Ball Valves With Flanged or Butt Welding For General Purpose
 - MSS-SP-110-96.....Ball Valve Threaded, Socket Welding, Solder Joint, Grooved and Flared Ends
 - MSS-SP-73-03.....Brazing Joints for Copper and Copper Alloy Solder Pressure Fittings

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

- A. Copper Tubing: Type "K", ASTM B819, seamless copper tube, hard drawn temper, with wrought copper fittings conforming to ASME B16.22 or brazing fittings complying with MSS SP-73. Size designated reflecting nominal inside diameter. All tubing and fittings shall be labeled "ACR/OXY", "OXY", "OXY/MED", "ACR/MED", or "MED".

- B. Brazing Alloy: AWS A5.8, Classification BCuP, greater than 537 °C (1000 °F) melting temperature. Flux is strictly prohibited for copper-to-copper connections.
- C. Screw Joints: Polytetrafluoroethylene (teflon) tape.
- D. Memory metal couplings: Temperature and pressure rating shall not be less than that of a brazed joint.
- E. Apply piping identification labels at the time of installation in accordance with current NFPA. Apply supplementary color identification in accordance with CGA Pamphlet C-9.
- F. Special Fittings: The following special fittings shall be permitted to be used in lieu of brazed joints:
 - 1. Memory-metal couplings having temperature and pressure ratings joints not less than that of a brazed joint.
 - 2. Listed or approved metallic gas tube fittings that, when made up, provide a permanent joint having the mechanical, thermal, and sealing integrity of a brazed joint.
 - 3. Dielectric fittings where required by the manufacturer of special medical equipment to electrically isolate the equipment from the piping distribution system.
 - 4. Axially swaged, elastic strain preload fittings providing metal to metal seal having pressure and temperature ratings not less than that of a brazed joint and when complete are permanent and non-separable.

2.2 EXPOSED LABORATORY AND HEALTHCARE GASES PIPING

- A. Finished Room: Use full iron pipe size chrome plated brass piping for exposed laboratory and healthcare gas piping connecting fixtures, casework, cabinets, equipment and reagent racks when not concealed by apron including those furnished by the Government or specified in other sections.
 - 1. Pipe: Fed. Spec. WW-P-351, standard weight.
 - 2. Fittings: ASME B16.15 cast bronze threaded fittings with chrome finish, (125 and 250 PS1 Classes).
 - 3. Nipples: ASTM B 687, Chromium-plated.
 - 4. Unions: Mss SP-72, SP-110, Brass or Bronze with chrome finish. Unions 65 mm (2-1/2 inches) and larger shall be flange type with approved gaskets.
 - 5. Valves: Mss SP-72, SP-110, Brass or bronze with chrome finish.

2.3 VALVES

- A. Ball: In-line, other than zone valves in cabinets:
 - 1. Seventy five millimeter (2 1/2 inches) and smaller: Bronze/ brass body, Fed. Spec. MSS SP72 & SP 110 , Type II, Class 150, Style 1,

with tubing extensions for brazed connections, full port, three-piece or double union end connections, teflon seat seals, full flow, 4125 kPa (600 psi) WOG minimum working pressure, with locking type handle, cleaned for oxygen use and labeled for intended service

B. Check:

1. Eighty millimeter (3 inches) and smaller: Bronze/brass body, straight through design for minimum pressure drop, spring loaded, self-aligning with teflon cone seat, vibration free, silent operation, supplied NPT female threads at each end with flow direction arrow permanently cast into, cleaned for oxygen use and labeled for intended service, 2750 kPa (400 psi) WOG minimum working pressure.
2. One hundred millimeter (4 inches) and larger: Iron body, bronze trim, swing type, vertical or horizontal installation, flange connection, with flow direction arrow permanently cast into, cleaned for oxygen use and labeled for intended service, 1025 kPa (150 psi) WSP.

