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optimus
ARCHITECTURE

Vassar Brothers Medical Center

Linear Accelerator Replacement

45 Reade Pl
Poughkeepsie, NY 12601

Project Manual For Construction

Optimus Architecture
Rhinebeck, New York
845 876 8202
845 876 8112 FAX
Date: December 3, 2020

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SECTION 00100
INFORMATION TO BIDDERS

1. **INVITATION TO BID**
   A. Nuvance invites bids from contractors for work in connection with the following project:

      Nuvance, Vassar Brothers Medical Center
      Linear Accelerator Replacement
      45 Reade Place
      Poughkeepsie, NY 12601

   B. This project includes approximately 600 square feet of selective interior demolition and renovation located in the existing radiology/oncology suite on the second floor of Vassar Brothers Medical Center at 45 Reade Place, Poughkeepsie. The existing building is of non-combustible construction (Type I-B). The adjacent (west-most) linear accelerator vault and control room will remain in use during construction. The east-most linear accelerator vault will be renovated as required to accept the new linear accelerator. The project encompasses general construction and MEP work.

      The work in the existing linear accelerator room and control room is a gut renovation with select items to remain in place (i.e. HDR after loader provisions, etc). The Contractor shall provide all labor and materials as required to build-out the space to accommodate the new linear accelerator and update the area in accordance with the construction documents. This work includes, but is not limited to, establishing the adjusted layout, providing new gypsum board systems, new ceiling systems, new finishes, new frames and doors, new casework, new accessories, new plumbing fixtures, new light fixtures, new lead shielding and new MEP systems as shown in the accompanying documents. Work will be required on the floor below for the new MEP work. All work to be performed on the First Floor (in the Mechanical Equipment Room) shall be scheduled with and approved by the Owner and the VBMC facilities department. The Contractor shall coordinate and schedule all disturbances outside of the linear accelerator vault area with the Owner. The adjacent areas are occupied and will remain in use during construction. The Contractor shall minimize construction noise and disturbances during the primary hours of operation for adjacent areas.

      The Contractor shall note that some scope of the work may require premium-time / off-hour work. Compliance with the Hospital's Infection Control Policies and Procedures shall be closely observed and implemented.

   C. The Owner reserves the right to reject any and all bids.

2. **PROPOSAL**
   A. Proposals shall be submitted on the forms provided by the Architect. All blank spaces for the Base Bid, Allowance and Alternate prices where applicable shall be filled in.

   B. Each bidder shall include in his proposal all applicable fees and taxes, including Permit Fees and unless otherwise stipulated. The Owner shall obtain and pay for the Building Permit.

   C. Bids having unfilled blanks in any part of the proposal may be rejected by the Owner.

   D. Each bidder shall include with his proposal an insurance form (Acord Form #25) valid for the liabilities as noted on the attached sample, or as determined by the Owner.

E. A list of names of the Sub-contractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for such portions of the Work as may be designated in the Bidding Documents or, if no portions are so designated, the names of Sub-contractors proposed for the principal portions of the Work. The Contractor shall be required to establish to the satisfaction of the Owner the reliability and responsibility of the proposed Sub-contractors to furnish and perform the Work described in the Sections of the Specifications pertaining to such proposed Sub-contractors respective trades. The list of Sub-Contractors shall be provided on forms as provided by the Owner with these specifications.

3. **CONDITIONS OF WORK**

A. Each bidder shall inform himself fully of the conditions relating to the construction and labor under which the work is now being or will be performed. Failure to do so will not relieve a successful bidder of his obligation to furnish all material and labor necessary to carry out the provisions of the Contract Documents and to complete the contemplated work for the consideration set forth in his bid.

B. Each contractor, in the carrying out of his work, shall employ such methods or means as will not cause any interruptions or interference with the work of any other contractor, nor will endanger the health or safety of any persons on the premises.

C. All Work within adjacent areas/suites to remain in operation while work is performed will require off-hour work / premium time. Off hours time shall be as established by the Owner. Required Work outside of this schedule shall be reviewed with and approved by the Owner at least two (2) weeks in advance. Work outside of the Linear Accelerator Vault that affects or disrupts the daily operation of the adjacent areas shall be performed as off-hour Work. Contractor will be responsible for daily cleaning and final cleaning before the space is returned to the Owner for his use at the expired time.

D. This work is open shop there are no prevailing wage or union requirements.

E. Electrical Rough-In: The General Contractor shall be required to review all rough-in electrical boxes with the Owner prior to running cable. The Contractor shall obtain a written sign off that device boxes are acceptable prior to proceeding.

4. **WORK BY OTHERS**

A. The following work shall be performed at the project by other contractors requiring scheduling, coordination and cooperation by the General Contractor and his Sub-Contractors as follows:

1) **Telephone:** The Owner shall arrange for a Telephone Contractor to distribute phone service to each location. The Contractor shall coordinate his work with the Telephone Contractor and maintain access for all required wiring.

2) **Computer:** The Owner shall arrange for a Computer Contractor and/or his internal IT Department to design and install a computer network. The Contractor shall coordinate his work with the Computer Contractor/ IT Department and maintain access for all required wiring.

3) **Signage:** The Owner shall arrange for all new individual room signage as necessary. The Contractor shall coordinate his work with the signage contractor.

4) **Medical Equipment:** The Owner will contract with an equipment vendor for the purchase and installation of the medical equipment and accessory equipment. The Owner's Equipment Vendord shall be responsible for delivery and placement of the equipment into final position. The

General Contractor shall coordinate and schedule his work with the Owner's Equipment Vendors. An Equipment Installation Specialist shall be identified by the Owner. Refer to Specification Section 01041 - Project Coordination for additional requirements.

5) **Scheduling and Additional Work:** The General Contractor shall provide within two weeks of award of contract a project schedule for the Owner to use with his service contractors for installing their work, to avoid project delays and additional work. The Contractor shall be responsible for determining the appropriate lead and notification time required for each Owner contractor / vendor. The Contractor shall also be responsible for keeping the Architect and Owner informed of the Owner's contractors' progress as it impacts the Contractor's work, schedule and completion, with sufficient notification to allow the Owner time to expedite his contractors to keep them within schedule.

5. **CONTRACT**
   A. The Contract between the Contractor and the Owner shall include the following and shall be prepared by the Contractor:
      1) Contract: AIA Document A101, Standard Form of Agreement Between Owner and Contractor.
      2) General Conditions: AIA Document A201, General Conditions of the Contract for Construction.
      3) All documents referred to in the Contract and General Conditions as being part of the Contract.

6. **DEFINITIONS**
   A. All definitions set forth in the General Conditions and Supplementary General Conditions are applicable to these instructions to bidders.

   B. Bidding Documents include the Information for Bidders, the Bid Form and the proposed Contract Documents including any Addenda issued prior to receipt of bids.

   C. Addenda are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents, including Drawings and Specifications, by additions deletions, clarifications or corrections. Addenda shall become part of the Contract Documents when the Construction Contract is executed.

7. **QUALIFICATIONS OF BIDDERS:**
   A. Owner may consider the following factors in determining if a bidder is qualified to submit a bid:
      1) The proposed Contractor's financial strength, personnel, and other resources, including subcontractors;
      2) The proposed Contractor's record of performance and integrity;
      3) Whether the proposed Contractor is qualified legally to contract with local public agencies;
      4) Whether the proposed Contractor supplied all necessary information concerning its responsibility;
      5) Complaints on file with local and state licensing authorities; and
      6) Prior litigation history.

8. **BIDDER'S REPRESENTATION**
   A. Each bidder by making his bid represents that he has read and understands the Bidding Documents.

   B. Each bidder by making his bid represents that he has visited the site and familiarized himself with the local conditions under which the Work is to be performed.

9. **BIDDING PROCEDURES**

A. All bids shall be prepared on the forms provided by the Architect and submitted in accordance with the Information for Bidders.

B. A bid may be considered invalid if it has not been deposited at the location prior to the time and date for receipt of bids indicated in the Bidding Documents, or prior to any extension thereof issued to the bidders. Bids will be accepted via mail, email or fax provided that the documents are legible. Mail-in bids must be sent regular or express mail and received by the return date and time to be considered as a timely receipt of bid.

C. Unless otherwise provided in any supplement to this Information for Bidders, no bidder shall modify, withdraw or cancel his bid or any part thereof for sixty (60) days after the time designated for the receipt of bids in the Bidding Documents.

D. Prior to the receipt of bids, Addenda will be distributed to each person or firm recorded by the Owner as having received the Bidding Documents and will be available for that purpose. Modifications issued after the receipt of bids will be mailed or delivered only to the selected bidder.

10. **EXAMINATION OF BIDDING DOCUMENTS**

A. Digital Bid Documents are available from the Owner. Contact Rick Faley, Senior Project Manager, (845) 554-1179.

B. Each bidder shall examine the Bidding Documents carefully and not later than seven (7) days prior to the date for receipt of bids, shall make written request to the Owner & Architect for interpretation or correction of any ambiguity, inconsistency or error therein which he may discover. Any interpretation or correction will be issued as an Addendum by the Architect. Only a written interpretation or correction by Addendum shall be binding. No bidder shall rely upon interpretation or correction given by any other method.

11. **SUBSTITUTIONS**

A. Each bidder represents that his bid is based upon the materials and equipment described in the Bidding Documents.

12. **REJECTION OF BIDS**

A. The bidder acknowledges the right of the Owner to reject any and all bids and to waive any informality or irregularity in any bid received. In addition, the bidder recognizes the right of the Owner to reject a bid if the bidder failed to submit the data required by the Bidding Documents, or if the bid is in any way incomplete or irregular.

B. Substitution, along with corresponding change in price, will be considered (unless specifically prohibited in any particular specification section) if such request is submitted to the Owner along with a bid. Each such request shall include a complete description of the proposed substitute, the name of the material or equipment for which it is to be substituted; drawings, cuts, performance and test data and any other data or information necessary for a complete evaluation.

13. **SUBMISSION OF POST-BID INFORMATION**

A. Upon request by the Owner, the selected bidders shall, within three (3) days thereafter submit the following:

1) A Schedule of Values to be used for the Bidder's Application for Payment. The bidder shall submit drafts of both the AIA G702 Application and Certification for Payment as well as the AIA G703 Continuation sheet (Schedule of Values).

2) A designation of the Work to be performed by the Bidder with his own forces.

3) The Owner will notify the Bidder in writing if the Owner after due investigation, has reasonable and substantial objection to any person or organization on such list, and refuses in writing to accept such person or organization; the Bidder may, at his option, withdraw his bid, notwithstanding anything to the contrary contained in Paragraph 8-C. If the Bidder submits an acceptable substitute with an increase in his bid price to cover the difference in cost occasioned by such substitution, the Owner may, at his discretion, accept the increased bid price or he may reject the Bidder. Subcontractors and other persons and organizations proposed by the Bidder and accepted by the Owner must be used on the Work for which they were proposed and accepted and shall not be changed except with the written approval of the Owner.

-END OF SECTION-

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YY)

PRODUCER

INSURANCE COMPANY
ADDRESS

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURERS AFFORDING COVERAGE

INSURED

CONTRACTING COMPANY
ADDRESS

INSURER A:
INSURER B:
INSURER C:
INSURER D:
INSURER E:

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY				EACH OCCURRENCE	$1,000,000
	[X] COMMERCIAL GENERAL LIABILITY				FIRE DAMAGE (Any one fire)	$300,000
	[ ] CLAIMS MADE [X] OCCUR				MED EXP (Any one person)	$5,000
					PERSONAL & ADV INJURY	$1,000,000
					GENERAL AGGREGATE	$2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:				PRODUCTS - COMP/OP AGG	$2,000,000
	[ ] POLICY [ ] PRO-JECT [ ] LOC					
B	AUTOMOBILE LIABILITY				COMBINED SINGLE LIMIT (Ea accident)	$1,000,000
	[X] ANY AUTO					
	[ ] ALL OWNED AUTOS				BODILY INJURY (Per person)	$
	[ ] SCHEDULED AUTOS					
	[X] HIRED AUTOS				BODILY INJURY (Per accident)	$
	[X] NON-OWNED AUTOS					
					PROPERTY DAMAGE (Per accident)	$
	GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
	[ ] ANY AUTO				OTHER THAN AUTO ONLY: EA ACC	$
					AGG	$
C	EXCESS LIABILITY				EACH OCCURRENCE	$2,000,000
	[X] OCCUR [ ] CLAIMS MADE				AGGREGATE	$2,000,000
						$
	[ ] DEDUCTIBLE					$
	[X] RETENTION $10000					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				WC STATU-TORY LIMITS / OTH-ER	
					E.L. EACH ACCIDENT	$ Statutory
					E.L. DISEASE - EA EMPLOYEE	$ Limits
					E.L. DISEASE - POLICY LIMIT	$
	OTHER					

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

CERTIFICATE HOLDER NAMED AS ADDITIONAL INSURED

CERTIFICATE HOLDER | ADDITIONAL INSURED; INSURER LETTER: ____

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL Ten DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

SECTION 01000
GENERAL REQUIREMENTS

1. **Summary of Work:**

A. **Applicable Laws:** All work shall be conducted in strict compliance with all applicable Federal, New York State, and local regulations. These shall include, but are not limited to: New York State Industrial Code Rules 56 and 753 "Call Before You Dig", Department of Labor Regulations, and site specific variances that may be required.

B. **Submittals:** Following his initial review and approval, the Contractor shall submit to the Architect for approval, shop drawings, product data, samples and any other literature or items as required to indicate layout, dimensions, connections, materials and colors intended for use in the project. The Contractor shall also submit construction photographs to document the progress of the work. Refer to Section 01300 "Submittals" for additional information.
   1) Any work incorporated into the project without review and approval by the Architect may be rejected and replaced by the Contractor at his sole cost.
   2) All submissions shall be made with a minimum of (1) reproducible and three (3) prints/copies/samples, unless otherwise indicated under Submittals Specification Section 01300 or under a particular Specification Section.
   3) Contractor shall highlight or circle all applicable data intended for approval.
   4) Contractor shall use Architect's identification systems for clear, complete and proper identification of where all submittal information applies, including but not limited to specification sections, room numbers, door numbers, schedule titles and numbers.
   5) Submittals which do not contain required information shall be automatically rejected. Refer to Specification Section 01300 entitled Submittals
   6) Submittals and material orders shall occur promptly. All costs associated with substitute materials due to specified materials or equipment going out of stock, out of print, or being discontinued thirty days or more after the date of the general contract shall be at the Contractor's sole expense. The Contractor shall reimburse the Owner for all additional work by the Architect to review or redesign for substitute materials as a result of the Contractor's delays in seeking approval and/or procuring the specified materials.

C. **Permits and Fees:** The Owner will secure and pay for the building permit. The Contractor shall secure and pay for all other permits necessary for proper and lawful execution of the work. The Contractor shall be responsible to coordinate all required inspections with the Building Department and Owner.

D. **Taxes:** All necessary and applicable taxes shall be paid for by the Contractor.

E. **Substitutions:** The Contractor may propose substitutions to the materials and details of the contract documents, unless specifically prohibited by a particular specification section. In such case, Contractor shall provide a side-by-side comparison so as to illustrate that the substitution is equal or better than the item originally specified. Any substitution submittal that does not contain such comparison will be automatically rejected. All substitutions are subject to the Owner's and Architect's approval. Substitutions made without approval may be rejected and corrected at the Contractor's sole cost. Substitutions involving additional work of the Architect such as analysis for suitability, changes in design, or revisions to contract documents may require additional compensation to the Architect. Therefore, all substitutions shall benefit the Owner by a reduction in cost or time.

F. **Construction Surveying:** Contractor shall be responsible for layout in accordance with the design documents during construction. All dimensions and details of the contract documents shall be considered when laying out the work. Where a detail or dimension is inconsistent with all other available information, the Contractor shall be solely responsible for meeting the intent of the documents. The Contractor shall, upon request of the Architect, provide sketch and/or photograph of conditions that require additional information, clarification or comment from the Architect/Engineer. Failure to accurately layout construction work may result in rejection of the work, reconstruction and/or correction at the Contractor's sole cost. The Contractor shall be responsible for reimbursing the Owner for the Architect's additional work related to resolving Contractor layout errors.

G. **Existing Conditions:** This project involves an existing building. The Contractor accepts the existing conditions, and will provide all preparation required for new work. All work shall be subject to the Architect's approval prior to removal or replacement of existing materials. This project will require Cutting and Patching, refer to Section 01045. The Contractor shall, upon the request of the Architect, take photographs of existing conditions, or new conditions, that require additional information, clarification or comment by the Architect/Engineer. Submit photographs with written questions to the Architect/Engineer for review. All written questions shall be submitted in the form of a Request for Information (RFI).

H. **Owner Occupancy:** The building is occupied. The hospital is governed by NYS DOH health codes and standards that require a clean and sanitary environment in all occupied areas. The includes but is not limited to maintaining dust barriers, mopping up dusty surfaces before opening areas up to patients. The facility has an infection control administrator who will inspect the work area and advise the Contractor on proper precautions. The Owner shall provide access to the work areas and will make limited areas at a time available for construction. Before work starts, the Contractor and Owner shall develop a mutually acceptable phasing plan and schedule to minimize conflict, to maintain the Owner’s operations while facilitating construction. Any disruption resulting from new work shall be kept to a minimum. The Contractor shall conform to and observe all applicable Construction Infection Control Policies and Procedures, and Matrixes as outlined by the Owner, and any additional requirements as set forth by Vassar Brothers Medical Center.

I. **Phasing & Staging:** The Contractor shall provide a colored phasing diagram plan for the various areas of Work and submit to the Owner and Architect for review. The phasing of Work shall be carefully reviewed with and agreed to in writing, by the Owner. The Contractor shall also proposed a staging and dumpster area to minimize disturbance. The staging and dumpster area shall be coordinated with and agreed to in writing, by the Owner before work commences. Contractor parking shall be as designated by the Owner.

J. **Schedule:** Provide a detailed schedule for all work performed by trade, and maintain this schedule from week to week.

K. **Temporary Protection of Installed Work:** Contractor shall provide, if and as required, barricades, barriers, warning and protective devices for pedestrians and vehicular traffic in conformance with governing codes and regulations. To the greatest extent possible and practical, vehicular and pedestrian traffic flow shall be maintained during the project. Provide temporary and removable protection for installed Products. Control activity in the immediate work area to prevent damage. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings. Protect finished floors, stairs and other surfaces from traffic, dirt, wear, damage, or movement of heavy

objects, by protecting durable sheet materials. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer. Prohibit traffic from landscaped areas.

L. **Safety:** Contractor shall be responsible for compliance with all Federal, State and Local Safety and Environmental regulatory requirements. Such includes, but is not limited to; Record keeping, posting of Right-To-Know/Material Safety Data Sheets, Employee Training, Safety Equipment & Procedures, etc.

M. **Security:** Owner's facility shall be secure at all times. Contractor shall coordinate with Owner all access and proper security measures when performing work on-site including: identification of Contractor and Sub-contractor employees; separation of work areas from Owner operations; and securing temporary barriers and enclosures where work is ongoing from one day to the next.

N. **Winter Construction:** Contractor shall provide, if and as required, temporary enclosures and heat as needed to maintain proper temperatures and work environment throughout the construction period until the project is accepted by the Owner for Beneficial Occupancy, or as otherwise agreed in writing.

O. **Temporary Sanitary Facilities:** By Contractor. No facilities are available at the site.

P. **Temporary Utilities:** The Contractor shall provide and pay for all electricity and water from available services. Contractor shall make all connections and provide temporary distribution. Contractor shall coordinate any required shut-downs with the owner at least 5 working days prior to shut down, unless specifically noted on MEP Drawings for further advance scheduling with Owner.

Q. **Temporary Services:** Temporary telephone service used by the Contractor during construction shall be furnished and paid for by Contractor. Contractor shall provide and pay for all required temporary light, ventilation, heat or other temporary provisions required to service the work until the project is accepted by the Owner for Beneficial Occupancy, or as otherwise agreed in writing.

R. **Construction Insurance:** Contractor shall maintain General Liability, Automobile Liability, and Workmen's Compensation and Employer's Liability coverage in the amounts acceptable to the Owner. The Contractor shall name the Owner and Architect "additional insured" and indemnify them for all activities of the Contractor. Contractor shall file the proper forms with the Owner prior to commencement of construction. The Owner shall be responsible for maintaining Builder's Risk Coverage during the course of the project and shall file proper forms with the Contractor.