C. Zone Valve in Cabinet: Ball valve, bronze/ brass body, double seal, three piece or double union end connections, replaceable teflon seat seals, teflon stem seal, 4125 kPa (600 psi) WOG, cold, non-shock gas working pressure service to 100 kPa (29 inch Hg), cleaned for oxygen use and labeled for intended service, blowout proof stem, one quarter turn of handle to completely open or close. Provide tubing extensions factory brazed, and pressure tested. Provide 3 mm (1/8 inch) NPT gauge port for a 50mm (2 inch) diameter monitoring gauge downstream of the shut off valve. Zone valves shall be securely attached to the cabinet and provided with type-K copper tube extensions for making connection to system piping outside the cabinet. Zone valves shall be products of one manufacturer, and uniform throughout in pattern, overall size and appearance. Trim with color coded plastic inserts or color coded stick-on labels. Install valves in cabinets such that cover window cannot be in place when any valve is in the closed position. Color coding for identification plates and labels is as follows:

SERVICE LABEL	IDENTIFICATION COLORS	MFG. STD. CLR.
OXYGEN	White letters on green background	GREEN
MEDICAL AIR	Black or white letters on yellow background	YELLOW

2.4 VALVE CABINETS

- A. Flush mounted commercially available item for use with laboratory and healthcare services, not lighter than 1.3 mm (18 gage) steel or 1.9 mm (14 gage) extruded aluminum, rigidly assembled, of adequate size to accommodate valve(s) and fittings. Punch or drill sides to receive tubing. Provide anchors to secure cabinet to wall construction. Seal openings in cabinet to be dust tight. Locate bottom of cabinet 1375 mm (4 foot 6 inches) above floor.
- B. Mount engraved rigid plastic identification plate on wall above or adjacent to cabinet. Color code identification plate to match gas identification colors as indicated above. Identification plate must be clearly visible at all times. Provide inscriptions on plate to read in substance: "VALVE CONTROL SUPPLY TO ROOMS."
- C. Cover plate: Fabricate from 1.3 mm (18 gage) sheet metal with satin chromed finish, extruded anodized aluminum, or .85 mm (22 gage) stainless steel. Provide cover window of replaceable plastic, with a corrosion resistant device or lever secured to window for emergency window removal. Permanently paint or stencil on window: CAUTION-CLOSE ONLY IN EMERGENCY, SHUT-OFF VALVES FOR PIPED GASES", or equivalent wording. Configure such that it is not possible to install window with any valve in the closed position. Each valve shall have gauge upstream of valve inside valve box.
- D. Cabinets and isolation valves shall be located and piped as shown, and at a minimum, so as to allow the isolation of each smoke compartment separately. No cabinet shall serve more than one smoke compartment.

2.5 GAGES

- A. Pressure Gages: Includes gages temporarily supplied for testing purposes.
 - 1. For line pressure use adjacent to source equipment: ASME B40.1, pressure gage, single, size 115 mm (4-1/2 inches), for compressed air, nitrogen and oxygen, accurate to within two percent, with metal case. Range shall be two times operating pressure. Dial graduations and figures shall be black on a white background, or white on a black background. Gage shall be cleaned for oxygen use, labeled for appropriate service, and marked "USE NO OIL". Install with gage cock.
 - 2. For all services downstream of main shutoff valve: Manufactured for oxygen use, labeled for the appropriate service and marked "USE NO OIL", 40 mm (1-1/2 inch) diameter gage with dial range 1-690 kPa (1-100 psi) for air service, and 1-690 kPa (1-100 psi) for oxygen service.

2.6 STATION OUTLETS

- A. For all services except ceiling hose drops: For designated service, consisting of a quick coupler and inlet supply tube. Provide coupler that is non-interchangeable with other services, and leak proof under three times the normal working pressure. Equip each station outlet with an automatic valve and a secondary check valve to conform with NFPA 99. Equip each station inlet with an automatic valve to conform with NFPA 99. Place valves in the assembly to provide easy access after installation for servicing and replacement, and to facilitate line blow-out, purging, and testing. Fasten each outlet and inlet securely to rough-in to prevent floating and provide each with a capped stub length of 6 mm (1/4-inch) (10 mm outside diameter) (3/8-inch outside diameter) tubing for connection to supply. Identification of each gas service shall be permanently cast into the back plate and shall be visible through a transparent plastic guard. Label stub tubing for appropriate service. Rough-in kits and test plugs for Prefabricated Bedside Patient Units (PBPU) are furnished under this specification but installed by manufacturer of PBPU before initial test specified herein. Install completion kits (valve body and face plate) for the remainder of required tests.

2.7 STATION OUTLETS

- A. For all services: Brass, stainless steel or chromed metal non-interchangeable DISS connections for appropriate service to conform with CGA V-5. Equip each station outlet with an automatic valve and a secondary check valve to conform with NFPA 99. Equip each station inlet with an automatic valve to conform with NFPA 99. Place valves in the assembly to provide easy access after installation, for servicing and replacement, and to facilitate line blow-out, purging, and testing. Fasten each outlet securely to outlet rough-in to prevent floating, and provide each outlet with a capped stub length of 6 mm (1/4-inch) (10 mm (3/8-inch) outside diameter) tubing for connection to supply. Label stub tubing for appropriate service. Adjustable to compensate for variations in plaster or cover thickness. Rough-in kits and test plugs for Prefabricated Bedside Patient Units (PBPU) are furnished under this specification but installed by manufacturer of PBPU before initial tests specified herein. Install outlet completion kits (valve body and face plate) for the remainder of required tests.

2.8 STATION OUTLET ROUGH-IN

- A. Flush mounted, protected against corrosion. Anchor rough-in securely to unit or wall construction.

- B. Modular Cover Plate: Die cast back plate, two-piece .85 mm (22 gage) stainless steel or 1.6 mm (16 gage) chromium plated metal, with mounting flanges on all four sides, secured to rough-in with stainless steel or chromium plated countersunk screws.
- C. Cover Plate for Prefabricated Bedside Patient Units (PBPU): One-piece with construction and material as indicated for modular cover plate.
- D. Provide permanent, metal or plastic, identification plates securely fastened at each outlet and inlet opening, with inscription for appropriate service using color coded letters and background. Metal plates shall have letters embossed on baked-on enamel background. Color coding for identification plates is as follows:

SERVICE LABEL	IDENTIFICATION PLATE COLORS
OXYGEN	White letters on green background
MEDICAL AIR	Black or white letters on yellow

2.9 ALARMS

- A. Provide all low voltage control wiring, except for wiring from alarm relay interface control cabinet to ECC, required for complete, proper functioning system, in conformance with Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW). Run wiring in conduit, in conformance with Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.
- B. Local Alarm Functions: Provide individual local air compressor malfunction alarms at each compressor system main control panel.
 - 1. Compressor Malfunction Alarm: Each compressor system receiving any of the following individual signals and sends a single combined "compressor malfunction alarm" signal to master alarm panel.
 - a. Thermal Malfunction Alarm: Functions when discharge air temperature exceeds 177 °C (350 °F), shutting down affected compressor.
 - b. Lead Compressor Fails to Start: Functions when lead compressor fails to start when actuated, causing lag pump to start.
 - c. Lag Compressor in Use: Functions when the primary or lead compressor is incapable of satisfying the demand. When three or more compressors are part of the system, the lag compressor in use alarm shall energize when the last compressor has been signaled to start.
 - d. High Water Level in Receiver. (Liquid ring or water-cooled units)
 - e. High Water Level in Separator (if so required). (Liquid ring unit)