S. **Clean Up:** The Contractor shall, throughout and upon completion of the work, leave the site and building free from debris and materials directly related to the work performed by the Contractor. All debris or refuse shall be disposed of legally and properly. At completion of the project, the Contractor shall vacuum and wash down all surfaces as is appropriate to the material and finish..

T. **Temporary Signs:** As required for direction and safety by Contractor.

U. **Preconstruction Investigations:** All preconstruction investigations required to properly design and construct the project are the responsibility of the Contractor.

V. **Contract Closeout:** See specification section 01700.

W. **Warranties:** All work on the project is warranted to be of new materials, good quality, free of defects, and satisfactory for the uses intended. The Contractor shall repair or replace, to the Owner's satisfaction, any and all work that proves to be defective, insufficient, or incomplete for a period of one year after final completion. Warranty shall include all labor and materials. Warranted items include "as-built" documentation, and all other aspects of the Contractor's service which may affect the condition requiring correction. The Contractor shall provide and assign to the Owner all manufacturer's warranties and a letter of Contractor's warranty for all work of the project. All systems shall be installed in accordance with manufacturer's warranties, and where inspections are required to establish that warranties are met, the Contractor shall arrange such inspections at his cost. Where the Contractor fails to establish the manufacturer's warrantee through proper installation and inspection, the Contractor shall be liable for at least the same value of warrantee through the manufacturer's period of warrantee. See specification section 01700 for additional requirements.

X. **Change Order Work:** All additional work required by the Owner, but not included at the time of Contract, shall be awarded through written change order prior to commencing with the work. Prices shall be based on either unit prices, allowances, actual cost plus fee, or a negotiated lump sum as selected by the Owner. Contractor shall itemize his proposals in detail, with complete supporting back-up, to the satisfaction of the Owner. Where the owner feels the Contractor's price proposals are not acceptable, the Contractor shall, or the Owner may, secure three competitive prices for the work proposed. The Owner shall compensate the Contractor based on the lowest competitive price.

Y. **Material Delivery, Storage, and Handling:** This shall be in accordance with manufacturer's recommendations. On-site storage shall be limited to material required for immediate use. Payment for stored materials shall be governed by the following:

1) Stored material can only be requisitioned for if the Contractor has completed the full submittal process and all materials have been approved.
2) Contractor shall provide proof of receipt of goods (invoice, shipping documents, etc.).
3) Contractor's insurance certificate will indicate that all goods being stored on his premises are covered under his liability insurance.
4) Contractor will provide a letter indicating that upon receipt of payment from Owner for the stored materials, said materials shall become the property of the Owner.

Z. **Field Measurements:** Verify that field measurements are as indicated on design drawings and/or shop drawings as applicable. Contractor shall be responsible for determining that all dimensions coordinate with each other and with existing conditions. Contractor shall bring any discrepancies or requests for clarification to the attention of the Architect prior to constructing work that does not conform to the intent of the contract documents.

AA. **Use of Contract Documents:** All contract documents are prepared for this project only, and remain the property of the Architect. The Owner shall make one set of reproducible documents available to the Contractor for the purpose of making copies for his use on this project. All reproductions are at the Contractor's cost.

BB. **Payments and Retainage:** Progress Payments shall be governed by the following:

1) The period covered by each Application for Payment shall be one calendar month beginning on the first day of the month and ending on the last day of the month.
2) The Contractor shall submit to the Architect, Application for Payment not later than the fifth (5th) day of a month.
3) The Owner shall make payment to the Contractor not later than thirty (30) days after the Architect's receipt of the Application for Payment.

4) The Owner shall require a 10% retainage of the Contract Sum over the entire Construction period, ending on the date of issuance of the Certificate of Substantial Completion. Upon acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.
5) The contractor shall submit drafts of both the AIA G702 Application and Certification for Payment as well as the AIA G703 Continuation sheet (Schedule of Values) for review by the Architect. All payment applications for payment shall be made on these forms.

-END OF SECTION-

SECTION 01041
PROJECT COORDINATION

1. **GENERAL**
   A. Scope:
      1) Furnish all labor, equipment and material required for coordinating the project and providing for the needs of each contractor and vendor including but not limited to:
         a. General Contractor's subcontractors and vendors.
         b. Owner's communication systems contractors:
            (a) Telephone.
            (b) Computers.
            (c) Security.
         c. Owner's medical equipment vendors/contractors.
         d. Owner's signage vendor

   B. Project Coordination:
      1) Provide all coordination necessary for completion of each trade and activity in concert with all other work.
      2) Become familiar with the work and requirements of each contractor and vendor.
      3) Maintain at the job site and refer to as required, a complete set of:
         a. Contract Documents.
         b. Submittals.
         c. Shop drawings.
         d. Coordination drawings.
         e. Vendor manuals and installation drawings.

   C. Construction Mobilization: For each contractor and vendor:
      1) Allocate mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
      2) During construction, coordinate use of site and facilities.
      3) Provide and maintain procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
      4) Provide and instruct on the use of temporary utilities and construction facilities.
      5) Provide and coordinate all field engineering and layout work.

   D. Schedules:
      1) Submit preliminary progress schedule to Owner, Architect and all contractors and vendors.
      2) After review by all parties, revise and resubmit schedule to establish the Project schedule.
      3) During progress of work revise and resubmit with each Application for Payment.

   E. Submittals:
      1) Provide a submittal list to include the responsibilities of all contractors and vendors to the Architect.
      2) Track the progress of delivery, compliance and approval of all required submittals and submit with each Application for Payment.
      1) Submit requests for interpretation of Contract Documents, and obtain instructions from the Architect and/or Owner.
      2) Process requests with complete information for substitutions, and change orders, through the Architect.

3) Deliver closeout submittals for review and preliminary inspection reports, for transmittal to Architect.

G. Coordination Drawings:
1) Where the Contractor determines that coordination drawings are useful to the coordination of the project, prepare such drawings with the contractors and submit them to the Architect for review.
2) The General Contractor shall not rely on the Contract Documents as a substitution for coordination, or the preparation of coordination drawings.

H. Closeout Procedures:
1) Prior to determining Substantial and Final completions, take each contractor through the project and prepare a complete list of incomplete and/or unacceptable work.
2) Notify the Architect and Owner only when work is ready for Substantial Completion.
3) Take Architect and Owner on inspection with prepared list of items to be corrected and/or completed, add to this list all additional items observed by the Architect and Owner.
4) Determine with the Architect and Owner an agreeable schedule for completing and correcting items of work listed in executed Certificates of Substantial Completion.
5) Notify Architect when work is considered finally complete, when all items listed from the Substantial Completion list are completed.
6) Prepare a new list of items to be corrected and/or completed for use in touring the project with the Architect and Owner. Add to this list all additional items observed by the Architect and Owner for a Final Punch List.
7) Complete all Final Punch List items for completion of the project.

I. Owner's Contractors and Vendors: The following work will be performed at the project by the Owner's contractors or vendors:

1) **Telephone, Computer, Security:** The Owner shall arrange for his own Telephone, Computer and Security vendor to provide or extend phone systems, computer network systems and new Access Control and Surveillance at areas of new Work.

a. The Contractor's responsibilities include but are not limited to:
(a) Provide vertical and horizontal access throughout the new work area for the Telephone, Computer and Security Contractors to pull cable. Contractor shall provide junction boxes, backboxes, conduit and pull string as necessary to support Owner / Owner Vendor systems. Fire rate all through floor penetrations and where penetrating fire rated partitions. Penetrations shall be sealed smoke tight wherever sealed partitions are indicated by partition types and also at penetrations through partitions between patient rooms and penetrations through corridor partitions. Conduits are only required where indicated or where fire ratings and coordination dictate. Owner's contractors shall use fire rated or plenum rated wiring as required by Code.
(b) All concealed blocking for Vendor furnished televisions or other vendor provided equipment requiring support.
(c) Contractor shall provide compatible VESA mounts for all wall-mounted monitors. VESA mounts shall be review and approved by the Owner prior to purchase.
(d) Ensure that Owner's Contractors / Vendors are coordinated with current Construction Documents and desired locations of systems where indicated in Architectural and MEP drawings.
(e) Ensure that all Contractor sub-contractors and Contractor's vendors are familiar with requirements and all components of Owner Contractor / Owner Vendor systems which

require coordination or support in the sub-contractor's or vendor's Work.

(f) Maintain a written daily log at the Project site which include Owner's vendors and on-site activity. The log shall identify Vendor company name, individual and individual's job title along with the activity performed that day. This information shall be made available to the Owner, Architect / Engineer's at their request.

b. Owner's Telephone, Computer and Security Vendors shall provide and install their own systems including but not limited to cable, face plates, terminations, instruments, devices, low voltage power systems and standard voltage in locations other than closets indicated for use by these contractors. The General Contractor's Work shall include but not be limited to providing all necessary conduit, pull strings and boxes as prescribed by the Vendor's requirements unless otherwise provided by Owner's Vendor.

2) **Medical Equipment:** The Owner has contracted with a number of medical equipment vendors to provide movable equipment.

a. The Owner shall prepare a complete list of vendors with contact names, addresses, phone numbers and items to be installed. The Owner's vendors shall be responsible for delivering, unloading and moving into place their own equipment unless otherwise directed.

b. General Contractor's responsibilities shall include but not be limited to:

(a) Familiarize himself with the vendors' installation manuals and work descriptions, confirming with the vendor that the GC's work will accept the Vendor's work in all dimensions and detail.

(b) The General Contractor shall be responsible for coordinating his work directly with the Owners's medical equipment vendors.

(c) The General Contractor shall request and schedule a pre-construction site meeting with the Owner's medical equipment vendors to coordinate and establish all work required for the installation of the Owner's medical equipment. The General Contractor shall request, schedule, and coordinate as many site meetings during construction with the Owner's medical equipment vendor as required for coordination and installation of the medical equipment. The General Contractor shall be responsible for all additional cost required to engage the Owner's vendors and/or Architect in coordination beyond the initial coordination meeting.

(d) Prepare the equipment locations with all new work, alterations, rough-ins, finish work as may be required, in place and ready for installation including as indicated, plumbing, fire protection, HVAC, medical gases, compressed air, lighting, power, distribution.

(e) Connect mechanical/electrical utilities, power conditioners, as required for equipment operation from interface point.

(f) Provide conduit and wiring as follows:

(i) All conduit, raceways, piping and wiring required to feed, power and control Owner provided equipment.

3) **Signage:** The Owner shall arrange for his own Vendor to provide and install interior room signage and directories.

(a) The Contractor's responsibilities shall include but not be limited to:

(i) Providing concealed blocking at all interior locations and where required for adequate support of signage.

2. **PRODUCTS**

A. As indicated or as required.

3. **EXECUTION**

A. As required for a complete and operable facility with all Owner provided equipment in place and functional.

B. Protection:
   1) Provide protection as required to prevent damage to all equipment within the project area.
   2) Maintain dust free environment in all locations where unwrapped equipment has been temporarily or permanently placed.

C. Clean up:
   1) Maintain a clean site at all times as indicated.
   2) Provide clean-up and dispose of all waste from Owner's Contractor and Vendor work.

-END OF SECTION-

SECTION 01045
CUTTING & PATCHING

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to cut & patch for his own work as required or incidental to his work of another section, unless otherwise indicated. The General Contractor shall be responsible for all cutting and patching that will remain exposed to view. Sub-Contractors may be responsible for cutting and patching that will remain concealed from view.
      1) All work of this section shall be subject to the Architect's approval prior to the removal or replacement of existing materials.
      2) Contractor may find existing conditions that require patching prior to the start of his other work, in which case these repairs are included in the Work.
      3) The Contractor shall not be awarded extra cost associated with any required cutting and patching.
      4) Provide all preparation required for new work and finishes.

   B. Section includes: Requirements and limitations for cutting and patching of Work.

   C. Related sections:
      1) Section 01120 - Alteration Project Procedures: Cutting and Patching for Alteration Work.
      2) Section 01300 - Submittals.
      3) Section 07270 - Firestopping.
      4) Individual Product Specification Sections:
         a. Cutting and patching incidental to work of the section.
         b. Advance notification to other sections of openings required in work of those sections.
         c. Limitations on cutting structural members.

   D. Submittals:
      1) Submit under provisions of Section 01300.
      2) Submit written request in advance of cutting or alteration which affects:
         a. Structural integrity of any element of Project.
         b. Integrity of weather exposed or moisture resistant element.
         c. Efficiency, maintenance, or safety of any operational element.
         d. Visual qualities of sight exposed elements.
         e. Original historic construction materials.
         f. Work of Owner or separate contractor.

      3) Include in request:
         a. Identification of Project.
         b. Location and description of affected Work.
         c. Necessity for cutting or alteration.
         d. Description of proposed Work, Products and Contractors to be used.
         e. Alternatives to cutting and patching.
         f. Effect on work of Owner or separate contractor.
         g. Written permission of affected separate contractor.
         h. Date and time work will be executed.

2. **PRODUCTS**
   A. Materials:
      1) Primary Products: Those required for original installation.
      2) Product Substitution: For any proposed change in materials, submit request for substitution.

3. **EXECUTION**

A. Examination:

1) Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
2) After uncovering existing Work, assess conditions affecting performance of work.
3) Beginning of cutting or patching means acceptance of existing conditions.

B. Preparation:

1) Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
2) Provide protection from elements for areas which may be exposed by uncovering work.
3) Maintain excavations, if any, free of water.

C. Cutting:

1) Execute cutting and fitting including excavation and fill to complete the Work.
2) Uncover work to install improperly sequenced work.
3) Remove and replace defective or non-conforming work.
4) Remove samples of installed work for testing when requested.
5) Provide openings in the Work for penetration of mechanical and electrical work.
6) Employ original or skilled and experienced installer to perform cutting for all conditions.
7) Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
8) Where existing fireproofing materials are disturbed, removed or otherwise rendered ineffective by the installation of new work, Contractor shall be responsible for providing new fireproofing materials to match existing as required to maintain the integrity and continuity of the fire rating.

D. Patching:

1) Execute patching to complement adjacent Work.
2) Fit Products together to integrate with other Work.
3) Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
4) Employ original or skilled and experienced installer to perform patching for all conditions.
5) Restore work with new Products in accordance with requirements of Contract Documents.
6) Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
7) At penetrations of fire rated walls, partitions, floor or ceiling construction, completely seal voids with fire rated material in accordance with Section 07270, to full thickness of the penetrated element.
8) Re-finish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

-END OF SECTION-

SECTION 01120
ALTERATION PROJECT PROCEDURES

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to alter existing work as indicated or as required incidental to his work of another section.
      1) This project involves an existing building.
      2) All work of this section shall be subject to the Architect's approval prior to the removal or replacement of existing materials.
      3) The Contractor will not be awarded extra cost associated with any required cutting and patching.

   B. Section includes:
      1) Products and installation for patching and extending Work.
      2) Transition and adjustments.
      3) Repair of damaged surfaces, finishes, and cleaning.

   C. Related sections:
      1) Section 01045 - Cutting and Patching.
      2) Section 02072 - Minor Demolition for Remodeling: Removal and storage of products to be reinstalled by this section.

2. **PRODUCTS**
   A. Products for patching and extending work:
      1) New Materials: As specified in product sections; match existing products and Work for patching and extending work.
      2) Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing Work as a standard.

3. **EXECUTION**
   A. Examination:
      1) Verify that demolition is complete and areas are ready for installation of new Work.
      2) Beginning of restoration Work means acceptance of existing conditions.

   B. Preparation:
      1) Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
      2) Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
      3) Remove debris and abandoned items from area and from concealed spaces.
      4) Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.
      5) Close openings in exterior surfaces to protect existing work and salvage items from weather and extremes of temperature and humidity. Insulate duct work and piping, per Mechanical and Plumbing specifications, to prevent condensation in exposed areas.

   C. Installation:
      1) Coordinate work of alterations and renovations to expedite completion sequentially.
      2) Remove, cut, and patch Work in a manner to minimize damage and to provide a means of restoring products and finishes to original or specified condition in accordance with Section 01045.

3) Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes in accordance with Section 01045.
4) Project, Designated areas, Rooms and spaces, and Finishes: Complete including operational mechanical and electrical work.
5) In addition to specified replacement of equipment and fixtures restore existing plumbing, heating, and electrical systems to full operational condition.
6) Re-cover and refinish Work that exposes mechanical and electrical work exposed accidently during the work.
7) Install products as specified in individual sections.

D. Transitions:
1) Where new Work abuts or aligns with existing, perform a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
2) When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect/Engineer.

E. Adjustments:
1) Where removal of partitions or walls results in adjacent spaces becoming one space, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
2) Where a change of plane of 1/16 inch or more occurs, submit recommendation for providing a smooth transition for Architect/Engineer review and approval.
3) Trim existing doors as necessary to clear new floor finish. Refinish trim as required.
4) Fit work at penetrations of surfaces as specified in Section 01045.

F. Repair of damaged surfaces:
1) Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
2) Repair substrate prior to patching finish.

G. Finishes:
1) Finish surfaces as specified in individual product sections.
2) Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

H. Cleaning:
1) Broom clean all areas of work at the end of each work day.
2) Clean all work ready to use for final inspection and approval.
3) Dispose of all waste material in accordance with applicable laws.

-END OF SECTION-

SECTION 01300
SUBMITTALS

1. **GENERAL:**
   A. All contractors shall furnish submittals as indicated or as required incidental to his work of another section.

   B. Section includes:
      1) Submittal procedures
      2) Construction progress schedules
      3) Proposed Products list
      4) Proposed Sub-Contractor list
      5) Product Data
      6) Shop Drawings
      7) Samples
      8) Design Data
      9) Test Reports
      10) Certificates
      11) Manufacturer's instructions
      12) Manufacturer's field reports
      13) Erection Drawings
      14) Construction photographs

   C. Related Sections:
      1) General Conditions, pages 1-19, items 1-31.
      2) Section 01700 - Project Closeout: Manufacturer's Certificates and Closeout Submittals.
      3) Section 01740 - Warranties.

   D. References:
      1) AGC (Associated General Contractors of America) publication "The use of CPM in construction - A manual for General Contractors and the Construction Industry."

   E. Submittal procedures:
      1) Transmit each submittal with an appropriate transmittal form. The transmittal form must indicate the Project, the Contractor, date, specification number(s) and number of copies/samples submitted for each submittal. No processing action will be taken on any submittal that is not accompanied with a complete transmittal form.
      2) Transmit a minimum of three (3) copies/samples with a maximum of five (5) copies/ samples, unless otherwise indicated herein or in a particular specification section.
      3) Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
      4) Provide a complete submittal package for each individual specification section. Submittal items within the same specification section shall be provided in one complete package, unless otherwise directed or requested by the Architect. Individually submitted items within the same section, will not be accepted.
      5) Identify each submittal with Project, Contractor, Subcontractor or supplier. Highlight or otherwise indicate by bubble any pertinent drawing, detail number, specification section number, model, type, color, etc.
      6) Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of

products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Any submittal lacking the Contractor's approval stamp will automatically be disapproved and returned.

7) Transmit all submittals for review/approval within thirty (30) days of project award.
8) Schedule submittals to expedite the Project, coordinate submission of related items. Deliver to Architect or Owner's Representative at business address.
9) For each submittal for review and/or selection, allow fifteen (15) days excluding delivery time to and from the Contractor.
10) Identify product or system limitations which may be detrimental to successful performance of the completed Work, or otherwise differ from the Contract Documents or intent of the Work.
11) Provide space for Contractor and Architect/Engineer review stamps.
12) When revised for resubmission, identify all changes made since previous submission and provide a revision date.
13) Distribute copies of Architect/Engineer reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
14) Submittals not requested may not be recognized or processed.
15) Submittals marked for "File Use Only" will not be processed.

F. Construction Progress Schedules:
1) Submit initial schedule in duplicate within one week after notice to proceed.
2) Revise and resubmit as required by Owner's Representative.
3) Submit revised schedules (in duplicate) with each Application for Payment, identifying changes since previous version.
4) Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities.
5) Indicated estimated percentage of completion for each item of Work at each submission.
6) Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

G. Proposed Products List:
1) Within fifteen (15) days after date of notice to proceed, submit, in duplicate, a list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
2) For products specified only by reference standards, give manufacturer, trade name, model or catalogue designation, and reference standards.

H. Proposed Sub-Contractor List:
1) Within fifteen (15) days after award of the contract, Contractor shall submit, in triplicate, a list of proposed Sub-Contractors for each trade to the Architect/Engineer. The Architect/Engineer and/or the Owner may reasonably object, in writing, to any such proposed person or entity. Failure of the Owner or Architect/Engineer to reply with a written objection shall constitute notice of no reasonable objection to the proposed list.
2) Provide business name, name of principal and contact person, business address, telephone and fax numbers and statement of qualifications, including a list of previous work.

I. Product Data:
1) Product data for review and approval:
a. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract

documents.
   b. After review and approval, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - Project Closeout.
2) Product data for information:
   a. Submitted for the Owner's Representative's knowledge as contract administrator for the Owner.
3) Product data for Project Close-out:
   a. Submitted for the Owner's benefit during and after project completion.
4) Submit the number of copies the Contractor requires, plus two (2) copies which will be retained by the Architect/Engineer.
5) Mark each copy, by highlighting or bubble, to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information specific to this Project.
6) Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
7) After review and approval, distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - Project Closeout.

J. Shop Drawings:
1) Shop drawings for review and approval:
   a. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   b. After review and approval, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - Project Closeout.
2) Shop drawings for information:
   a. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.
3) Shop drawings for Project Closeout:
   a. Submitted for the Owner's benefit during and after project completion.
4) Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
5) Submit in the form of one (1) reproducible transparency and three (3) opaque reproductions.

K. Samples:
1) Samples for review and approval:
   a. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
   b. After review and approval, provide duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - Project Closeout.
2) Samples for information:
   a. Submitted for the Owner's Representative's knowledge as contract administrator or for the Owner.
3) Samples for selection:
   a. Submitted to the Architect/Engineer for aesthetic, color, or finish selection.

b. Submit samples of finishes from the full range of manufacturer's standard colors, textures, and patterns or in custom finishes specified for Architect/Engineer selection and/or approval.
c. After review and approval, provide duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - Project Closeout.

4) Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
5) Include identification on each sample, with full Project information.
6) Submit a minimum of three (3) copies/samples, more if specified in individual specification sections; one of which will be retained by the Architect/Engineer.
7) Reviewed samples which may be used in the Work are indicated in individual specification sections.
8) Samples will not be used for testing purposes unless specifically stated in the specifications section.
9) Samples will be returned to contractor for distribution when contractor is required to submit and match custom color or material selections.

L. Design Data:
1) Submit for the Architect/Engineer's knowledge.
2) Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
3) Submit a minimum of three (3) copies.

M. Test Reports:
1) Submit for the Architect/Engineer's knowledge.
2) Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
3) Submit a minimum of three (3) copies.

N. Certificates:
1) When specified in individual specification sections, submit a minimum of three (3) certifications by the manufacturer, installation/application subcontractor, or the Contractor to Architect/Engineer.
2) Indicate material or Product conforms to or exceeds specified requirements. Submit a minimum of three (3) copies of supporting reference data, affidavits, and certifications as appropriate.
3) Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

O. Manufacturer's Instructions:
1) When specified in individual specification sections, submit a minimum of three (3) printed and bound instructions or catalogs for delivery, storage, assembly, installation, start-up, adjusting and finishing, to Architect/Engineer for delivery to Owner.
2) Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

P. Manufacturer's Field Reports:
1) Submit reports for the Owner's Representative's benefit as contract administrator for the Owner.
2) Submit a minimum of three (3) reports within 30 days of observation to Architect/Engineer for information.

3) Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

Q. Erection Drawings:
1) Submit drawings for the Owner's Representative's benefit as contract administrator for the Owner.
2) Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
3) Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.
4) Submit a minimum of three (3) copies to the Architect/Engineer.

R. Construction Photographs:
1) The Contractor shall submit construction photographs using a date/time camera to document the progress of the project.
2) Digital construction photographs shall be taken and submitted weekly via email or CD, showing the major areas and components of work indicating "before" and "after" conditions.
3) The Contractor shall also provide, upon request of Architect, photographs of existing conditions or new conditions that require additional information, clarification or comment by the Architect/Engineer. The Contractor shall submit photographs with written questions to the Architect/Engineer for review.
4) Weekly Job site photographs to be taken digitally with date stamp activated. Photographs to be emailed to Architect by end of day each Friday for duration of project. A CD is to be submitted to the Architect with the closeout documents containing all job site photographs placed within dated subfolders for each week.
5) Identify photographs with date, time, orientation, and project identification.

2. **PRODUCTS:** (Not Used).

3. **EXECUTION:** (Not Used).

-END OF SECTION-

SECTION 01400
QUALITY CONTROL

1. **GENERAL:**
   A. All contractors shall furnish all material and equipment required for the work as indicated or as required for a complete project in accordance with this section.

   B. Section includes:
      1) Quality assurance - control of installation.
      2) Tolerances
      3) References and standards.
      4) Mock-up.
      5) Inspecting and testing laboratory services.
      6) Manufacturers' field services.

   C. Related Sections:
      1) Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.
      2) Section 01600 - Material and Equipment: Requirements for material and product quality.
      3) Section 01650 - Starting of Systems.

   D. Quality Assurance - Control of Installation:
      1) Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
      2) Comply with manufacturers' instructions, including each step in sequence.
      3) Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
      4) Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
      5) Perform Work by persons qualified to produce required and specified quality.
      6) Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
      7) Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

   E. Tolerances:
      1) Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
      2) Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
      3) Adjust Products to appropriate dimensions; position before securing Products in place.

   F. References & Standards:
      1) For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
      2) Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
      3) Obtain copies of standards where required by product specification sections.

4) Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

G. Mock-up:
1) Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
2) Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
3) Accepted mock-ups shall be a comparison standard for the remaining Work.
4) Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

H. Testing Services:
1) Owner will appoint, employ, and pay for specified services of an independent firm to perform testing except where indicated in the documents as specified testing services to be provided by the Contractor (i.e. sub-grade compaction testing report for adjusted sub-grade & controlled fill).
2) Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer. Payment for re-testing for testing initially payed for by the Owner will be charged to the Contractor by deducting testing charges from the Contract Sum/Price. Testing and retesting for tests to be provided by the Contractor shall be payed for by the Contractor.

I. Inspections Services:
1) Owner will appoint, employ, and pay for specified services of an independent firm to perform inspection.
2) In limited situations the Contractor may be required by the Construction Documents to provide independent testing to verify elements of their work.
3) Inspecting does not relieve Contractor to perform Work to contract requirements.

J. Manufacturers' Field Services:
1) When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment, as applicable, and to initiate instructions when necessary.
2) Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer subject to approval of Owner.
3) Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
4) Refer to Section 01300 - SUBMITTALS.

2. **PRODUCTS:** Not Used.

1. **EXECUTION:**
A. Examination:
1) Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
2) Verify that existing substrate is capable of structural support or attachment of new Work being

applied or attached.

3) Examine and verify specific conditions described in individual specification sections.
4) Verify that utility services are available, of the correct characteristics, and in the correct locations.

B. Preparation:
   1) Clean substrate surfaces prior to applying next material or substance.
   2) Seal cracks or openings of substrate prior to applying next material or substance.
   3) Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

-END OF SECTION-

SECTION 01600
MATERIAL & EQUIPMENT

1. **GENERAL:**
   A. All contractors shall furnish all material and equipment required for the work as indicated or as required for a complete project in accordance with this section.

   B. Section includes:
      1) Products.
      2) Transportation and handling.
      3) Storage and protection.
      4) Product options.
      5) Substitutions.

   C. Related Sections:
      1) General Conditions, pages 1-19, items 1-31.
      2) Section 01700 - Project Closeout: Manufacturer's Certificates and Closeout Submittals.
      3) Section 01740 - Warranties.

   D. Products:
      1) Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
      2) Provide interchangeable components of the same manufacture for components being replaced.

   E. Transportation & Handling:
      1) Transport and handle products in accordance with manufacturer's instructions.
      2) Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
      3) Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

   F. Storage & Protection:
      1) Store and protect products in accordance with manufacturers' instructions.
      2) Store with seals and labels intact and legible.
      3) Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
      4) For exterior storage of fabricated products, place on sloped supports above ground.
      5) Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
      6) Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
      7) Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
      8) Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
      9) Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

   G. Product Options:

1) Products specified by Reference Standards or by description only: Any product meeting those standards or description.
2) Products specified by naming one or more manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
3) Products specified by naming one or more manufacturers with a provision for substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

H. Substitutions:
   1) Architect/Engineer will consider requests for substitutions that are submitted with Bid-Form.
   2) The Contractor shall prepare a written cost savings to the Owner for any proposed substitution. In no instance shall any substitution require any additional compensation to the Contractor.
   3) Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
   4) Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
   5) A request constitutes a representation that the Contractor:
      a. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
      b. Will provide the same warranty for the substitution as for the specified product.
      c. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
      d. Waives claims for additional costs or time extension which may subsequently become apparent.
      e. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities.
   6) Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
   7) Substitution Submittal Procedure:
      a. Submit four copies of request for Substitution for consideration. Limit each request to one proposed substitution.
      b. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
      c. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

2. **PRODUCTS:** Not Used.

3. **EXECUTION:** Not Used.

-END OF SECTION-

SECTION 01650
STARTING OF SYSTEMS

1. **GENERAL**
   A. Scope:
      1) Contractor shall furnish all labor, equipment and material required for the Starting of Systems as indicated herein.

   B. Section Includes:
      1) Starting systems.
      2) Demonstration and instructions.
      3) Testing, adjusting, and balancing

   C. Related Sections:
      1) Section 01730 - Operation and Maintenance Data.

   D. Starting systems:
      1) Coordinate schedule for start-up of various equipment and systems.
      2) Notify Architect and Owner seven days prior to start-up of each item.
      3) Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
      4) Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
      5) Verify that wiring and support components for equipment are complete and tested.
      6) Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.
      7) When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
      8) Submit a written report in accordance with Section 01300 that equipment or system has been properly installed and is functioning correctly.

   E. Demonstration and Instructions:
      1) Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Substantial Completion.
      2) Demonstrate Project equipment and instruct by a qualified manufacturers' representative who is knowledgeable about the Project.
      3) For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
      4) Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
      5) Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at equipment or designated location.
      6) Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
      7) The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

   F. Testing, Adjusting and Balancing:
      1) Contractor will appoint, employ, and pay for services of an independent firm to perform testing,

adjusting, and balancing.

2) The independent firm will perform services specified in Division 15and as noted on the Drawings.
3) Reports will be submitted by the independent firm to the Architect indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

2. **PRODUCTS:** (Not Used).

3. **EXECUTION:** (Not Used).

-END OF SECTION-

SECTION 01700
PROJECT CLOSEOUT

1. **GENERAL**
   A. Scope:
      1) Contractor shall furnish all labor, equipment and material required for the following:
         a. Closeout procedures.
         b. Final cleaning.
         c. Adjusting.
         d. Project record documents.
         e. Operation and maintenance data.
         f. Spare parts and maintenance Products.
         g. Warranties and bonds.
         h. Maintenance service.

   B. Closeout Procedures:
      1) Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect's review.
      2) Provide submittals to Architect that are required by governing or other authorities.
      3) Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

   C. Final Cleaning:
      1) Execute final cleaning prior to final project assessment.
      2) Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
      3) Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
      4) Replace filters of operating equipment.
      5) Clean debris from roofs, gutters, downspouts, and drainage systems.
      6) Clean site; sweep paved areas, rake clean landscaped surfaces.
      7) Remove waste and surplus materials, rubbish, and construction facilities from the site.

   D. Adjusting:
      1) Adjust operating Products and equipment to ensure smooth and unhindered operation.

   E. Project Record Documents:
      1) Maintain on site one set of the following record documents; record actual revisions to the Work:
         a. Drawings.
         b. Specifications.
         c. Addenda.
         d. Change Orders and other modifications to the Contract.
         e. Reviewed Shop Drawings, Product Data, and Samples.
         f. Manufacturer's instruction for assembly, installation, and adjusting.
      2) Ensure entries are complete and accurate, enabling future reference by Owner.
      3) Store record documents separate from documents used for construction.
      4) Record information concurrent with construction progress.

   F. Specifications: Legibly mark and record at each Product section description of actual Products

installed, including the following:
   a. Manufacturer's name and product model and number.
   b. Product substitutions or alternates utilized.
   c. Changes made by Addenda and modifications.

G. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1) Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   2) Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   3) Field changes of dimension and detail.
   4) Details not on original Contract drawings.
   5) Submit documents to Architect with claim for final Application for Payment.
   6) All As-Built hard copy drawings shall also be provided in .pdf format on a CD-Rom with disc and disc cover labeled. Provide one (1) copy to Architect and one (1) copy to the Owner. Label shall include Project Name, Address and Contractor.

H. Operation and Maintenance Data:
   1) Submit data bound in 8-1/2 x 11 inch text pages, three D side ring binders with durable plastic covers.
   2) Prepare binder cover with printed title "OPERATION & MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
   3) Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
   4) Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 20 pound white paper, in three parts as follows:
      a. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
      b. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
         (1) Significant design criteria.
         (2) List of equipment.
         (3) Parts list for each component.
         (4) Operating instructions.
         (5) Maintenance instructions for equipment and systems.
         (6) Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
      c. Part 3: Project documents and certificates, including the following:
         (1) Shop drawings and product data.
         (2) Air and water balance reports.
         (3) Certificates.
         (4) Originals of warranties.

   5) Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned, with Architect comments. Revise content of all document sets as required prior to final submission.

   6) Submit two sets of revised final volumes, prints and CD-rom, within 10 days.

I. Spare Parts and Maintenance Products:
   1) Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections.
   2) Deliver to Project site and place in location as directed; obtain receipt prior to final payment

J. Warranties and Bonds:
   1) Provide duplicate notarized copies.
   2) Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
   3) Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
   4) Submit prior to final Application for Payment.
   5) For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

K. Maintenance Service:
   1) Furnish service and maintenance of components indicated in specification sections for one year from date of Substantial Completion during the warranty period.
   2) Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
   3) Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
   4) Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

2. **PRODUCTS:** (Not Used).

3. **EXECUTION:** (Not Used).

-END OF SECTION-

SECTION 01720
PROJECT RECORD DOCUMENTS

1. **Project Record Documents**
   A. The purpose of the Project Record Documents is to record the actual location of the Work in place, including, but not limited to, underground lines, concealed piping within buildings, concealed valves and control equipment, connections, switches, and cut-outs, and to record changes in the Work.

   B. In addition to the sets of Contract Documents that are required by Contractor on the Site to perform the Work, Contractor shall maintain, at the Site, 1 copy of all Drawings, Specifications, and Addenda, that are part of the Contract as awarded, and also Change Orders, Modifications, approved Shop Drawings, and other approved changes. Each of these documents shall be clearly marked "Project Record Copy" as indicated below, maintained in a clean and neat condition available at all times for inspection by the Owner and shall not be used for any other purpose during the progress of the Work.
      1) Each record copy shall bear the legend "PROJECT RECORD COPY" in heavy block lettering, ½" high and contain the following data:
         a. Contractor's Name_____
         b. Contractor's Address_____
         c. Made by_____ Date_____
         d. Checked by_____ Date_____
      2) Where possible, changes from the Contract Documents as awarded shall be conspicuously encircled.

   C. Project Record Requirements
      1) The Contractor shall mark-up the "Project Record Documents" to show:
         a. Approved changes in the Work
         b. Location of underground Work and concealed Work
         c. Details not shown in the original Contract Documents
         d. All relocations of Work.
         e. All changes in dimensions
         f. All access doors.
         g. Location of all plumbing, heating, ventilating, air conditioning and electrical assemblies
      2) As applicable for the project, such information shall include, but shall not be limited to:
         a. Footing depth in relation to finished grade elevations
         b. All changes in floor elevations.
         c. All structural changes.
         d. All substitutions.
         e. Elevations and locations of all underground utilities, services, or structures referenced to permanent above-ground structures or monuments.
         f. Designation of all utilities as to the size and use of such utilities.
         g. All invert elevations of manholes.
         h. The location of all utilities, services and appurtenances concealed in building structures that have been installed different from that required by the Contract.
         i. All approved change orders.

   D. Contractor shall keep the Project Record Documents up-to-date from day to day as the Work progresses. Appropriate documents shall be updated promptly and accurately; no Work shall be permanently concealed until all required information has been recorded.

E. Each month these record drawings will be examined by the Architect prior to recommending the approval of the partial payment request to ascertain that the record prints reflect the changes to date.

F. Record Shop Drawings: If installed equipment is at variance with the respective approved Shop Drawings, Contractor shall furnish to the Owner's Representative revised Shop Drawings indicating the actual completed installation.

G. All of the above listed requirements of this Article shall be at Contractor's expense.

H. The Project Record Documents shall be submitted by Contractor to the Architect when all the Work is completed and shall be approved by the Architect before Contractor may request final payment.

I. Final payment shall be contingent on completion of the above listed requirements in this Section.

-END OF SECTION-

SECTION 01730
OPERATION AND MAINTENANCE DATA

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material as required to compile and submit operation and maintenance data.

   B. Section includes:
      1) Format and content of manuals.
      2) Schedule of submittals.

   C. Related Sections:
      1) Section 01300 - Submittals: Submittal procedures, shop drawings, product data, and samples.
      2) Section 01700 - Project Closeout: Project closeout procedures.
      3) Section 01720 - Project Record Documents.
      4) Section 01740 - Warranties.
      5) Individual Specifications Sections: Specific requirements for operation and maintenance data.

   D. Format:
      1) Prepare data in the form of an instructional manual.
      2) Binders: Commercial quality, 8-1/2 x 11 inch, three D side ring binder with durable plastic covers, ring size as required - not to exceed 2 inches. When multiple binders are used, correlate data into related consistent groupings.
      3) Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
      4) Internally subdivide the binder contents with tabbed dividers for each separate product and system, logically organized as described below; with tab titling clearly printed/typed under reinforced laminated plastic tabs.

   E. Contents: Prepare a Table of Contents for each volume, with each Product or system description typed on 20 pound white paper, as follows:
      1) Table of Contents/Directory: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, Sub-consultants, Contractor and Subcontractors with name of responsible parties; schedule of products and systems, indexed to content of the volume.
      2) For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
      3) Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
      4) Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings. Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
      5) Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01300.
      6) Project documents and certificates, including the following:
         a. Shop drawings and product data.
         b. Certificates.
         c. Originals of warranties. Warranties: As specified in Section 01740.
      7) Bonds: Bind in photocopy of each.

F. Manual for Materials and Finishes:
   1) Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured Products.
   2) Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
   3) Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
   4) Additional Requirements: As specified in individual Product specification sections.
   5) Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

G. Manual for Equipment and Systems:
   1) Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
   2) Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
   3) Include color coded wiring diagrams as installed.
   4) Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
   5) Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
   6) Provide servicing and lubrication schedule, and list of lubricants required.
   7) Include manufacturer's printed operation and maintenance instructions.
   8) Include sequence of operation by controls manufacturer.
   9) Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
   10) Provide control diagrams by controls manufacturer as installed.
   11) Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
   12) Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
   13) Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
   14) Include test and balancing reports as specified in Section 01300.
   15) Additional Requirements: As specified in individual Product specification sections.
   16) Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

H. Instruction of Owner Personnel:
   1) Before final inspection, instruct Owner's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.
   2) For equipment requiring seasonal operation, perform instructions for other seasons within six months.

3) Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
4) Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

I. Submittals:
1) Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of work. Architect/Engineer will review draft and return one copy with comments.
2) For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
3) Submit one (1) copy of completed volumes fifteen (15) days prior to final inspection. This copy will be reviewed and returned after final inspection with Architect/Engineer comments. Revised content of all document sets as required prior to final submission.
4) Submit two (2) sets of revised final volumes in final form within 10 days after final inspection.

2. **PRODUCTS** (Not Used).

3. **EXECUTION** (Not Used).

-END OF SECTION-

SECTION 01740
WARRANTIES

1. **GENERAL:**
   A. Section Includes:
      1) Preparation and submittal of warranties.
      2) Time and schedule of submittals.