2. Desiccant Air Dryer Malfunction Alarm: Dryer receives the following individual signals and sends a single consolidated dryer malfunction alarm signal to master alarm panel.
 - a. Dew Point Alarm: Functions when line pressure dew point rises above 4 °C (39 °F) at 380 kPa (55 psi).
 3. Vacuum Pump Malfunction Alarm: Pump system receives the following individual signals and sends a single consolidated pump malfunction alarm signal to master alarm.
 - a. High Temperature Shut down Alarm: Functions when exhaust air temperature exceeds 104 °C (220 °F), shutting down affected pump.
 - b. Lead Pump Fails to Start Alarm: Functions when lead pump fails to start when actuated causing lag pump to start.
 - c. Lag Pump In Use Alarm: Functions when the primary or lead vacuum pump is incapable of satisfying the demand. When three or more vacuum pumps are part of the system, the lag pump in use alarm shall energize when the last vacuum pump has been signaled to start.
- C. Master Alarm Functions: Provide the following individual alarms at the master alarm panel.
1. Oxygen Alarms:
 - a. Liquid oxygen low level alarm: Functions when stored liquid oxygen reaches a predetermined minimum level.
 - b. Reserve switchover alarm: Functions when, or just before, reserve oxygen supply goes in operation.
 - c. Reserve low supply alarm: Functions when contents of cylinder reserve oxygen supply are reduced to one day's average supply; switch and contacts at the bulk tank control panel.
 - d. Reserve low pressure alarm: Functions when the gas pressure available in the liquid reserve oxygen supply is reduced below the pressure required to function properly.
 - e. Low pressure alarm: Functions when system pressure downstream of the main shutoff valve drops below 275 kPa (40 psi), plus/minus 14 kPa (2 psi); operated by pressure switch or transmitters.
 - f. High pressure alarm: functions when system pressure downstream of main shutoff valve increases above 415 kPa (60 psi), plus/minus 14 kPa (2 psi) set points; operated by pressure switches or transmitters.
 - g. Cylinder reserve pressure low: Functions when the content of a cylinder reserve header is reduced below one day's average supply.

2. Compressed Air Alarms:

- a. Medical air dew point high alarm: Functions when the line pressure dew point rises above 2 °C (35 °F) at 380 kPa (55 psi).
- b. Carbon Monoxide Alarm: Functions when the carbon monoxide levels rise above 10 parts per million; receives signal from the carbon monoxide monitor.
- c. Main Bank Filter Set Alarm: Functions when the pressure drop across filter set increases more than 14 kPa (2 psi) over that when filters are clean and new; operates by differential pressure switch or transmitters.
- d. Desiccant Prefilter Alarm: Functions when pressure across the filter increases more than 21 kPa (3 psi) over that when filters are clean and new; operates by pressure differential switch.
- e. Desiccant Post Filter Alarm: Functions when pressure drop across filter increases more than 21 kPa (3 psi) over that when filters are clean and new; operates by pressure differential switch.
- f. Desiccant Dryer Malfunction Alarm: Functions on any combination of failure of tower cycling and/or pressure dew point rise above 60 °C at 690 kPa (140 °F at 100 psi).
- g. Aftercooler High temperature Alarm: Functions when aftercooler discharge air temperature exceeds 38 °C (100 °F).
- h. Pressure Abnormal Alarm: Functions when system pressure downstream of main shutoff valve drops below 550 kPa (80 psi) (plus/minus gage or increases above 830 kPa (120 psi) (plus/minus 14 kPa (2 psi) set points; operated by pressure switch.
- i. Compressor Malfunction Alarm: Functions when compressor system control panel signals compressor thermal malfunction alarm, lead compressor fails to start alarm or high water level in receiver or separator (if so required) receives signal from system control panel.
- j. Low Lubricant Shutdown: For rotary screw compressors. Functions when lubricant level drops to a low point. Receives signal from compressor control panel.
- k. Instrument air dew point high alarm: Functions when the line pressure dew point rises above -30 °C (-22 °F) at 380 kPa (55 psi).

D. Alarm Functions:

1. Oxygen, nitrous oxide, carbon dioxide and compressed air alarms:
 Pressure alarms: Functions when pressure in branch drops below 275 kPa (40 psi), plus/minus 14 kPa (2 psi) or increases above 414 kPa

(60 psi), plus/minus 14 kPa (2 psi) set points; operated by pressure switches or transmitters.

2. Vacuum alarms: Low vacuum alarm: Functions when vacuum in branch drops below 40 kPa (12-inches Hg); operated by vacuum switch.
3. Vacuum alarms:
 - a. Low vacuum alarm: Function when system vacuum upstream of main shutoff valve drops below 40 kPa (12 inches Hg); operated by vacuum switch.
 - b. Filter differential pressure/back pressure alarm: Functions when discharge oil filter differential rises to set level, or when back pressure is sensed; receives signal from pump control panel.
 - c. Laboratory vacuum pump malfunction.
4. Waste Anesthetic Gas Disposal (WASG) low alarm: Functions when WAGD vacuum level or flow is below effective operating limits.

E. Alarm Panels:

1. General: Modular design, easily serviced and maintained; alarms operate on alternative current low voltage control circuit; provide required number of transformers for efficient functioning of complete system. Alarm panels shall be integral units, reporting oxygen, compressed air and vacuum services, as required.
2. Box: Flush mounted, sectional or one piece, corrosion protected. Size to accommodate required number of service functions for each location, and for one audible signal in each box. Anchor box securely. Provide spare capacity to accommodate 50% of the number of provided alarm points.
3. Cover plate: Designed to accommodate required number of signals, visual and audible, for each location, and containing adequate operating instructions within the operator's view. Bezel shall be extruded aluminum, chromium plated metal, or plastic. Secure to the box with chromium plated or stainless steel countersunk screws.
4. Service indicator lights: Red translucent plastic or LED with proper service identification inscribed thereon. Number of lights and service instruction shall be as required for each location. Provide each panel with a green test button of the same material, inscribed with "PUSH TO TEST" or similar message.
5. Audible signal: Provide one in each alarm panel and connect electrically with all service indicator light functions.
6. Controls:
 - a. Visual signal: When the condition occurs which any individual service indicator light is to report, button for particular

service shall give a lighted visual signal which cannot be canceled until such condition is corrected.

- b. Audible signal: Alarm shall give an audible signal upon circuit energization of any visual signal. Audible signal shall be continuous until silenced by pushing a button. This shall cancel and reset audible only, and not affect the visual signal. After silencing, subsequent alarms shall reactivate the audible alarm.
 - c. Signal tester: Test button or separate normal light shall be continuously lighted to indicate electrical circuit serving each individual alarm is energized. Pushing test button shall temporarily activate all visual signals and sound audible signal, thereby providing desired indications of status of system.
- F. Alarm Relay Interface Control Cabinet: Design cabinet to transfer the closed circuit alarm signals through relays to a set of terminals for monitoring signals at the ECC without interrupting the closed circuit system. Construct of 1.9 mm (14 gage) steel, conforming with NEMA ICS-6, Type 1, enclosures. Provide both normally open and normally closed contacts for output signals, with number of circuits required for full alarm capability at the ECC. Refer to Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC for compatibility.

2.10 PRESSURE SWITCHES

- A. General purpose, contact or mercury type, allowing both high and low pressure set points, with contact type provided with a protective dust cover; adjustable range set by inside or outside adjustment; switches activate when indicated by alarm requirements. Use one orifice nipple (or DISS demand check valve) for each sensor or pressure switch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. In accordance with current NFPA. Run buried oxygen piping in PVC protective pipe for entire length including enclosure of fittings and changes of direction.
- B. Install cast escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
- C. Keep open ends of tube capped or plugged at all times or otherwise sealed until final assembly.
- D. Cut piping square and accurately with a tube cutter (sawing not permitted) to measurements determined at place of installation. Ream tube to remove burrs, being careful not to expand tube, and so no chips of copper remain in the tube. Work into place without springing or

forcing. Bottom tube in socket so there are no gaps between tube and fitting. Exercise care in handling equipment and tools used in cutting or reaming of tube to prevent oil or grease being introduced into tubing. Where contamination has occurred, material is no longer suitable for oxygen service.