   B. Related Sections:
      1) General Conditions.
      2) Section 01700 - Project Closeout: Project closeout procedures.
      3) Section 01730 - Operation and Maintenance Data.
      4) Individual Specification Sections: Warranties required for specific Products of Work.

   C. Form of Submittals:
      1) Bind in commercial quality 8-1/2 x 11 inch, three ring binders with durable plastic covers.
      2) Cover: Identify each binder with typed or printed title WARRANTIES with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
      3) Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of Product or work item.
      4) Separate each warranty with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

   D. Preparation of Submittals:
      1) Obtain warranties executed in duplicate by responsible Subcontractors, supplier, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.
      2) Verify that documents are in proper form, contain full information, and re notarized.
      3) Co-execute submittals when required.
      4) Retain warranties until time specified for submittal.

   E. Time of Submittals:
      1) For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten (10) days after acceptance.
      2) Make other submittals within ten (10) days after Date of Substantial Completion, prior to final Application for Payment.
      3) For items of Work for which acceptance is delayed beyond the Date of Substantial Completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.

2. **PRODUCTS:** (Not Used).

3. **EXECUTION:** (Not Used).

-END OF SECTION-

SECTION 02072
MINOR DEMOLITION FOR REMODELING

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material required to identify, remove, dispose of and patch existing work as indicated or as required for new work and finishes. Work includes, but is not limited to:
      a. Remove all existing interior work including partitions, floor and wall finishes, electrical, mechanical and plumbing devices, conduits, piping, wiring, etc. from floor to underside of roof deck as indicated on the drawings or as required to install the new work.
      b. Remove portions of existing work as required to install new work whether or not indicated.
      c. Remove and reinstall work where existing work remains, but interferes with proper installation of new work.
      d. Patch/repair existing items as required following installation of new work.

   B. Related Sections
      1) Section 01045 - Cutting and Patching.
      2) Section 01700 - Project Closeout: Project Record Documents.

   C. Submittals: (Not Required).

   D. Standards:
      1) Conform to applicable code for demolition work, dust control, products requiring disconnection and re-connection of utilities.
      2) Obtain required permits from authorities.
      3) Do not close or obstruct egress width to any building or site exit.
      4) Conform to procedures applicable when hazardous or contaminated materials are discovered.

2. **PRODUCTS:** (Not Used).

3. **EXECUTION:**
   A. Preparation:
      1) Provide, erect, and maintain temporary barriers at locations appropriate to the work.
      2) Erect and maintain weatherproof closures for exterior openings.
      3) Erect and maintain temporary barriers to prevent the spread of dust, odors, and noise to permit continued Owner occupancy, when required.
      4) Protect new and existing materials which are not to be demolished.
      5) Prevent movement of structure; provide bracing and shoring.
      6) Notify affected utility companies before starting work and comply with their requirements.
      7) Mark location and termination of utilities.
      8) Provide appropriate temporary signage including signage for exit or building egress.

   B. Demolition:
      1) Disconnect, remove, cap, and identify designated utilities within demolition areas.
      2) Demolish in an orderly and careful manner. Protect existing supporting structural members.
      3) Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
      4) Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
      5) Remove temporary Work.

-END OF SECTION-

SECTION 03300
CAST-IN-PLACE CONCRETE

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material to provide and install cast-in-place concrete as indicated or as required for a complete project. Contractor shall also provide all testing and inspection of cast-in-place concrete work to demonstrate compliance with specifications. Work includes, but is not limited to:
      1) Slabs on grade.
      2) Interior and exterior slabs, housekeeping pads or protective encasement required for mechanical and electrical materials or equipment.
      3) Miscellaneous concrete work for cutting & patching, utilities or as otherwise required.
      4) Installation or embedment of all sleeves, attachments or other items provided by other trades for their work.
      5) Sealing of exposed concrete slabs and joints.
      6) All required accessories.
      7) Miscellaneous concrete work for utilities or as otherwise required.

   B. Related Sections:

   C. Definitions:
      1) Cementitious Materials: Portland cement alone or in combination with one or more of the following: fly ash and other pozzolans; subject to compliance with requirements.

   D. Submittals: Submit the following to the Architect & Engineer for approval.
      1) General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
      2) Product Data: For each type of product indicated.
      3) Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
         a. Indicate amounts of mixing water to be withheld for later addition at Project site.
      4) Provide slump and cylinder test results for concrete materials.
      5) Provide data on joint devices, attachment accessories, admixtures.
      6) Steel Reinforcement Shop Drawings: Prepare shop drawings in accordance with ACI 315. Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Include special reinforcement required for openings through concrete structures and dimensioned opening locations. Include applicable dimensions, sections, elevations, and details required to complete installation and coordination of the details, and typical details. Plan shall be drawn at a scale of no less than 1/8" per foot.
      7) Qualification Data: For Installer, manufacturer, testing agency.
      8) Material Certificates: For each of the following, signed by manufacturers:
         a. Cementitious materials.
         b. Admixtures.
         c. Form materials and form-release agents.
         d. Steel reinforcement and accessories.
         e. Waterstops.
         f. Curing compounds.

g. Bonding agents.
h. Adhesives.

9) Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   a. Aggregates.
10) Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
11) Field quality-control reports.

E. Submittals for Project Closeout:
   1) Accurately record the actual locations of embedded utilities and components in concrete work which are concealed from view.

F. Quality Assurance:
   1) Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
   2) Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
      a. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
   3) Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
      a. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
      b. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
   4) Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
   5) ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
      a. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
      b. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
      c. ACI 318, "Building Code Requirements for Reinforced Concrete."
      d. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
   6) Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
   7) Preinstallation Conference: Conduct conference at Project site.
      a. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
         (1) Contractor's superintendent.
         (2) Independent testing agency responsible for concrete design mixtures.
         (3) Ready-mix concrete manufacturer.
         (4) Concrete subcontractor.
         (5) Special concrete finish subcontractor.
      b. Review special inspection and testing and inspecting agency procedures for field quality

control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

G. Delivery, Storage, and Handling:
   1) Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
   2) Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

2. **PRODUCTS:**
   A. Form Facing Materials:
      1) Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
         a. Plywood, metal, or other approved panel materials.
         b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
            (1) High-density overlay, Class 1 or better.
            (2) Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
            (3) Structural 1, B-B or better; mill oiled and edge sealed.
            (4) B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
      2) Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
      3) Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
         a. Formulate form-release agent with rust inhibitor for steel form-facing materials.
      4) Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
         a. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
         b. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
         c. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

   B. Reinforcement:
      1) Steel Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
      2) FRP Reinforcing Bars: As Indicated.
      3) Plain-Steel Wire: ASTM A 82/A 82M.
      4) Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

   C. Reinforcement Accessories:
      1) Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive

strength than concrete and as follows:
a. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

D. Concrete Materials:
1) Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
a. Portland Cement: ASTM C 150, Type I or Type II. Supplement with the following:
(1) Fly Ash: ASTM C 618, Class F.
2) Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.
a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
b. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
3) Water: ASTM C 94/C 94M and potable.

E. Admixtures:
1) Air-Entraining Admixture: ASTM C 260.
2) Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
a. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
b. Retarding Admixture: ASTM C 494/C 494M, Type B.
c. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
d. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
e. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
f. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Waterstops:
1) Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

G. Vapor Retarder: Refer to Specification Section 07191 - Vapor Retarders.

H. Curing Materials:
1) Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
2) Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
3) Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
4) Water: Potable.
5) Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating, certified by curing compound manufacturer to not interfere with bonding of finished floor covering.

I. Related Materials:
1) Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
2) Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
3) Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing

and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   a. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
4) Premolded Joint Material: ASTM D 994- preformed types.

J. Concrete Mixtures, General:
1) Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   a. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
2) Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   a. Fly Ash: 25 percent.
   b. Combined Fly Ash and Pozzolan: 25 percent.
3) Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
4) Admixtures: Use admixtures according to manufacturer's written instructions.
   a. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   b. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   c. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a watercementitious materials ratio below 0.50.

K. Concrete mixtures for building elements:
1) Proportion normal-weight concrete mixture as follows:
   a. Minimum Compressive Strength: As indicated at 28 days.
   b. Maximum Water-Cementitious Materials Ratio: 0.50 for 3000 psi concrete, 0.45 for 3500 psi concrete.
   c. Slump Limit: 4 inches except 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
   d. Air Content: For perimeter and exterior footings and foundations 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

L. Fabricating Reinforcement: Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

M. Concrete mixing:
1) Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
   a. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

3. **EXECUTION:**
A. Formwork:
1) Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can

support such loads.

2) Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
3) Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
   a. Class C, ½ inch (13mm) tolerances for other concrete surfaces not otherwise noted.
4) Construct forms tight enough to prevent loss of concrete mortar.
5) Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
   a. Install keyways, reglets, recesses, and the like, for easy removal.
   b. Do not use rust-stained steel form-facing material.
6) Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
7) Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
8) Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
9) Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
10) Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
11) Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

B. Embedded Items:
   1) Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
      a. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

C. Removing and Reusing Forms:
   1) General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
   2) Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
   3) When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

D. Vapor Retarders:
   1) Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
      a. Lap joints 6 inches and seal with manufacturer's recommended tape.

E. Steel Reinforcement:
   1) General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
      a. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
   2) Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
   3) Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   4) Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
   5) Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Joints:
   1) General: Construct joints true to line with faces perpendicular to surface plane of concrete.
   2) Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
      a. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
      b. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
      c. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   3) Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
      a. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide by ¼ of the slab thickness joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
   4) Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
      a. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
      b. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

G. Waterstops:
   1) Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

H. Concrete Placement:
   1) Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
   2) Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
   3) Before test sampling and placing concrete, water may be added at Project site, subject to

limitations of ACI 301.
   a. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
4) Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   a. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   b. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   c. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
5) Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   a. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   b. Maintain reinforcement in position on chairs during concrete placement.
   c. Screed slab surfaces with a straightedge and strike off to correct elevations.
   d. Slope surfaces uniformly to drains where required.
   e. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
6) Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   a. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
   b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   c. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
7) Hot-Weather Placement: Comply with ACI 301 and as follows:
   a. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   b. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

I. Finishing Formed Surfaces:
1) Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities. Apply to concrete surfaces not exposed to view.
   a. Apply to concrete surfaces not exposed to view.
2) Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and

defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   a. Apply to concrete surfaces exposed to view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
3) Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

J. Finishing Floors and Slabs:
1) General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
2) Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   a. Apply float finish to surfaces indicated or to receive trowel finish.
3) Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   a. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   b. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface.
      (1) Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

K. Miscellaneous Concrete Items:
1) Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
2) Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
3) Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

L. Concrete Protecting and Curing:
1) General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
2) Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
3) Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms.

If removing forms before end of curing period, continue curing for the remainder of the curing period.

4) Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
5) Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   a. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      (1) Water.
      (2) Continuous water-fog spray.
      (3) Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
   b. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
      (1) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
      (2) Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
      (3) Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
   c. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period. Do not apply curing compound to any concrete surface intended to receive floor finishes.
      (1) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

M. Concrete Surface Repairs:
   1) Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
   2) Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
   3) Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
      a. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
      b. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

c. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

4) Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
   a. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
   b. After concrete has cured at least 14 days, correct high areas by grinding.
   c. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
   d. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
   e. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
   f. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
   g. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
5) Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
6) Repair materials and installation not specified above may be used, subject to Architect's approval.

N. Special Inspections:
1) Special Inspections and tests shall be performed by the Special Inspector or Special Inspection Agency.
2) Verification and inspection of concrete construction shall be in accordance with the building code and as follows:
   a. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
      (1) Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
         (i) When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches if fewer than five are used.

(2) Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
(3) Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
(4) Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
(5) Compression Test Specimens: ASTM C 31/C 31M.
(i) Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
(6) Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
(i) A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
(ii) Strength of east concrete mixture will be satisfactory if every average of any three consecutive compressive-strength test value falls below specified compressive strength by more than 500 psi.
(7) Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.
(8) Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
(i) Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis.
(9) Additional Tests: Additional tests and Inspections shall be made of concrete when test results indicate that slump, air entrainment compressive strengths, or other requirements have not been met.

b. Inspections: Perform inspections of the work to verify compliance with the requirements of the contract documents, including the following:
(1) Steel reinforcement placement.
(2) Steel reinforcement welding.
(3) Headed bolts and studs.
(4) Use of required design mixture.
(5) Concrete placement, including conveying and depositing.
(6) Curing procedures and maintenance of curing temperature.
(7) Concrete batch plant and review procedures for maintaining proper mix proportions and proper mix techniques.
(8) Concrete delivery tickets at time of delivery to assure conformance to ACI 318.

3) Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
4) Additional testing and inspecting will be performed to determine compliance of replaced or additional work with specified requirements at the Contractor's expense.

-END OF SECTION-

SECTION 03506
FLOOR-LEVELING UNDERLAYMENT

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to install floor-leveling underlayment as indicated or as required to prepare uneven, irregular or otherwise unsuitable surfaces for new finishes. Work includes but is not limited to:
      1) Application of site mixed, Portland cement-based floor leveling underlayment / patching compound.
      2) Preparation of existing flooring surfaces as required.

   B. References:
      1) ASTM E286 - Test Method for Surface Flammability of Building Materials Using an 8 Foot Tunnel Furnace.

   C. Submittals:
      1) Section 01000 - General Requirements - Procedure for Submittals.
      2) Submit under provisions of Section 01300.
      3) Product Data: Provide physical characteristics and product limitations.
      4) Manufacturer's Instructions: Indicate mix instructions.
      5) Certificate: Certify that products meet or exceed specified requirements.

   D. Quality Assurance:
      1) Applicator: Company specializing in performing the work of this Section with minimum one year experience approved by manufacturer.

   E. Regulatory Requirements:
      1) Conform to applicable code for combustibility or flame spread requirements.

   F. Environmental Requirements:
      1) Do not install underlayment until floor penetrations and peripheral work are complete.
      2) Maintain minimum ambient temperatures of 50 degrees F (10 degrees C) 24 hours before, during and 72 hours after installation of underlayment.
      3) During the curing process, ventilate spaces to remove excess moisture.

   G. Delivery, Storage & Handling:
      1) Deliver materials in manufacturers unopened original packaging and protect from extreme termpeatures and moisture. Protect liquids from freezing. Inspect all packages for damage.
      2) Store primers and sealants in cool dry location with ambient temperature range of 60°F to 80°F.

2. **PRODUCTS**
   A. Manufacturers:
      1) Ardex Engineered Cements, (www.ardex.com), Aliquippa, PA (724) 203-5000. Product- K-15 or approved equal. Note: Ardex is highly recommended by Armstrong and Mannington Flooring Manufacturers.
      2) Silpro Corporation, (www.silpro.com), Ayer, MA (800) 343-1501. Product- Masco Latex Flooring Cement.

   B. Materials:
      1) Underlayment: Portland cement-based mix.

2) Water: Potable and not detrimental to underlayment mix materials.
3) Primer: Manufacturer's recommended type.
4) Joint and Crack Filler: Manufacturer's recommended type.
5) Welded Wire Fabric: ASTM A185, welded steel wire fabric.

C. Mixing:
1) Site mix materials in accordance with manufacturer's instructions.
2) Mix to achieve following characteristics:
a. Compressive Strength: 3,000 psi minimum.
b. Fire Hazard Classification: Flame/Smoke rating of 0/0 in accordance with ASTM E286.

3. **EXECUTION**

A. Examination:
1) Determine where floor leveling is required based on:
a. Architect's requirements for flat and level floor conditions,
b. Floor finish material manufacturer' recommendations and/or requirements for a level and solid substrate,
c. Poor existing conditions that would normally require refinishing for a new project.

B. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum bi-products, or other compounds detrimental to underlayment material's ability to bond to substrate.

C. Preparation:
1) Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.
2) Vacuum clean surfaces.
3) Prime substrate in accordance with manufacturer's instructions. Allow to dry.
4) Close floor openings.

D. Application:
1) Install underlayment in accordance with manufacturer's instructions.
2) Place to nominal thickness indicated or scheduled; feather-edge to maximum 3/8 thickness.
3) Place before partition installation.

E. Curing: Air cure in accordance with manufacturer's instructions.

F. Application Tolerance: Top Surface: Level to 1/8 inch in 10 ft.

G. Protection of Finished Work: Do not permit traffic over unprotected floor underlayment surfaces.

-END OF SECTION-

SECTION 05500
METAL FABRICATIONS

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material to provide and install miscellaneous structural steel and shop fabricated steel items as indicated or as required for a complete project. Work includes, but is not limited to:
      1) Laser supports (where required by drawings).
      2) Miscellaneous metal items.

   B. Submittals:
      1) Submit under provisions of Section 01300.
      2) Submit shop drawings detailing fabrication of structural steel components, including connections, splices, holes, welds, and bolts.

   C. Standards: Comply with applicable provisions of the following specifications and documents:
      1) AISC's "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design."
      2) ASTM A6 (ASTM A6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
      3) Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
      4) Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code-Steel." Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
      5) American Iron and Steel Institute (AISI) Specification for the Design of Cold Formed Steel Structural Members, 1986 edition & 1989 addendum.
      6) American Society Of Testing Materials (ASTM) Specifications. 653 Standard Specification for Sheet Steel, Zinc (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process. C-955 Standard Specification for Load Bearing (Transverse and Axial) Steel Studs, Runner (Track) and Bracing and Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases.

   D. Delivery, Storage and Handling:
      1) Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
      2) Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.

2. **PRODUCTS:**
   A. Materials:
      1) Structural Steel Shapes, Plates, and Bars: ASTM A36 (ASTM A36M), carbon steel.
      2) Cold-Formed Structural Steel Tubing: ASTM A500, Grade B.
      3) Anchor Rods, Bolts, Nuts, Washers: ASTM A36 (ASTM A36M).
      4) Cold Formed Load Bearing Metal Framing: 16 gauge, from steel that corresponds to minimum requirements of AISI (1986, 1989 addendum)
      5) Ladders: ANSI A14.3.
      6) High-Strength Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers, uncoated.

7) Welding Materials: AWS D1.1; type required for materials being welded.
8) Primer: SSPC-Paint 25; alkyd primer.
9) Nonmetallic, Shrinkage-Resistant Grout: Premixed, ASTM C1107, of consistency suitable for application.

3. **FABRICATION:**

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

B. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

C. Shop install and tighten non-high-strength bolts, except where high-strength bolts are indicated.

D. Shop install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
1) Connection Type: Snug tightened, unless indicated as slip-critical, direct-tension, or tensioned shear/bearing connections.

E. Cold Formed Structural Metal Framing: All galvanized studs, joists, track, bridging and accessories shall be formed from steel having a galvanized coating meeting the requirements of ASTM A 653.

F. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

G. Shop Priming: Shop prime steel, except surfaces embedded in concrete or mortar, and surfaces to be field welded.
1) Surface Preparation: SSPC-SP 2 "Hand Tool Cleaning" or SSPC- SP 3 "Power Tool Cleaning."
2) Priming: Immediately after surface preparation, apply primer to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

4. **EXECUTION**

A. Verify that field conditions are acceptable and are ready to receive new work.

B. Provide lintel sizes in accordance with Lintel Schedule indicated on Drawings.

C. Install items plumb and level, accurately fitted, free from distortion or defects.

D. Erect Structural Steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

E. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

F. Base Plate and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates and set on wedges, shims, or setting nuts as required. Tighten anchor bolts, cut off wedges or shims flush with edge of base or bearing plate, and pack grout solidly between bearing surfaces and plates.

G. Erection Tolerances: Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges." Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts." Connection Type: Snug tightened, unless indicated as slip- critical, direct-tension, or tensioned shear/bearing connections.

H. Welded Connections:
   1) Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

I. Quality Control: Owner may engage an independent testing and inspecting agency to perform shop and field inspections and tests and to prepare test reports.
   1) Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.
   2) Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
   3) High-strength bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
   4) In addition to visual inspection, welded connections will be inspected and tested according to AWS D1.1 procedures.

-END OF SECTION-

SECTION 06100
ROUGH CARPENTRY

1. **GENERAL**
   A. Scope: Furnish and install all rough carpentry and related work as indicated or required for a complete project. Work includes but is not limited to:
      1) Structural wood support and blocking required for openings, supporting equipment, and for work of others.
      2) All required plywood back boards for mounting equipment.
      3) All rough hardware, inserts, anchors, related metal components, and other related items required for work of this Section.
      4) Miscellaneous wood blocking, framing, nailing strips, nailing inserts, sheathing, and related items required for all trades, including wood preservative treatments and applications where required.
      5) Other usual items of normal rough carpentry work indicated or necessary for the proper completion of the project.
      6) Wood framing and blocking specified under this section and metal studs specified in Section 09260 - Gypsum Board Systems may be substituted for each other in non-structural locations. See Architect for approval.
      7) Each trade is responsible to verify that all rough carpentry will be provided and installed to meet his requirements. Where provisions are not made with the carpentry contractor, the trade requiring the rough carpentry shall provide and install his own rough carpentry. These trades include but are not limited to:
         a. Finish carpentry and millwork.
         b. Doors, windows and frames.
         c. Gypsum board systems.
         d. Fire extinguishers.
         e. Electrical.
         f. Mechanical.

   B. Submittals: None.

   C. Standards:
      1) AFPA - American Forest and Paper Association (T10) - Wood Frame Construction Manual.
      2) AITC - American Institute of Timber Construction - Construction manual.
      3) APA - American Plywood Association.
      4) ASTM C 79/C 79M - Standard Specification for Treated Core and Nontreated Core Gypsum Sheathing Board.
      5) ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
      6) AWPA - American Wood Protection Association (U1) - All Timber Products Preservative Treatment by Pressure Process.
      7) AWPA- American Wood Protection Association (U1) - Preservative Treatment by Pressure Processes.
      8) AWPA - American Wood Protection Association (U1) - Structural Lumber Fire Retardant Treatment by Pressure Process.
      9) PS 1- National Institute of Standards and Technology (Department of Commerce) - Construction and Industrial Plywood.
      10) WWPA - Western Wood Products Association.

   D. Coordination: Coordinate work of this section with all trades.

2. **PRODUCTS**
   A. Wood Materials:
      1) Lumber Grading Rules: AITC, WWPA.
      2) Structural Framing (including studs, headers, joists, rafters): Douglas Fir species, #2 grade or better, K.D. to 15% maximum moisture content.
      3) Non Bearing Studs: Douglas Fir species, construction grade or better, K.D. to 15% maximum moisture content.
      4) Miscellaneous Framing and Blocking: Douglas Fir species, 19 percent maximum moisture content, pressure preservative treat where exposed to weather or masonry.
      5) Plywood:
         a. APA Structural I, Grade C-D; Exposure Durability 1; sanded where exposed to view.
         b. APA Structural I, Grade A-C, Exposure Durability 1; sanded where exposed to view.
         c. Marine Plywood, Grade C-C; Exposure Durability 1.
      6) Laminated Veneer Lumber (LVL): Minimum E=2,000,000 psi; minimum allowable fiber stress (Fb)=2,800 psi; similar or equal to 2.0E G-P LAM LVL by Georgia Pacific (www.gp.com).

   B. Rough Hardware:
      1) Provide all rough hardware required to complete this work and to attach this work in a secure and rigid manner to work of other trades, including all inserts, anchors, anchor bolts, lagbolts, screws, washers, nails, and other rough hardware.
      2) All rough hardware for exterior use, for use as blocking at exterior aluminum and glass enclosures or to be exposed in the finished interior, shall be hot-dip galvanized or non-ferrous.
      3) Concealed interior rough hardware may be unpainted.
      4) Rough hardware shall be of appropriate type and of proper capacity and size as required for each specific application.

   C. Factory Wood Treatment: For all lumber in contact with concrete slabs on grade, concrete or masonry walls, or for use as edgings, blockings, nailers, cants, curbs, etc., at exterior locations:
      1) Preservative Treated Wood: Pressure treatment with waterborne preservatives shall meet AWPA Standard U1 (current edition) to the requirements for AWPA Use Category 3B (UC3B) or higher.
      2) Wood Preservative Surface Application: Clear, wood preservative type, manufactured by Osmose or equal.

3. **EXECUTION**
   A. The rough carpentry work required shall include all work of rough carpentry nature required throughout the project to complete the work. All rough carpentry work shall be placed in accordance with requirements of Contractors making use of rough carpentry for attachment of their work.

   B. Drawings are schematic. Place and build up wood blocking in sizes and quantities as required to properly locate and support attached work. Contractor will not be compensated for wood blocking required but not shown on the drawings.

   C. New work shall be installed as required to support, reinforce and finish out with existing work.

   D. Provide temporary support or shoring of existing work as required where new work occurs.

   E. Where indicated or reasonably required wood blocking has been mislocated or left out, Contractor

shall remove new work and properly install rough carpentry and surrounding materials at his sole cost.

F. Construct all rough carpentry work plumb, level, and true, with tight, close-fitting joints, securely attached and braced to surrounding construction.

G. Place horizontal members, crown side up.

H. Provide metal framing components where indicated or as required to support wood framing or blocking. Brace metal framing and secure to structure to make rigid.

I. Secure sheathing to solid substrate, furring or framing members with ends over firm bearing.

J. Paint equipment backboards prior to installation of attached equipment.

-END OF SECTION-

SECTION 06410
CUSTOM CASEWORK

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install all custom casework as indicated or as required for a complete project. Work includes, but is not limited to:
      1) Production and/or custom fabricated "European Style" base and overhead cabinet units.
      2) Cabinet, countertop and worksurface hardware and accessories (grommets, support brackets, etc.)
      3) Under counter file cabinets.
      4) Fascia/soffit panels at cabinets as indicated.
      5) Preparation for installing utilities.
      6) Trimming out and sealing at all joints.

   B. Standards:
      1) ANSI A135.4 - Basic Hardboard.
      2) ANSI A208.1 - Mat Formed Wood Particleboard.
      3) AWI (Architectural Woodwork Institute) - Quality Standards.
      4) BHMA A156.9 - Cabinet Hardware.
      5) FS MMM-A-130 - Adhesive, Contact.
      6) HPMA (Hardwood Plywood Manufacturer's Association) HP - American Standard for Hardwood and Decorative Plywood.
      7) NEMA (National Electric Manufacturers Association) LD3 - High Pressure Decorative Laminates.
      8) NHLA (National Hardwood Lumber Association).
      9) PS 1 - Construction and Industrial Plywood.
      10) PS 20 - American Softwood Lumber Standard.
      11) NAAMM - Finishes for Stainless Steel AMP 503.

   C. Submittals:
      1) Submit under provisions of Section 01300.
      2) Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
      3) Product Data: Provide data for hardware accessories.
      4) Samples: Submit one (1), 6x6 inch size sample, illustrating cabinet finish.
      5) Samples: Submit one (1), 6x6 inch size sample, illustrating each type counter top material, edges and finish.
      6) Samples: Submit three (3) samples of door pulls, hinges and cabinet locks, illustrating hardware type and finish.

   D. Quality Assurance:
      1) Perform work in accordance with AWI Custom quality.
      2) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

   E. Delivery, Storage, & Protection: Protect units from moisture and damage.

   F. Field Measurements: Verify that field measurements are as indicated on drawings.

   G. Coordination: Coordinate the work with mechanical, electrical, telephone and security rough-ins,

installation of associated and adjacent components.

H. Warranty:
1) Provide minimum one (1) year warranty on all Custom Casework.

2. **PRODUCTS**

A. Wood Materials:
1) Hardwood Lumber: graded in accordance with AWI Custom; average moisture content of 6 percent; species and grade for laminate.

B. Panel Materials:
1) Wood Particleboard: ANSI A208.1 standard, composed of wood chips, medium density, made with high waterproof resin binders; or grade to suit application; sanded faces, all surfaces laminated. Located as follows:
a. Door and Drawer Fronts.
b. Drawer Construction.
c. Gables and Backs.
d. Cabinet Shelving.
e. Cabinet Sidewalls, valances and backsplash.
f. Plastic laminated countertops without sinks.
2) Marine Plywood: to be used as substrate at all countertops with sink locations and at all cabinet base locations where cabinet panels rest on the floor (i.e. toe/kickspaces). No substitutions to marine plywood will be permitted as this is a Health Code requirement at sink locations.

C. Laminate Materials:
1) Plastic Laminate:
a. General Use and Postforming: NEMA LD 3, General Purpose and Postforming types (H-5 and HF-4 grades); color, pattern, and matte surface texture, as indicated.
b. UL Listed Fire Rated: NEMA LD 3, ,048" Horizontal Grade (H-4).
2) Laminate Backing Sheet: LD-3 BK20 backing grade, undecorated plastic laminate.
3) Low Pressure Laminate: Melamine; white color, solid pattern; and matte surface texture.

D. Edging Materials:
1) Shelves, doors, and drawers:
a. Square edge Thin PVC edge banding (min .018"), color to match adjacent finish, as selected by Architect, or as described on drawings.
b. Manufacturers: Equal to:
i) Canplast (www.canplast.com), a Surteco brand, (800) 577-9555.
ii) Döellken, (www.na.doellken.com), a Surteco brand, (800) 461-0061.

E. Accessories:
1) Adhesive: Type recommended by laminate and PVC edgebanding manufacturer to suit application.
2) Fasteners: Size and type to suit application.
3) Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; finish in concealed locations and brass finish in exposed locations.
4) Concealed Joint Fasteners: Threaded steel.
5) Grommets: Metal material for cut-outs sized as indicated, color: Satin Nickel.

F. Hardware:

1) Shelf Standards and Rests: Brass pins and rests, cut for fitted rests spaced at 2 inch centers.
2) Door Pulls: “Mocket - DP3A, Color: Satin Nickel”
3) Cabinet Door and Drawer Catches: Magnetic.
4) Removable Panel Catches: Double roller type.
5) Hinges: Knuckle disappearing type at cabinets, steel with satin finish.
6) Drawer Slides: “Accuride” (www.accuride.com), (562) 903-0200 or approved equal. Medium duty full extension metal ball bearing slides w/ 100 lb capacity.
7) Inside Wall Mount Undercounter Support Brackets: “Rakks"(www.rakks.com), (800) 826-6006. Model: #EH-1818FM, Color: Off White.
8) Undercounter Wire Management: “Thomas and Betts"(www.tnb.com), (800) 816-7809. Model: #TY2X4WPG6, Color: Grey

G. Wood Fabrication:
1) Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
2) Cap exposed plastic laminate finish edges with material of same plastic laminate finish and pattern.
3) Apply trim and moldings tight and snug to cabinet panels and joints.
4) Door Fronts: 3/4 inch thick; flush style.
5) When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
6) Apply plastic laminate finish in full uninterrupted sheets to all exterior cabinet surfaces as well as to the entire cabinet door construction, consistent with manufactured sizes. Fit corners and joints hairline and seal. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
7) Apply laminate backing sheet to reverse side of plastic and metal laminate finished surfaces.
8) Mechanically fasten back splash to countertops with steel brackets at 16 inches on center where the backside of finished backsplash is exposed to view and unable to maintain a secure and rigid connection at countertop and wall surface.
9) Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal cut edges.
10) Field assembly of light valances and light valance returns will be permitted for cabinetry without exposed finished ends. Where a finished end is exposed to view, end cabinet & valance shall be constructed so that plastic laminate is applied in a full uninterrupted sheet on both surfaces without a seam.

3. EXECUTION

A. Examination:
1) Verify adequacy of backing and support framing in partitions.
2) Verify location and sizes of utility rough-in associated with work of this section.

B. Installation:
1) Set and secure casework in place; rigid, plumb, and level.
2) Use fixture attachments in concealed locations for wall mounted components.
3) Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
4) Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
5) Secure cabinet and counter bases to floor using appropriate angles and anchorages.
6) Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

7) Seal all joints with adjacent work.
8) Provide cutouts for field installed fixtures and equipment by others. Verify locations of cutouts. Seal cut edges.
9) Install grommets above phone/data/power outlets in locations approved by the Owner.

C. Adjusting: Adjust moving or operating parts to function smoothly and correctly.

D. Cleaning: Clean casework, counters, shelves, hardware, fittings, and fixtures.

E. Laminate Schedule:
1) Cabinet Exteriors: Indicated on drawings.
2) Cabinet Interiors: Low pressure laminate.
3) Plastic Laminate Light Valance: Indicated on drawings.

-END OF SECTION-

SECTION 06550
SOLID SURFACING

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install all solid surfacing countertop work as indicated or as required for a complete project. Work includes but is not limited to:
      1) Production and/or custom fabricated counter tops & work surfaces.
      2) Trimming out and sealing at all joints.

   B. Standards:
      1) NEMA (National Electric Manufacturers Association) LD3-3 - Solid Surfacing

   C. Submittals:
      1) Submit under provisions of 01300.
      2) Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
      3) Product Data: Provide data for product and accessories.
      4) Samples: Submit one (1) 12x12 inch size sample, illustrating each type counter top material, edges and finish.

   D. Quality Assurance:
      1) Perform work in accordance with manufacturers specifications.
      2) Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

   E. Delivery, Storage, & Protection: Protect units from moisture and damage.

   F. Field Measurements: Verify that field measurements are as indicated on drawings.

   G. Coordination: Coordinate the work with mechanical, electrical, telephone and security rough-ins, installation of associated and adjacent components.

2. **PRODUCTS**
   A. Solid Surfacing Materials:
      1) Surfaces to be Corian solid surfaces: manufactured by DuPont or equal, (www.dupont.com/corian) 1-800-4-CORIAN (800) 426-7426
      2) Comply with NEMA LD 3-3; color, pattern, and matte surface texture, as indicated.
      3) Homogeneous and non-porous.
      4) Horizontal surfaces to be min. 3/4" thick
      5) Physical properties to comply with manufacturer's standard specifications.
      6) Colors: As indicated.

   B. Accessories:
      1) Adhesive: Type recommended by solid surfacing manufacturer to suit application.
      2) Fasteners: Size and type to suit application.

3. **EXECUTION**
   A. Examination:
      1) Verify adequacy of backing and support framing in partitions.

2) Verify location and sizes of utility rough-in associated with work of this section.

B. Installation:
1) Shall be in a professional manner, in accordance with the manufacturer's instructions.
2) Set and secure solid surfaces in place; rigid, plumb, and level.
3) Carefully scribe solid surfacing abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
4) Seal all joints with adjacent work.
5) Provide cutouts for field installed fixtures and equipment by others. Verify locations of cutouts.

C. Adjusting: Adjust moving or operating parts to function smoothly and correctly.

D. Cleaning: Clean solid surfaces in accordance with manufacturer's recommendations..

E. Solid Surfacing Schedule:
1) Solid Surfacing Countertops: Indicated on drawings.

-END OF SECTION-

SECTION 07191
VAPOR RETARDERS

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material to provide and install vapor retarders as indicated or as required. Work includes but is not limited to sheet and sealant materials for controlling vapor diffusion at:
      1) Concrete slabs-on-grade.

   B. System Description:
      1) Materials and installation methods to provide continuity of vapor retarder:
         a. In conjunction with materials described in Section 03300.
         b. In conjunction with materials described in Section 07213.
         c. In conjunction with materials described in Section 09260.
         d. To seal gaps between enclosure components and opening frames.

   C. References:
      1) ASTM D 882 - Tensile Properties of Thin Plastic Sheeting.
      2) ASTM D 1709 - Impact Resistance of Plastic Film by the Free-Falling Dart Method.
      3) ASTM D 2582 - Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
      4) ASTM D 3776 - Mass Per Unit Area (Weight) of Woven Fabric.
      5) ASTM D 4833 - Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
      6) ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
      7) ASTM E 154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
      8) ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials.
      9) ASTM E 1745 - Standard Specification for Water Vapor Retarders Used in Contact With Soil or Granular Fill Under Concrete Slabs.
      10) NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

   D. Submittals:
      1) Submit under provisions of Section 01300.
      2) Product Data: Provide data on material characteristics.
      3) Manufacturer's Installation Instructions: Indicate Preparation.

   E. Delivery, Storage & Handling:
      1) Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
      2) Store materials in a clean, dry area in accordance with manufacturer's instructions.
      3) Protect materials during handling and installation to prevent damage.

2. **PRODUCTS**
   A. Sheet Materials:
      1) Sheet Retarder Type 1: Refinforced Polyethylene film for above grade application, 6-8 mil thick, with a maximum permeance rating of 0.030. Materials equal to:
         a. Raven Industries Inc. (www.ravenind.com), Sioux Falls, SD. 1-800-635-3456. Product: Dura Skrim 6WW #R6WWK.
         b. Reef Industries, Inc. (www.reefindustries.com), Houston, TX. 1-800-231-6074. Product: Griffolyn Type-65.

2) Sheet Retarder Type 2: Class A, High-strength co-extruded polyolefin membrane for below grade and underslab application with a maximum permeance rating of 0.011. Equal to:
   a. Raven Industries Inc. (www.ravenind.com). Product: VaporBlock 15.
   b. Reef Industries, Inc. (www.reefindustries.com). Product: Griffolyn 15 Mil Green.
   c. Stego Industries LLC (www.stegoindustries.com), San Clemente, CA. (877) 464-7834. Product: Stego Wrap 15-mil Vapor Barrier.

B. Accessories:
   1) Ensure accessories are from same manufacturer as vapor retarder.
   2) Tape: As recommended and approved by manufacturer, compatible with sheet material.
   3) Self-Adhesive Repair Tape: As recommended and approved by manufacturer.
   4) Pipe Boots: Factory fabricated, as recommended and approved by manufacturer.

3. **EXECUTION**

A. Examination:
   1) Verify condition of substrate and adjacent materials.
   2) Examine areas to receive vapor retarders. Notify Architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

B. Examination and Preparation:
   1) Level and tamp or roll aggregate, sand or tamped earth base.
   2) Remove loose or foreign matter which might impair adhesion or cause punctures.

C. Installation:
   1) Install materials in accordance with manufacturer's instructions and in accordance with ASTM E 1643.
   2) Vapor Retarder For Stud Framed Walls:
      a. Install vapor retarders continuously at locations on walls as indicated on the drawings. Ensure there are no discontinuities in vapor retarder at seams and penetrations.
      b. Install vapor retarders in largest practical widths.
      c. Lap edges over stud faces, lap ends onto adjacent construction; tape ends and seal penetrations to ensure complete seal. Ensure vapor retarder surfaces to receive mastic tape are clean and dry.
      d. Immediately repair holes in vapor retarder with self-adhesive repair tape.
      e. Seal around pipes and other penetrations in vapor retarder with pipe boots in accordance with manufacturer’s instructions.
      f. Install gypsum wallboard under separate section to hold poly vapor retarder in place.

   2) Vapor Retarder For Interior Slabs-On-Grade:
      a. Grade area with fine material and remove all sharp stones or objects. Ensure subgrade beneath vapor retarder is smooth, level, and compacted with no sharp projections.
      b. Install vapor retarders continuously at locations under slab as indicated on the drawings. Ensure that there are no discontinuities in vapor retarder at seams and penetrations.
      c. Install vapor retarders in largest practical widths with the longest dimension parallel with the direction of the pour.
      d. Lap vapor retarder over footings and seal to foundation walls.
      e. Join sections of vapor retarder, overlap, and seal penetrations in vapor retarder with mastic tape in accordance with manufacturer’s instructions. Ensure vapor retarder surfaces to receive mastic tape are clean and dry.

f. Ensure there is no moisture entrapment by vapor retarder due to rainfall or ground water intrusion.
g. Immediately repair holes in vapor retarder with shelf adhesive repair tape in accordance with manufacturer's instructions.
h. Seal around pipes and other projections in vapor retarder with manufacturer pipe boots in accordance with manufacturer's instructions.
i. Place above materials with care and patch all tears in vapor retarder with additional sheet material and adhesive tape prior to pouring concrete.

3) Protection:
   a. Protect reinforced vapor retarders from damage until covered by wall finish. For underslab applications, protect vapor retarder from damage during installation of reinforcing steel and utilities and during placement of concrete slab or granular materials.
   b. Immediately repair damaged vapor retarder in accordance with manufacturer's instructions.

-END OF SECTION-

SECTION 07213
BATT INSULATION

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install batt insulation as indicated and as required for a complete project. Work includes but is not limited to:
      1) Batt acoustical insulation at metal stud framed interior partitions as indicated.

   B. System Description: Provide continuity of thermal barrier and vapor retarder at building enclosure elements as indicated; material for acoustic barrier at interior partitions.

2. **PRODUCTS**
   A. Materials:
      1) Batt Insulation: ASTM C665; preformed glass fiber batt or roll equal to Owens-Corning (www.owenscorning.com); friction fit, conforming to Flame/Smoke Properties: In accordance with ASTM E84 and NFPA 255. Thicknesses as suitable for stud cavity width, unless otherwise indicated.
      2) Wire: Steel for use at otherwise unsupported insulation.