- E. Spacing of hangers: Current NFPA.
- F. Rigidly support valves and other equipment to prevent strain on tube or joints.
- G. While being brazed, joints shall be continuously purged with *oil* free nitrogen. The flow of purged gas shall be maintained until joint is cool to touch.
- H. Do not bend tubing. Use fittings.
- I. Provide two 25 mm (1 inch) minimum conduits from ceiling column assembly to adjacent corridor, one for mass spectrometer tubing and wiring and one for monitor wiring, for connection to signal cabling network.
- J. Install pressure switches, transmitter and gauges to be easily accessed, and provide access panel where installed above plaster ceiling. Install pressure switch and sensors with orifice nipple between the pipe line and switches/sensors.
- K. Apply pipe labeling during installation process and not after installation is completed. Size of legend letters shall be in accordance with ANSI A13.1.
- L. After initial leakage testing is completed, allow piping to remain pressurized with testing gas until testing agency performs final tests.
- M. Penetrations:
 - 1. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoked partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING, with intumescent materials only. Completely fill and seal clearances between raceways and openings with the fire stopping material.
 - 2. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.
- N. Provide 40mm (1 1/2 inch) diameter line pressure gage downstream of zone valve in cabinets.
- O. Provide zone valves in cabinets where indicated and outside each Operating Room and a minimum one zone valve assembly for each 18 outlet set.

3.2 TESTS

- A. Initial Tests: Blow down, and high and low pressure leakage tests as required by current NFPA with documentation.
- B. Laboratory and healthcare testing agency shall perform the following:
 - 1. Perform and document all cross connection tests, labeling verification, supply system operation, and valve and alarm operation tests as required by, and in accordance with, current NFPA and the procedures set forth in pre-qualification documentation.
 - 2. Verify that the systems, as installed, meet or exceed the requirements of current NFPA, this specification, and that the systems operate as required.
 - 3. Piping purge test: For each positive pressure gas system, verify cleanliness of piping system. Filter a minimum of 35 cubic feet (1000 liters) of gas through a clean white 0.45 micron filter at a minimum velocity of 3.5 scfm (100 Lpm). Filter shall show no discoloration, and shall accrue no more than 0.1 mg of matter. Test each zone at the outlet most remote from the source. Perform test with the use of an inert gas as described in CGA P-9.
 - 4. Piping purity test: For each positive pressure system, verify purity of piping system. Test each zone at the most remote outlet for dew point, carbon monoxide, total hydrocarbons (as methane), and halogenated hydrocarbons, and compare with source gas. The two tests must in no case exceed variation as specified in Paragraph, Maximum Allowable Variation. Perform test with the use of an inert gas as described in CGA P-9.
 - 5. Outlet and inlet flow test:
 - a. Test all outlets for flow. Perform test with the use of an inert gas as described in CGA P-9.
 - b. Oxygen and air outlets must deliver 100 Lpm (3.5 scfm) with a pressure drop of no more than 35 kPa (5 psi), and static pressure of 350 kPa (50 psi).
 - c. Needle valve air outlets must deliver 1.5 scfm with a pressure drop of no more than five psi, and static pressure of 350 kPa (50 psi).
 - 6. Source Contamination Test: Analyze each pressure gas source for concentration of contaminants, by volume. Take samples for air system test at the intake and at a point immediately downstream of the final filter outlet. The compared tests must in no case exceed variation as specified in Paragraph, Maximum Allowable Variation. Allowable concentrations are below the following:

Dew point, air	4 degrees C (39 degrees F) pressure dew point at 690 kPa (100 psi)
Carbon monoxide, air	10 mg/L (ppm)
Carbon dioxide, air	500 mg/L (ppm)
Gaseous hydrocarbons as methane, air	25 mg/L (ppm)
Halogenated hydrocarbons, air	2 mg/L (ppm)

7. Analysis Test:

- a. Analyze each pressure gas source and outlet for concentration of gas, by volume.
- b. Make analysis with instruments designed to measure the specific gas dispensed.
- c. Allowable concentrations are within the following:

Oxygen	>=97 plus percent oxygen
Medical air	19.5 percent to 23.5 percent oxygen
Carbon Dioxide	99 plus percent carbon dioxide

8. Maximum Allowable Variation: Between comparative test results required are as follows:

Dew point	2 degrees C (36 degrees F)
Carbon monoxide	2 mg/L (ppm)
Total hydrocarbons as methane	1 mg/L (ppm)
Halogenated hydrocarbons	2 mg/L (ppm)

C. The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior to notice.

3.3 COMMISSIONING

A. Provide commissioning documentation accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS for all inspection, startup, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.

- B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

3.4 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for four hours to instruct VA Personnel in operation and maintenance of units.
- B. Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

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