3. **EXECUTION**
   A. Examination: Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

   B. Installation:
      1) Install insulation in accordance with insulation manufacturer's instructions.
      2) Install in metal stud wall spaces without gaps or voids. Do not compress insulation.
      3) Install in metal stud wall spaces as required to repair/replace existing when damaged or deteriorated.
      4) Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
      5) Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
      6) Retain in place, where no wall enclosure will be installed, with wire secured to framing members.

   C. Schedule:
      1) As indicated on the drawings.

-END OF SECTION-

SECTION 07270
FIRESTOPPING

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to firestop and firesafe all joints and penetrations either existing or new at all floors, smoke and/or fire rated construction, and as required for a complete project. Work includes but is not limited to firestopping and firesafing at:
      1) Floor to floor construction.
      2) Vertical shafts.
      3) New and existing smoke and fire-rated partitions.

   B. Standards:
      1) ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
      2) ASTM E119 - Method for Fire Tests of Building Construction and Materials.
      3) ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
      4) UL - Fire Hazard Classifications.
      5) UL 263 - Fire Tests of Building Construction and Materials.
      6) UL 723 - Test for Surface Burning Characteristics of Building Materials.
      7) UL 1479 - Fire Tests of Through-Penetration Firestops.

   C. Definition: Firestopping (Firesafing): Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

   D. Submittals:
      1) System Description: With the assistance of the materials manufacturer, provide a complete UL approved system description for each application of firestopping or firesafing materials. Material descriptions alone do not constitute a fire rating.
      2) Product Data: Provide data on product characteristics, performance and limitation criteria.
      3) Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
      4) Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
      5) Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

   E. Quality Assurance:
      1) A manufacturer's direct representative (not distributor or agent) shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
      2) Firestop System installation shall meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
      3) Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the Architect and Structural Engineer prior to penetrating any load bearing assembly.
      4) For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth

by the International Firestop Council.

F. Qualifications:
   1) Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   2) Applicator: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacture's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

G. Regulatory Requirements:
   1) Conform to applicable code and UL requirements for fire resistance ratings and surface burning characteristics.
   2) Provide certificate of compliance from each material or system manufacturer that their products are installed in accordance with their instructions, and achieve applicable code and UL requirements for each application

H. Delivery, Storage, and Protection:
   1) Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.
   2) Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
   3) Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
   4) Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
   5) Do not use damaged or expired materials.

I. Environmental Requirements:
   1) Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
   2) Provide ventilation in areas to receive solvent cured materials.

2. **PRODUCTS**

A. Firestopping & Firestopping Systems: Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume II of the UL Fire Resistance Directory; provide products of the following manufacturers as identified below:
   1) Manufacturers equal to:
      a. Hilti Inc, (www.us.hilti.com) 1-800-879-8000.
      b. 3M Fire Protection Products. (www.3m.com) 1-800-328-1687.
      c. Morgan Thermal Ceramics, Firemaster. (www.morganthermalceramics.com) (706)-796-4200.
      d. Tremco Construction Products, TREMstop. (www.tremcofirestop.com) 1-800-321-7906.
      e. USG, Fire Code Compound. (www.usg.com) 1-800-874-4968.
      f. Thermafiber (www.thermafiber.com) 1-888-834-2371.

   2) Materials:
      a. Use only firestop products that have been UL 1479, ASTM E 814, or UL 2079 tested for specific fire-rated construction conditions conforming to construction assembly type,

penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

b. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

c. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction being penetrated.

B. Accessories:

1) Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

2) Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

3. **EXECUTION**

A. Examination:

1) Verify openings are ready to receive the work of this section.

2) Verify that all conditions conform to the Firestopping & Firestopping System intended for use. When conditions vary from those required, consult with the product manufacturer.

3) Consult with Architect & Mechanical Engineer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

B. Preparation:

1) Verify penetrations are properly sized and in suitable condition for application of materials.

2) Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

3) Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

4) Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

5) Do not proceed until unsatisfactory conditions have been corrected.

C. Application: Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

1) Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.

2) Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

3) Apply materials in accordance with manufacturer's complete and applicable instructions.

4) Apply firestopping material in sufficient thickness to achieve rating.

5) Compress fibered material to achieve proper density.

D. Field Quality Control:

1) Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

2) Keep areas of work accessible until inspection by applicable code authorities.

3) Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

E. Adjusting and Cleaning:

1) Remove equipment, materials and debris, leaving area in undamaged, clean condition.

2) Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

F. Protection of Finished Work:
   1) Protect adjacent surfaces from damage by material installation.
   2) Protect materials from damage on surfaces subjected to traffic.

-END OF SECTION-

SECTION 07900
JOINT SEALERS

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material to provide and install all caulking and sealing work, as indicated or as required for a complete project. Caulking and sealant work is the responsibility of the General Contractor. Work includes, but is not limited to:
      1) Caulking around perimeters of interior door and fixed glass frames.
      2) Sealing of countertops and cabinet work at adjoining wall materials.
      3) Sealing of plumbing fixtures.
      4) Sealing at interior partitions required to be smoke tight.
      5) All other exterior and interior sealing indicated, or reasonably required to complete the work.

   B. Related Sections:
      1) Section 02518- Concrete Pavers: Sealants required in conjunction with pavers.
      2) Section 03300- Cast-In-Place Concrete: Sealants required in conjunction with cast-in-place concrete.
      3) Section 04300- Unit Masonry System: Sealants required in conjunction with concrete and brick unit masonry.
      4) Section 06610- Glass Fiber and Resin Fabrications: Sealants required in conjunction with fiberglass cornice and column components.
      5) Section 07270- Firestopping: Sealants required in conjunction with firestopping systems.
      6) Section 07620- Sheet Metal Flashing & Trim: Sealants required in conjunction with metal flashings.
      7) Section 08111- Hollow Metal Doors & Frames: Sealants required in conjunction with door frames.
      8) Section 08520- Aluminum Windows: Sealants required in conjunction with aluminum windows.
      9) Section 08800- Glazing: Sealants required in conjunction with glazing methods.
      10) Section 08920- Glazed Aluminum Curtain Wall System: Sealants required in conjunction with aluminum curtain wall system.
      11) Section 09260- Gypsum Board Systems: Sealants required at membrane and through penetrations of gypsum board assemblies.

   C. References:
      1) ASTM C790- Use of Latex Sealing Compounds
      2) ASTM C804- Use of Solvent-Release Type Sealants
      3) ASTM C834- Latex Sealing Compounds
      4) ASTM D1056- Flexible Cellular Materials - Sponge or Expanded Rubber
      5) ASTM D1565- Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
      6) SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification.

   D. Samples and Product Data: Submit under provisions of Section 01300. Submit to Architect for approval complete samples and manufacturer's product data sufficient to fully describe the proposed work. All colors where exposed to view as approved by Architect.

   E. Quality Assurance: All sealant work shall be performed by workmen trained and qualified to install this work. Failure to use proper materials, provide a good seal or an attractive appearance shall result in rejection of the work, requiring removal and replacement at the contractor’s sole expense. Perform

work in accordance with SWRI requirements for materials and installation.

2. **PRODUCTS**
   A. Caulking & Sealing Materials:
      1) All sealants and caulkings shall be suitable for the application intended and as recommended by associated materials manufacturers.
      2) Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board. Refer to Specification Section 09260-Gypsum Board Systems.
      3) Sealant for general exterior use on vertical surfaces or joints up to, and including, 1/2 in. wide shall be gungrade, one-part acrylic based sealant meeting Fed. Spec. TT-S-00230, Type II; equal to "Mono" by Tremco Mfg. Co. (www.tremcosealants.com), as approved by the Architect. Color as selected by Architect.
      4) Sealant for exterior and interior use on vertical surfaces for joints more - than 1/2 in. in width shall be two-part polysulfide, liquid polymer based sealant, gun-grade, non-sagging type, with ultimate Shore A Hardness of approximately 35, meeting Fed. Spec. TT-S-.00227, bearing "Seal of Approval" of Thiokol Corp. Color as selected by Architect.
      5) Caulking compound for all general interior uses not requiring acoustic performance or smoke tightness shall be acrylic-latex paintable, conforming to or exceeding Fed. Spec. TT-C-598, Type I, equal to "Tremco Caulking Compound" by Tremco Mfg. Co.(www.tremcosealants.com) , as approved by Architect.
      6) Sealant of control joints where traffic occurs shall have a shore hardness greater than 80.
      7) Primer for sealants shall be as recommended by manufacturer of each specific material.
      8) Joint Filler for Horizontal Joints: Two continuously contacting rows of closed-cell butyl rod compressed in the joint to approximately 2/3 original thickness.

3. **EXECUTION**
   A. Preparation of Joints:
      1) Remove loose materials and foreign matter which might impair adhesion of sealant.
      2) Joints shall be clean and thoroughly dry, and shall be primed where and as recommended by sealant manufacturer.
      3) All joints shall be backed with joint backing material to eliminate back bond. Joint proportions shall be as recommended by manufacturer.
      4) Perform preparation in accordance with manufacturer's instructions.
      5) Protect elements surrounding the work of this section from damage or disfiguration.

   B. Application:
      1) All work of this Section shall be in strict accordance with the sealant manufacture's printed instructions for the various materials and conditions.
      2) Measure joint dimensions and size materials to achieve 2:1 width/depth ratios.
      3) Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
      4) Sealant shall be applied by hand guns, without smearing of adjacent surfaces, and with sufficient pressure and proper nozzle size to solidly fill all voids and joints. Beads shall be tooled concave to insure smooth finish and firm, full contact with sides of joints. No application of sealant or caulking shall be undertaken at a temperature of less than 38 degrees F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
      5) Apply sealants and caulkings prior to installation of paint and wall coverings.
      6) Sealant at exterior locations shall be air and water tight.
      7) Leave all surfaces in work area clean and free of caulking waste. Remove and dispose of all excess materials and disposable tools off-site.

-END OF SECTION-

SECTION 08110
STANDARD STEEL DOORS & FRAMES

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install standard steel hollow metal doors and frames as indicated and as required for a complete project. Work includes but is not limited to non-rated, fire rated, thermally insulated steel and lead lined doors and frames as follows:
      1) Interior doors & frames, non-rated.

   B. Submittals:
      1) Submit under provisions of Section 01300.
      2) Product Data: Indicate door and frame configurations, location of cut-outs for hardware and reinforcement.
      3) Shop Drawings: Indicate door and frame elevations, hardware cut-outs, internal reinforcement, closure method, and finishes.

   C. Quality Assurance: Conform to requirements of SDI-100 and ANSI A117.1.

   D. Regulatory Requirements:
      1) ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames.
      2) ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
      3) ASTM 115- Door and Hardware Preparation.
      4) ASTM A653/ A653M - Standard Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
      5) ASTM A1008M - Standard for Cold Rolled Material.
      6) ASTM E152 - Methods of Fire Tests of Door Assemblies.
      7) Door and Hardware Institute (DHI) A115 Series- Specifications for Steel Doors and Frame Preparation for Hardware.
      8) National Association of Architectural Metal Manufacturers (NAAM/ HMMA) 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames.
      9) National Fire Protection Association (NFPA) 80 - Fire Doors and Fire Windows.
      10) NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
      11) NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.
      12) UL 10B - Fire Tests of Door Assemblies.
      13) UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies.

   E. Delivery, Storage, and Protection:
      1) Store in accordance with NAAM/ HMMA 840.
      2) Accept doors and frames on site in manufacturer's packaging. Inspect for damage.
      3) Protect with resilient packaging, avoid humidity build-up under coverings; prevent corrosion.

   F. Project Conditions:
      1) Coordinate the work with door opening construction, and door hardware installation.
      2) Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.
      3) Coordinate frame installation with size, location, and installation of service utilities.

2. **PRODUCTS**
   A. Manufacturers: Equal to:

1) Ceco Door Products, Milan, TN 1-888-232-6366 (www.cecodoor.com)
2) Steelcraft, Cincinnati, OH 1-800-930-8585. (www.steelcraft.com)

B. Steel Doors (NOT USED):
   1) Exterior Doors (NOT USED):
      a. Grade: ANSI A250.8 Level 3, physical performance level A (extra heavy duty), Model 2, seamless.
      b. Core: Rigid polyurethane foam with a minimum insulation value of R10.
      c. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/ A653M, with manufacturer's standard coating thickness.
      d. Texture: Smooth faces.
      e. Provide optional snap-in top cap.
      f. Weatherstripping: In accordance with Section 08710.
   2) Interior Doors, Non-Fire-Rated (NOT USED):
      a. Grade: ANSI A250.8 Level 2, physical performance level B (heavy duty), Model 1, full flush.
      b. Core: Mineral board.
      c. Thickness: 1-3/4 inches.
      d. Texture: Smooth Faces.
   3) Interior Doors, Fire-Rated (NOT USED):
      a. Grade: ANSI A250.8 Level 2, physical performance level B (heavy duty), Model 1, full flush.
      b. Fire Rating: As indicated on Door and Frame Schedule, tested in accordance with UL 10C (Positive Pressure).
      c. Fire Rating: As indicated on Door and Frame Schedule, with temperature rise ratings as required by Code, tested in accordance with NFPA 252.
         i) Provide units listed and labeled by UL.
         ii) Attach fire rating label to each fire rated unit.
      d. Core: Mineral board.
      e. Texture: Smooth Faces.
   4) End Closures: Channel, 0.042 inches thick minimum, inverted.

C. Steel Frame Construction:
   1) General:
      a. Comply with the requirements of grade specified for corresponding door, except:
         i) ANSI A250.8 Level 1 doors (standard duty): 16 gage frames.
         ii) ANSI A250.8 Level 3 doors (extra heavy duty): 14 gage frames.
      b. Fabricate frames as welded unit. Knock down field assembly will only be accepted in interior locations where welded unit cannot be installed. Field assembled and welded units shall be indicated on shop drawings. Include brackets and accessories as required.
         i) Field assembled frames shall be welded and ground smooth. Shop drawings shall clearly indicate splices, cuts, cold joints and accessories.
      c. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
      d. Frames wider than 48 inches: Reinforce with12 gauge steel channel full width and depth, fitted tightly into frame head, flush with top. Galvanize reinforcement where galvanized frames are provided.
         i) For frames that cannot be shipped in a single unit, the shop drawings shall indicate where the cuts will be and which alignment accessories will be used, how they will be attached to the frame and which surfaces will be field welded and ground smooth.
      e. Frames installed back-to-back: Reinforce with 12 gauge welded steel channels anchored to floor and overhead structure.
      f. Provide 45 degree hospital stops at frames where noted in door and frame schedule. Stops shall

be capped, fully welded and ground smooth.
g. Provide 'High Frequency' hinge reinforcement at all frames.
h. Provide 12 gauge continuous hinge reinforcement factory drilled and tapped at all frames where continuous hinges are intended.
i. Provide two (2) drill jigs with one (1) jig provided to frame manufacturer prior to frame fabrication. At the end of the project, the Contractor shall provide remaining drill jig to the Owner with close-out material.

2) Interior Door Frames: Face welded type.
a. Fabricate using at least one (1) tab per bent surface and each tab to be bent, tack welded. Fitment between members shall be .010" maximum gap.
b. Fire Rating: Where frames are required to be fire-rated, provide fire rating same as door, labeled.

3) Frames for interior glazing or borrowed lights: Construction and face dimensions to match door frames, and as indicated on drawings.

4) Interior Pocket Door Frame/Assembly.
a. Frame shall have an attached pocket which allows for hanging the track and then applying gypsum board to the vertical ribs on both sides. Spacing between the vertical ribs shall match the adjacent framing.
b. 16 gauge frame.
c. Manufacturer: "Karpen Steel Custom Doors & Frames - Pocket Frame With Attached Pocket" (https://karpensteel.com), or equal

D. Accessories:
1) Louvers (where indicated): Factory installed, roll formed steel with overlapping frame; Color finish to match door color.
a. Fasteners: exposed or concealed.
2) Glazing: As specified in Section 08800, factory installed.
3) Glazing beads, stops and accessories for fire rated openings shall strictly adhere to the manufacturers tested procedures, fabricator shall provide manufacturers documented complying procedures in their shop drawings.
4) Astragals for Double Doors: As specified in Section 08710.
a. Fire-Rated Doors: Steel, shape as required to accomplish fire rating.
5) Grout for Masonry Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited.
6) Silencers: Resilient rubber fitted into drilled hole. Also refer to Section 08710. Provide 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

E. Finish:
1) Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
2) Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

3. **EXECUTION**
A. Examination:
1) Verify existing conditions before starting work.
2) Verify that opening sizes and tolerances are acceptable.
B. Preparation:
1) Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.
C. Installation:
1) Install frames in accordance with SDI-100 and DHI.
2) In addition, install fire-rated units in accordance with NFPA 80.

3) Coordinate with masonry and gypsum board wall construction for anchor placement and installation.
4) Grout frames in masonry construction, using hand trowel methods; brace frames to that pressure of grout before setting will not deform frames.
5) Coordinate installation of doors and frames with installation of hardware specified in Section 08710.
6) Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.
7) Coordinate installation of glazing.
8) Touch-up factory primed doors and frames.

D. Erection Tolerances:
1) Clearances Between Door and Frame: As specified in ANSI A250.8.
2) Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

E. Adjusting: Adjust door and frame for smooth and balanced door movement.

F. Schedule: Refer to Door and Frame Schedule in the drawings.

-END OF SECTION-

SECTION 08211
FLUSH WOOD DOORS

1. **GENERAL:**
   A. Scope: Furnish all labor, equipment and material required to provide and install flush wood doors as indicated or as required for a complete project. Work includes, but is not limited to:
      1) Flush wood doors, flush and flush glazed configuration; non-rated and rated, to include factory machining and factory finishing.

   B. Submittals:
      1) Submit under provisions of Section 01300.
      2) Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
      3) Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing, louvers and hardware.
      4) Samples:
         a. Color Samples for factory prefinishing: Submit five (5) samples, not less than 5" x 8" size on specified veneer species. The sample should reasonably represent the color range of the veneer species selected.
         b. Construction Samples: Submit five (5) door section samples, not less than 5" x 5", showing door faces, stiles, and core representative of each door type specified.
      5) Submit manufacturer's cleaning instructions for doors.

   C. Quality Assurance:
      1) Perform work in accordance with AWI Quality Standards Illustrated (current edition) Section 1300, Architectural Flush Doors, Premium Grade.
      2) Finish doors in accordance with AWI Quality Standard.

   D. Standards:
      1) ANSI A208.1 – Particleboard.
      2) ASTM E 90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
      3) ASTM E 413 – Classification for Rating Sound Insulation.
      4) AWI/AWMAC/WI Architectural Woodwork Standards, Section 9 – Doors.
      5) NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
      6) UBC 7-2-1997/UL 10C – Positive Pressure Fire Tests of Door Assemblies.
      7) WDMA Finish System TR-6, Catalyzed Polyurethane.
      8) WDMA I.S. 1A – Architectural Wood Flush Doors.
      9) WDMA I.S. 10 – Industry Standard for Testing Cellulosic Composite Materials for Use in Fenestration Products.

   E. Delivery, Storage, and Protection:
      1) Package, deliver and store doors in accordance with AWI.
      2) Accept doors and frames on site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer. Inspect for damage.
      3) Protect door with resilient packaging sealed with heat shrunk plastic or polybags. Do not store in damp or wet areas and out of direct sunlight.
      4) Store doors flat on level surface.
      5) Do not store doors directly on concrete.

6) Keep doors completely covered. Use covering which allows air circulation and does not permit light to penetrate.
7) Store doors between 50 and 90 degrees F and 25 to 55 percent relative humidity.
8) Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
9) Handle doors in accordance with manufacturer's instructions.
10) Protect doors and finish during handling and installation to prevent damage.
11) Handle doors with clean hands or clean gloves.
12) Lift and carry doors. Do not drag doors across other doors or surfaces.

F. Environmental Requirements:
1) Do not subject doors to extreme conditions or changes in temperature or relative humidity in accordance with WDMA I.S.1-A.

G. Warranty:
1) Provide warranty to the following term: Interior doors: Lifetime (PC-5 doors, lifetime warranty included).
2) Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials or workmanship, and telegraphing of core construction.
3) Warranty shall provide for repair or replacement of the door as originally furnished.
4) Defects noted during warranty period shall be corrected at no cost to Owner. Corrective work shall include labor and material for repair, replacement, refinishing, and rehanging as required.

2. **PRODUCTS:**
A. Manufacturers: Equal to:
1) VT Industries (www.vtindustries.com), Holstein, IA (800) 827-1615. Product: Heritage Collection.
2) Mohawk Flush Doors, Inc. (www.mohawkdoors.com), Northumberland, PA (570)-473-3557.
3) Marshfield Door Systems (www.marshfielddoors.com), Marshfield, WI 1-800-869-3667. Product: Signature Series.
4) Graham Doors (www.grahamdoors.com), Mason City, IA (641)-423-2444. Product: Graham Premium Grade Architectural Wood Doors.

Note: All doors must be supplied through one company.

B. Door Types:
1) Flush interior doors: 1-3/4" thick; particleboard solid core construction.
a. Standard Interior Doors: AWI Door Type PC-5.
b. Fire Rated Doors: AWI Door Type PC-5 with 20 minute rating, FD-5 with 60 minute or 90 minute rating per door schedule.

C. Door Construction:
1) Core (Solid, Non-Rated): For non-rated and 20 min. Non-labeled doors, Comply with AWI Door Type PC-5 Custom Grade with pair match and set match of adjacent pairs Particleboard core to be LD-2 per AWI Section 1300.
2) Core (Solid, Fire Rated): For fire-rated doors comply with AWI Door Type FD-5 Custom Grade with pair match and set match of adjacent pairs. Non-combustible non-asbestos mineral core per AWI Section 1300. Provide mineral blocking when required for surface mounted hardware. Minimum 5" top and 5" bottom blocking required for all fire doors having surface mounted hardware. Provide lock blocks for exit devices on mineral core doors.

3) Veneer Facing (Flush Interior Doors): AWI Custom Grade (one piece with no seams allowed) with pair match and set match of adjacent pairs, plain sliced Select White Birch premium species wood. No heartwood shall be permitted.
4) Cross Banding Behind Veneer Finish: minimum 1/16" thick natural hardwood material with grain running perpendicular to the face and stiles and extending the full width of the door.
5) Face and Crossband Adhesive to be minimum: Type I - Waterproof.

D. Fabrication:
1) Fabricate non-rated doors in accordance with AWI Quality Standards requirements.
2) Fabricate fire rated doors in accordance with AWI Quality Standards and to UL and Warnock Hersey requirements. Attach fire rating label to door.
3) Vertical Exposed Edge of Stiles: Of same species of veneer facing, hardwood for transparent finish.
4) Stiles to be AWI minimum and have a minimum of ½" hardwood outer stile, of the same species as face, when 2-ply stiles are used. Veneer over SCL is not acceptable.
5) Fit door edge trim to edge of stiles after applying veneer facing.
6) Bonding: Stiles and rails securely bonded to the core and entire unit abrasively planed before veneering.
7) Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.
8) Factory fit doors for frame opening dimensions identified on shop drawings.
9) Provide edge clearances in accordance with AWI 1300, Section G-19.
10) Doors in smoke partitions shall close the opening with only a minimum clearance necessary for proper operation and shall have 1/4" undercut from top of finish floor.

E. Finish:
1) Factory Finish: WDMA TR-8 / AWS System 9, Color: As specified on drawings., AWI premium finish grade.
2) Factory sealed door top & bottom edges with sealer to match door finish.

3. **EXECUTION:**
A. Examination:
1) Verify that opening sizes and tolerances are acceptable.
2) Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

B. Installation:
1) Install non-rated and fire- rated doors in accordance with AWI Quality Standard, NFPA 80 and to Warnock Hersey requirements.
2) Trim non-rated door width by cutting equally on both jamb edges.
3) Trim door height by cutting bottom edges to a maximum of 3/4 inch. Trim fire door height at bottom edge only, in accordance with fire rating requirements.
4) Machine cut for hardware.
5) Coordinate installation of doors with installation of frames specified in Section 08110 and hardware specified in Section 08710.

C. Adjusting:
1) Adjust door and frame for smooth and balanced door movement.
2) Adjust closer for full closure.

D. Schedule: Refer to Door and Frame Schedule in the drawings.

-END OF SECTION-

SECTION 08305
ACCESS DOORS

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install access doors as indicated or as required for a complete project. Work includes, but is not limited to:
      1) Wall and ceiling locations, non-security types, for access for equipment maintenance and operations.

   B. Related Sections:
      1) Section 09260 - Gypsum Board Systems: Openings in partitions and ceilings.
      2) Section 09900 - Painting: Field paint finish.
      3) Section 15400 - Plumbing Work: Plumbing components requiring access.
      4) Section 15600 - HVAC: Access doors in ductwork.
      5) Division 16 - Electrical: Electrical and security components requiring access.

   C. Standards:
      1) Warnock Hersey - Certification Listings.

   D. Design Requirements:
      1) Fabricate floor access assemblies to support live load of 100 lb/sq ft with deflection not to exceed 1/180 of span.

   E. Submittals:
      1) Section 01300 - Submittals: Procedures for submittals.
      2) Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
      3) Shop Drawings: Indicate exact position of all access door units.
      4) Samples: Submit two access units, 12 x 12 inch in size illustrating frame configuration, anchors and locking screws. Samples may be used in work.
      5) Manufacturer's Installation Instructions: Indicate installation requirements, rough-in dimensions.

   F. Project Conditions: Coordinate the work with other work requiring access doors.

2. **PRODUCTS:**
   A. Access Units- Walls & Ceilings:
      1) Type 1- Non-Fire Rated. Shall be provided in all drywall ceilings, soffits or partitions that do not require a fire rating, and shall be one of the following approved manufacturers and products:
         a. J.L Industries (www.jlindustries.com), Bloomington, MN, 1-800-528-1411. Model: WB.
         b. KARP (www.karpinc.com), Maspeth, NY 1-800-888-4212. Model: KDW.
         c. Milcor (www.milcorinc.com), Lima, OH 1-800-528-1411. Model: DW.
         d. Additional equal manufacturers and products may be considered.
      2) Type 2- Fire Rated. Shall be provided in Fire rated ceilings, soffits, and partitions, and shall bear a UL 1-1/2 hour, Class B label, heat transmission less than two hundred fifty (250) degrees Farenheit after 30 minutes. One of the following approved manufacturers and products may be used:

a. J.L Industries (www.jlindustries.com), Bloomington, MN, 1-800-528-1411. Model FDWB.
b. KARP (www.karpinc.com), Maspeth, NY 1-800-888-4212. Model: KRP-450FR.
c. Milcor (www.milcorinc.com), Lima, OH 1-800-528-1411. Model: UFR.
d. Additional equal manufacturers and products may be considered.

3) Type 3- Non-Fire Rated Spring Loaded. Shall be provided in all drywall partitions as indicated on the drawings, and shall be one of the following approved manufacturers and products:
a. KARP (www.karpinc.com), Maspeth, NY 1-800-888-4212. Model: KDW.
b. Milcor (www.milcorinc.com), Lima, OH 1-800-528-1411. Model: DW.
c. Additional equal manufacturers and products may be considered.

B. Finishes:
1) Base Metal Protection: Galvanized, hot dipped finish. Prime coat units with baked on primer.
2) Finish: Two coats field painted in Section 09900.

3. **EXECUTION:**

A. Examination:
1) Verification of existing conditions before starting work.
2) Verify that rough openings for door and frame are correctly sized and located.

B. Installation:
1) Install units in accordance with manufacturer's instructions.
2) Install frames plumb and level in opening. Secure rigidly in place.
3) Position unit to provide convenient access to concealed work requiring access.

-END OF SECTION-

SECTION 08710
DOOR HARDWARE

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material to install finish door hardware as indicated, specified or otherwise obviously necessary for all swinging, sliding, folding and other doors, except items which are specifically excluded from this section of the specification or are of a unique hardware specified in other sections. New Work includes, but is not limited to:
      1) Hardware for doors, including pivots, push/pulls, stops, tracks, door plates and any other device or product required to provide a complete door installation.
      2) All hardware shall be of models and sizes for the specific application, regardless of any indication in the drawings or specifications that standard hardware may be used.
      3) Coordinate this work with other affected sections involving manufacture, fabrication or installation of internal reinforcement for door hardware, and manufacture, fabrication or installation of door frames.

   B. References:
      1) Standards:
         a. ANSI A156.1 - Butts and Hinges
         b. ANSI A156.2 - Bored Locks and Latches
         c. ANSI A156.3 - Exit Devices
         d. ANSI A156.4 - Door Controls - Door Closers
         e. ANSI A156.5 - Auxiliary Locks and Associated Products
         f. ANSI A156.6 - Architectural Door Trim
         g. ANSI A156.7 - Template Hinge Dimensions
         h. ANSI A156.8 - Door Controls - Overhead Holders
         i. ANSI A156.13 - Mortise Locks and Latches
         j. ANSI A156.15 - Closer Holder Release Devices
         k. ANSI A156.16 - Auxiliary Hardware
         l. ANSI A156.17 - Self Closing Hinges & Pivots
         m. ANSI A156.18 - Material and Finishes
         n. ANSI A156.21 - Thresholds
         o. ANSI A156.23 - Electromagnetic Locks
         p. DHI A115 Series - Steel Doors and Frame Preparation for Hardware
         q. DHI A115W Series- Wood Door and Frame Preparation for Hardware
         r. UL 10C - Positive Pressure Fire Tests of Door Assemblies
         s. UL 305 - Panic Hardware
         t. UL 1784 - Air Leakage Test for Door Assemblies
      2) Codes: Including but not limited to:
         a. NFPA 101-12 - Life Safety Code.
         b. NFPA 80-10 - Standard for Fire Doors and Other Opening Protectives.
         c. ICC / 2015 International Building Code; 3rd Printing.
         d. ANSI A117.1-09 - American National Standard Accessible and Usable Buildings and Facilities.
         e. ADA - Americans with Disabilities Act, 2010.

   C. Submittals:
      1) Submit under provisions of Section 01300.
      2) Shop Drawings: Provide complete hardware schedule, indicating every item required for each door opening, with locations and mounting heights of each type of hardware, electrical

characteristics and connection requirements. Hardware schedule shall be submitted within two (2) weeks from date the purchase order is received by the finish hardware supplier. Furnish four (4) copies of revised schedules after approval for field and file use. Schedules shall include the following information:

a. Location of each hardware set cross-referenced to indications on drawings, both on floor plans and in door and frame schedule.
b. Handing and degree of swing of each door.
c. Door and frame sizes and materials.
d. Keying information.
e. Type, style, function, size, and finish of each hardware item.
f. Elevation drawings and operational descriptions for all electronic openings.
g. Name and manufacturer of each hardware item.
h. Fastenings and other pertinent information.
i. Explanation of all abbreviations, symbols, and codes contained in the schedule.
j. Mounting locations for hardware when varies from standard.

3) Furnish a complete parts lists and suitable templates, together with finish hardware schedule to contractor, for distribution to necessary trades supplying materials to be prepped for finish hardware.
4) Submit catalogue cuts and/or product data sheets for all scheduled finish hardware.
5) Submit separate detailed keying schedule for approval indicating clearly how the Owner's final instructions on keying locks has been fulfilled. Key schedules shall include the following:
   a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
   b. Use ANSI A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide three (3) copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instruction and special key stamping instructions.
   e. Provide one complete bitting list of key buts and one key system schematic illustrating system usage and expansion.
      (a) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by owner
6) Samples: Upon request, samples of each type of hardware in finish indicated shall be submitted. Samples are to remain undamaged and in working condition through submittal and reveiw process. Items will be returned to the supplier or incorporated into the work within limitations of keying coordination requirements.
7) Operation and Maintenance Data: Upon completion of construction and building turnover, furnish two (2) complete maintenance manuals to the owner. Manuals to include the following items:
   a. Approved hardware schedule, catalogue cuts and keying schedule.
   b. Hardware installation and adjustment instructions.
   c. Manufacturer's written warranty information.
   d. Wiring diagrams, elevation drawings and operational descriptions for all electronic openings.

D. Qualifications:
   1) Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
   2) Hardware Supplier: Company specializing in supplying commercial and institutional door

hardware with three years experience.

3) Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this section.

E. Regulatory Requirements:
   1) Fire-Rated Openings:
      a. Provide door hardware for fire-rated openings that comply with NFPA 80 and requirements of Authorities Having Jurisdiction. Provide only items of door hardware that are listed by Underwriter's Laboratories (UL) or Warnock Hersey (WH) for use on types and sizes of doors indicated.
      b. Project requires door assemblies and components that are compliant with positive pressure and S-label requirements. Specifications must be cross-referenced and coordinated with door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, UBC 7-2, Fire Tests of Door Assemblies and UL 1784, Air Leakage Test for Door Assemblies (tested with artificial bottom seal).
         (a) Certification(s) of compliance shall be made available upon request by the Authority Having Jurisdiction.
   2) Conform to all ADA and handicap accessibility requirements.
   3) Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., or testing firm acceptable to the Authority Having Jurisdiction as suitable for the purpose specified and indicated.

F. Delivery, Storage & Handling:
   1) The supplier shall deliver all hardware to the project site; direct factory shipments are not allowed unless agreed upon beforehand. Hardware supplier shall coordinate delivery times and schedules with the contractor. Package hardware items individually; label and identify each package with door opening code to match hardware schedule. Inventory door hardware jointly with representatives of hardware supplier and hardware installer/contractor until each is satisfied that count is correct.
   2) Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of work will not be delayed by hardware losses both before and after installation.
   3) Deliver keys to Owner by security shipment direct from hardware supplier.

G. Quality Assurance:
   1) Keying Conference: Conduct conference at Project site to comply with requirements of Division 01.
      a. Supplier's Architectural Hardware Consultant (AHC) shall meet with the Owner to determine all keying requirements.
      b. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
         (a) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
         (b) Preliminary key system schematic diagram.
         (c) Requirements for key control system.
         (d) Requirements for access control.
         (e) Address for delivery of keys.

H. Warranty: All items, except as noted below, shall be warranted in writing by the manufacturer against

failure due to defective materials and workmanship for a minimum period of one (1) year commencing on the date of final completion and acceptance. In the event of product failure, promptly repair or replace item with no additional cost to Owner.

1) Cylindrical locksets: Ten (10) years
2) Mortise locksets: Five (5) years
3) Exit devices: Five (5) years
4) Door closers: Ten (10) years

I. Maintenance Materials:
   1) Provide special wrenches and tools applicable to each different or special hardware component.
   2) Provide maintenance tools and accessories supplied by hardware component manufacturer.

2. **PRODUCTS**

A. Manufacturers:
   1) Only manufacturers as listed below shall be accepted. Obtain each type of finish hardware (hinges, latch and locksets, exit devices, door closers, etc) from a single manufacturer.
   2) **Substitutions:** Hardware similar to that specified may be substituted, provided it is equal and/or similar in design, performance and quality, and is approved by the Architect. Substitutions shall be clear and complete, describing all differences between the specified item(s) and the proposed substitution. See section 01000 for additional information regarding substitutions.

B. Materials:
   1) Screws and Fasteners:
      a. All required screws shall be supplied as necessary for securing finish hardware in the appropriate manner. Thru-bolts shall be supplied for exit devices and door closers where required by Code and the appropriate blocking or reinforcing is not present in the door to preclude their use.

   2) Hanging Devices:
      a. Pivots:
         (a) Pivots shall conform to ANSI/BHMA C0711 and be offset hung non-handed type for single acting doors.
         (b) Provide intermediate pivots as required and as recommended by manufacturer.
         (c) Specified Manufacturer: Ives (IVE), Model 7237F & 7230F-7237F INT (http://us.allegion.com/en/home/products/brands/ives.html)
      b. Heavy Duty Track & Rollers:
         (a) Provide track and rollers as compatible with the sliding door frame and pocket.

   3) Locking Devices
      a. Sliding Door Mortise Lock:
         (a) Heavy duty commercial, non-handed sliding door mortise lock.
         (b) Specified Manufacturer: Hager (HA), 3800 Series. (http://www.hagerco.com/)

   4) Cylinders and Keying:
      a. Cylinders:
         (a) Provide small format interchangeable core type cylinders.
         (b) Specified Manufacturer: BEST or as directed by Owner (www.bestaccess.com)
      b. Keying:
         (a) All permanent cylinders/cores shall be master-keyed as directed by the Owner and factory registered. The factory shall key all locks and cylinders complying with

guidelines in ANSI/BHMA A156.28.

(b) Great-Grand Master Key System: Cylinders/cores operated by change (day) keys, master key, grad master key and great-grand master key.

(c) All cores shall be small format interchangeable.

(d) Master keys shall be sealed in tamper-proof packaged boxes when shipped from the factory.

(e) Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements shall be cause of replacement of cylinders/cores involved at no additional cost to Owner.

(f) Provide keys with the following features:

(i) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)

(ii) Patent Protection; Keys and blanks protected by one or more utility patent(s)

(iii) Geographically Exclusive: Where High Security or security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions:

1) One allocation within postal zip codes with the same first two (2) digits.

(g) Identification:

(i) Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.

(ii) Identification stamping provisions must be approved by the Architect and Owner.

(iii) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.

(iv) Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to Owner.

(v) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

(h) Quantity. Furnish the following quantities:

(i) Change (Day) Keys: 3 per cylinder/core.

(ii) Permanent Control Keys: 3.

(iii) Master Keys: 6.

(iv) Unused balance of key blanks shall be furnished to Owner with the cut keys.

(v) Extra Keys:

1) Construction Keys: 12

5) Door Trim:

a. Fabricate protection plates from minimum .050 inch thick stainless steel, all beveled edges (B4E), square corners, complying with BHMA A156.6, and fasted with oval head phillips fasteners countersunk into plate surface. Push plates, door plates, door pulls and miscellaneous door trim shall be as shown in the hardware set.

(a) Specified Manufacturer: Ives (IVE), Models 8200, 8303, 8400 (http://us.allegion.com/en/home/products/brands/ives.html).

6) Door Stops and Holders:

a. Wall Mounted Door Stops:

(a) Where a door is indicted on the plans to strike flush against a wall, wall bumpers shall be provided. Provide concave design where indicated.

(i) Specified Manufacturer: Ives (IVE), Model WS407CVX/WS407CCV

(http://us.allegion.com/en/home/products/brands/ives.html).

7) Sliding Door Pulls:
   a. Edge Pulls:
      (a) Install at edge of sliding door to allow for operation of door from the fully open position. Spring shall automatically return lever flush with plate.
      (b) Specified Manufacturer: Ives (IVE), Model 230 (http://us.allegion.com/en/home/products/brands/ives.html).
   b. Flush Pulls:
      (a) ADA flush pulls.
      (b) Specified Manufacturer: Assa Abloy (Rockwood), Model BF97 (https://www.assaabloy.com/en/com/).

8) Silencers:
   a. Silencers:
   b. Furnish rubber door silencers for all new interior hollow metal and wood frames, two (2) per pair and three (3) per single door frame.
   c. Specified Manufacturers: Ives (IVE), Model SR64 (http://us.allegion.com/en/home/products/brands/ives.html).

3. **EXECUTION**

A. Examination:
   1) Contractor shall ensure that the building is secured and free from weather elements prior to installing interior door hardware. Examine hardware before installation to ensure it is free of defects.
   2) Verify that electric power is available to power operated devices and of the correct characteristics.

B. Installation:
   1) Install hardware in accordance with manufacturer's instructions, use templates provided by hardware item manufacturer. Securely set all hardware into the surrounding construction. Adjust for careful fitting and proper operation of doors and hardware.
   2) Mount hardware units at heights indicated in the following applicable publications, except as specifically indicated or required to comply with the governing regulations.
      a. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
      b. NWWDA Industry Standard I.S. 1.7, "Hardware Locations for Wood Flush Doors."
   3) Coordinate mounting heights and locations prior to order of materials to avoid conflicts between hardware items, glazing, louvers, or other door and hardware features.
   4) All hardware shall be applied and installed in accordance with best trade practice by an experienced hardware installer. Care shall be exercised not to mar or damage adjacent work.
   5) Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
   6) Provide a secure lock up for hardware delivered to the project, but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

C. Field Quality Control: The hardware supplier and/or his Architectural Hardware Consultant shall do a final inspection prior to building completion to ensure that all hardware was correctly installed and is in proper working order. Furnish letter certifying that inspection has been completed, the hardware has been installed and is in proper working order.

D. Adjusting, Cleaning and Demonstrating:
   1) Adjust and check each operating item of hardware and each door to ensure proper operation of function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.
   2) Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
   3) Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes and usage of any electronic devices.

E. Protection: Contractor shall protect all hardware, as it is stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

F. Hardware Schedule: Submit proposed schedule, lump sum price for a complete project and unit prices for information with bid for Owner's approval and acceptance.

G. Schedule: See Door & Hardware Schedule: The following hardware set schedule is furnished for whatever assistance it may afford the Contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware set, provide door or item with hardware same as required for similar purposes. Contractor shall provide complete hardware set as required for normal operation for each door and room type, for all doors on the project.

   1) Manufacturer's Abbreviations:
      a. HA - Hager
      b. IVE - Ives
      c. RCK - Rockwood

H. HARDWARE SETS:

HARDWARE SET #1:
New Vault Door w/ Automatic Operator & Pushbuttons
Doors: 100

1	Automatic Door Equipment - See Specification Section 08721			
1	Offset Pivot Set (Top & Bottom)	7237F	630	IVE
1	Intermediate Pivot	7230F-7237F INT	630	IVE
1	Push Plate (4"x16")	8200	630	IVE
1	Pull Plate (4"x16", 10" CTC)	8303	630	IVE
1	Wall Stop	WS407CVX	626	IVE
2	Door Protection Plates	8400	630	IVE
3	Silencers	SR64	GRY	IVE

3 Push Buttons
1 Door Mounted Sensors (Detex A019 Series or equal)
1 Point to Point Wiring Diagrams
1 Riser Wiring Diagrams

Notes:
1) Depressing actuators on either side will automatically open door to allow occupants to pass through.
2) Sensor shall be mounted to push side of door to ensure that the door does not close against stretcher during transport.
3) A separate actuator shall be provided in the control room for partial open (1/2 open) hold open position for staff convenience.
4) The vault door shall be provided as a complete package with the vendor coordinating and adjusting the above manufacturers and models as required for a complete and functional door opening. Any adjustments are subject to the review and approval of the design team.
5) Install door stop at pull handle contact point.

Description of Operation:
1. Opening always available for egress.
2. Opening will have automatic operator for stretcher transport assistance.
3. When a push button is activated the automatic operator will open the door. After auto operator times out, door will return to the closed position. At the Owner's preference the push buttons may be setup for push to open / push to close. Allowing for a hold open condition prior to second actuation. Final automatic operator programming/setup subject to Owner's review and approval.
4. A separate pushbutton shall be provided in the control room for partial open (1/2 open) hold open position for staff convenience.

HARDWARE SET #2:
Sliding Door w/ Mortise Lock
Doors: 101

1	Heavy Duty Track & Rollers			
1	Edge Pull	230	626	IVE
2	ADA Flush Pulls (5"x5"x7/8")	BF97	626	RCK
1	Sliding Door Mortise Lock (w/ SFIC housing)	3800 Series	626	HA
1	SFIC Core (Keyed Per the Owner's Requirements)			
3	Clear Vinyl Edge Bumpers			

Notes:
1. Contractor to coordinate and adjust door hardware as required to ensure proper coordination and a compete/functional door opening. Any adjustments are subject to the review and approval of the design team.

-END OF SECTION-

SECTION 08721
AUTOMATIC DOOR EQUIPMENT

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install electric operated door equipment for a complete project. Work includes, but is not limited to:
      1) Electric operated door equipment.
      2) Control Devices.
      3) All manufacturer recommended safety devices.

   B. Related Sections:
      1) Section 08110 - Standard Steel Doors & Frames
      2) Section 08710 - Door Hardware: Doors requiring access control.
      3) Div. 16 - Electrical Wiring:
         a. Wiring and conduit from door operator to control switch.
         b. Wiring and conduit from control switch to power unit.
         c. Wiring and conduit from power unit to disconnect.

   C. References:
      1) BHMA A156.10 - Power Operated Pedestrian Doors.
      2) NEMA MG 1 - Motors and Generators
      3) NFPA 70 - National Electric Code
      4) NFPA 101 - Life Safety Code
      5) UL 325 - Electric Door, Drapery, Gate, Louver and Window Operators and Systems
      6) UL 10C - Positive Pressure Fire Tests of Door Assemblies

   F. System Description:
      1) Automatic Door Equipment: Electrically operated with push button control device.
      2) Door: Single swing, pivot operation.

   G. Performance Requirements:
      1) Automatic Door Equipment: Accommodate heavy pedestrian traffic, and weight of doors.
      2) Operators: Fully adjustable for opening and closing speeds, checking speeds, hold open time, and cancellation on activation of fire alarm and smoke detection system.

   H. Submittals for Review:
      1) Submit under provisions of Section 01300.
      2) Shop Drawings:
         a. Indicate layout and dimensions; head, jamb and sill conditions; elevations; components, anchorages, recesses, materials, and finishes, electrical characteristics and connection requirements.
         b. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.
      3) Product Data: Provide data on system components, sizes, features, and finishes.
      4) Samples: Submit three samples of exposed to view hardware.

   I. Submittals for Information:
      1) Submit under provisions of Section 01300.
      2) Manufacturer’s Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer’s hardware and component templates.

J. Submittals at Project Closeout:
   1) Section 01730 - Operation and Maintenance Data: Procedures for Submittals.
   2) Project Record Documents: Record actual locations of concealed equipment, services and conduit.
   3) Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.

K. Quality Assurance:
   1) Perform work in accordance with BHMA A156.10 and UL 325. Maintain one copy on site.
   2) Manufacturer's Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
   3) Installer's Qualifications: Installer shall be factory trained, certified by AAADM, and experienced to perform work of this section.

L. Regulatory Requirements:
   1) Conform to applicable code for automatic release of control drive unit to permit manual opening of doors.
   2) Conform to NFPA 101.
   3) Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

M. Warranty:
   1) General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
   2) Automatic Door Operators shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.
   3) During the warranty period a factory-trained technician shall perform service and affect repairs. An inspection shall be performed after each adjustment or repair.
   4) During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.
   5) Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

2 PRODUCTS

A. Specified Manufacturer:
   1) Brookfield Industries, 99 W Hillside Ave, Thomaston, CT. (860) 283-6211. (https://bfimfg.com/). Model NB-500-LE for use on heavy commercial/industrial swing doors weighting up to 2,500 lbs and 48"wide.
      a. Substitutions: Requests for substitution and product approval in compliance with the specifications must be submitted in writing and in accordance with the procedures outlined in Division 1. Approval of requests is at the discretion of the Owner and Architect.
      b. Automatic Operator: Electro-mechanical, powered by 90 volt DC, 1/8 hp motor. Operator shall be adjustable to compensate for different manual push forces as required.
         i Automatic operator shall be capable of operating and controlling up to a 2,500 pound door, 48 inches in width.
      c. Forward and reverse torque adjustment: via current limit trimpot settings on the motor control to adjust the operating torque in order to comply with the 15 lb opening/closing force

in ANSI 156.19.

d. Automatic egress: or door reversal whenever the force values of ANSI 156.19 have been exceeded in either the opening or closing directions; however, door shall not reverse automatically when in the latch check or back check modes.
e. Auto backlash removal:closes the door against the frame and removes all mechanical backlash in the system when in the latch check mode.
f. Absolute position feedback control: this assures the CPU always knows the door's position. During installation, a power interruption, or if electrical noise is encountered, the door is not required to be "homed", "reset" nor go through a "learn speed cycle" at any time.
g. Manual operation:30 lbs to set door in motion; 15 lbs to full open, 1" from latch edge per ANSI 156.19
h. Supply voltage:115VAC +/- 10% (230VAC for European service) 50/60 Hertz single phase. In-Line circuit breakers supplied with motor control and PLC. Surge protection, line filters, and EMI ferrites shall be included.
i. Current Consumption:maximum 3 amperes.
j. PLC/Logic Control:
    i Shall be a PLC with sufficient I/O and a CPU (Central Processing Unit) with adequate memory, response times and scanning rates in order to properly control the motion and positioning of linear accelerator swing doors.
    ii Outputs commands shall be the internal type, integral with the PLC. No external limit switches shall be allowed for control of door positioning.
    iii A means to interface with the PLC for adjusting preset values for the open, partial open, closed, latch check and back check positions.
    iv Diagnostics and troubleshooting of the PLC shall be provided with LED and modular plug-in components.
    v The PLC shall be provided with an internal battery to store the door position presets in the CPU memory.
k. Gear Motor:1/8 hp permanent magnet 90 volt DC motor 1650 RPM TENV, 40:1 reduction
l. Motor Control:shall be a full-wave, four quadrant, regenerative, 90 VDC variable speed control with the following functions and modified for optimum torque control for Low Energy applications: FWD/REV maximum speed FWD/REV current limit IR compensation FWD/REV acceleration/deceleration 1% speed regulation 50:1 speed range.
m. Speed Control:a means of controlling independent forward and reverse speeds per ANSI 156.19 as well as controlling latch check and back check speeds. This can be accomplished externally with speed pots or internally with the PLC.
n. Drive train and linkage mechanism: shall be designed to allow manual operation of the door per ANSI 156.19 in addition to assuring each component from the motor to the door attachment point is properly "sized" in order to transfer all working loads and operating torques. Standard linkage shall consist of a pull open design with crank arm, slider block and cam follower assembly.
o. Enclosure: 1/8" Aluminum plate reinforced with angle iron. Overall 8 ¾" high x 7 ¾" deep x 36 ¼ long. (2) 7/8" diameter penetrations for ½" conduit are drilled on each end or the metric equivalent for European installations. .
p. Materials: Aluminum 6061-T651&T-6, AISI 1018 cold rolled steel, grade 5 bolting or better
q. Mounting hardware:the NB-500 shall be mounted with (6) 3/8" grade 5 diameter bolts with compatible washers and lock washers. Hardware must also be properly tightened with adequate thread engagement.
r. Finish:all exposed carbon steel surfaces shall be prime painted, while all exposed aluminum surfaces shall be brushed and anodized.
s. Functionality test: each NB-500 is cycle tested in position for 24 hrs. prior to shipment.

Each unit is checked for leaks and that all I/O are functioning properly.

t. Installation: the NB-500 shall be installed per drawing NB-500-4 for pull open linkages and NB-500-44. Optional: NB-500-0 for push open applications

u. Provide impulse and presence detection sensor on the push sides of the door slab to ensure door does not close on an individual on the push side when in close proximity and such that when a stretcher is being passed through the opening it remains in the open for duration of the time the stretcher is passing through the opening.

v. Push Button Control Device: 4-1/2" square stainless steel back plate, 4-1/2" square active stainless steel face plate, UL listed "cherry switch", SPDT, Mom., mounted on electrical outlet box. Electrical outlet box as recommended by manufacturer and hardwired to door operator controls.
   i Equal to: MS Sedco (www.mssedco.com); Model 59-H.

w. Push Button Control Device For "PARTIAL OPEN": 4-1/2" square stainless steel back plate, 4-1/2" square active stainless steel face plate, UL listed "cherry switch", SPDT, Mom., mounted on electrical outlet box. Electrical outlet box as recommended by manufacturer and hardwired to door operator controls.
   i Equal to: MS Sedco (www.mssedco.com); Model 59-CUSTOM.
   ii Provide lettering as approved by Owner. Recommend "1/2 OPEN".

x. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

y. Signage: Provide signage in accordance with ANSI/BHMA A156.10.

z. Finishes:
   i Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   ii Exposed Components: Aluminum finish to be Class I clear anodized.

3 EXECUTION

A. Examination:
   1) Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance.
   2) Examine roughing-in for electrical source power to verify actual locations of wiring connections.
   3) Proceed only after such discrepancies or conflicts have been resolved.

B. Installation:
   1) Install equipment in accordance with manufacturer's instructions.
   2) Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.
   3) Coordinate installation of components with related and adjacent work; level and plumb.
   4) Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.
   5) Provide for dimensional distortion of components during operation.
   6) Operators: Install automatic operators plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
   7) Install surface mounted hardware using concealed fasteners to greatest extent possible.

8) Set headers, carrier assemblies, tracks, operating brackets and guides level and true to location with anchorage for permanent support.
9) Door Operators: Connect door operators to electrical power distribution system as specified in Division 16 Sections.
10) Sealants: Comply with requirements specified in division 7 Section "Joint Sealants" to seal between the operator housing and the adjacent wall surface.
11) Signage: Apply signage on both sides of each door and sidelite as required by ANSI/BHMA A156.19 and manufacturers installation instructions.

C. Field Quality Control:
   1) Manufacturers Field Services:
      a. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.
      b. Before placing doors into operation, AAADM certified technician shall inspect and approve doors for compliance with ANSI/BHMA A156.19. Certified technician shall be approved by manufacturer.

D. Adjusting:
   1) Adjust door operators, controls and hardware for smooth and safe operation and for weather tight closure. Adjust doors in compliance with ANSI/BHMA A156.19.

E. Cleaning and Protection:
   1) Remove temporary protection.
   2) Clean adjacent surfaces soiled by automatic operator installation.
   3) Clean metal surfaces promptly after installation. Remove excess sealants, compounds, dirt and other substances. Repair damages finish to match original finish.

F. Demonstration:
   1) Engage a factory-authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of the door.

-END OF SECTION-

SECTION 09260
GYPSUM BOARD SYSTEMS

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material to provide and install gypsum drywall systems as indicated or as required for a complete project. Work includes, but is not limited to:

      1) Screwable steel stud interior partitions to receive gypsum wallboard.
      2) Gypsum wallboard finishes for interior walls, partitions and sills.
      3) Gypsum wallboard laminated to existing construction where indicated.
      4) Interior gypsum board soffits and ceilings where indicated.
      5) Furred wall assemblies.
      6) Repair and refinishing of all existing gypsum wallboard for new work and finishes.
      7) Preparation of all door and window openings in metal stud framing. See Section 05400- Cold-Formed Metal Framing.
      8) Acoustic sealant where indicated.
      9) All associated wood blocking. See Section 06100 - Rough Carpentry.
      10) All required access doors in gypsum walls and ceilings for mechanical maintenance. See Section 08305.
      11) All required acoustic and thermal insulation, vapor retarders. See Division 7.
      12) Contractor shall provide stenciling above ceiling on all fire rated walls (new and existing). It is the general contractor's responsibility to coordinate the stenciling of the rated walls.
          Stenciling shall be:
          (a) Bold Arial type face in Fluorescent red.
          (b) 6" tall lettering.
          (c) Lettering shall be in at least two lines of text: ("X" designates the rating in hours)
              "X HOUR"
              "FIRE BARRIER" or 'SMOKE BARRIER' or 'FIRE WALL' (as appropriate).
          (d) Stenciling to occur 10'-0" o.c. max with at least one grouping of stenciling per wall face.
          (e) Stenciling to be minimum of 2'-0" and maximum of 5'-0" above ceiling. (Special cases due to height limitations to be reviewed with Architect).
          (f) Stenciling to be placed on all rated walls no matter of material.

   B. Standards:
      1) ASTM C36- Standard Specification for Gypsum Wallboard.
      2) ASTM C475/ C475M- Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
      3) ASTM C630/ C630M - Standard Specification for Water-Resistant Gypsum Backing Board.
      4) ASTM C645- Standard Specification for Nonstructural Steel Framing.
      5) ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
      6) ASTM C840- Standard Specification for Application and Finishing of Gypsum Board.
      7) ASTM C931/ C931M- Standard Specification for Exterior Gypsum Soffit Board.
      8) ASTM C1002- Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
      9) ASTM C1396/ C1396M- Standard Specification for Gypsum Board.
      10) ASTM C1658 - Standard Specification for Glass-Mat Gypsum Panels.
      11) ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitios

Backer Units.
12) ASTM C1278 - Standard Specification for Fiber- Reinforced Gypsum Panels.
13) ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
14) ASTM E119- Standard Test Methods for Fire Tests of Building Construction and Materials
15) ASTM D3273- Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
16) GA-214- Recommended Levels of Gypsum Board Finish.
17) GA-226- Application of Gypsum board to Form Curved Surfaces.
18) GA-253- Recommended Specifications for the Application of Gypsum Sheathing.
19) GA-600- Fire Resistance Design Manual.
20) UL (FRD)- Fire Resistance Directory; Underwriters Laboratories Inc.

C. Submittals:
1) Submit under provisions of Section 01300.
2) Submit product data for all materials used.
3) Submit samples and shop drawings for all materials or details that may vary from details or conditions indicated.

D. Coordination:
1) All work of this section shall be coordinated with other trades.
2) All provisions normally installed under this section, required by other trades, including but not limited to supports, blocking, access panels, fire safing, sealing, etc. shall be the responsibility of the General Contractor, whether or not specifically indicated or detailed.

E. Environmental Requirements:
1) Do not install gypsum board when ambient temperature is below 40°F.
2) For adhesive attachment of gypsum board, and for finishing of gypsum board, maintain ambient temperature above 55°F from one week prior to attachment or joint treatment, and until joint treatment is complete and dry.

F. Delivery, Storage & Handling:
1) Deliver material to site promptly without undue exposure to weather.
2) Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
3) Store above ground in dry, ventilated space.
4) Store materials under cover, and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.
5) Protect materials from soiling, rusting and damage.
6) Store board to be directly applied to masonry walls at 70°F for a period of twenty-four (24) hours prior to installation.
7) Steel framing and related accessories shall be stored and handled in accordance with AISI's "Code of Standard Practice".

G. Maintenance: The contractor shall take all precautions for preventing mold, mildew damage and other damage during the course of construction period. Any gypsum board material that becomes damaged shall be removed and replaced at no cost.

2. **PRODUCTS:**

A. Metal Framing Materials:
   1) Screwable Steel Stud System: Shall be a complete proprietary framing system, consisting of pre-fabricated, non-load bearing, screwable galvanized steel studs, and all required steel track, anchors and related items. Gauge of studs suitable for application. Components shall meet ASTM C 645; galvanized sheet metal, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/360. Pounds per square foot lateral load as suitable for application.
      (1) Studs: C shaped with knurled faces.
      (2) Runners: U shaped, sized to match studs.
      (3) Ceiling Channels: C shaped, provide slotted deflection track where wall construction extends to the floor structure above.
      (4) Furring: Hat-shaped sections, minimum depth of 7/8 inch.
   2) Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

B. Gypsum Board Materials:
   1) Gypsum Board- All types: Complying with applicable requirements of ASTM C1396/ C1396M. Panel sizes shall be 4 ft. by 10 ft. minimum.
      (1) Gypsum products manufactured in China will not be accepted.
   2) Type X: Fire resistant, UL rated.
      (1) Application: Use at all fire-rated and non-rated assemblies, unless otherwise indicated.
      (2) Thickness: As indicated on partition types.
      (3) Edges: Tapered.
      (4) Acceptable Products:
         (a) Firecode C Core (Type X) as manufactured by U.S. Gypsum Corp. (www.usg.com).
         (b) Gold Bond Fire Shield as manufactured by National Gypsum (www.national-gypsum.com).
         (c) TuffRock Type X as manufactured by Georgia-Pacific Gypsum LLC (www.gp.com/gypsum).
   3) Moisture & Mold Resistant Board Materials: ASTM D3273.
      (1) Coated Fiberglass Mat Faced (Paperless) Gypsum Board; or mold, mildew and moisture resistant recycled paper face over fire-resistant mold and mildew resistant gypsum core with mold, mildew and moisture resistant paper on back side.
      (2) Application: Use wherever moisture resistant drywall (greenboard) is indicated and at interior side of exterior wall construction. Interior applications only.
      (3) Thickness: As indicated on drawings.
      (4) Edges: Tapered.
      (5) Acceptable Products:
         (a) Mold Tough Firecode C Core (Type-X) as manufactured by U.S. Gypsum Corp. (www.usg.com).
         (b) Gold Bond Brand XP Fire-Shield as manufactured by National Gypsum (www.national-gypsum.com).
         (c) DensArmor Plus Fireguard as manufactured by Georgia-Pacific Gypsum LLC (www.gp.com/gypsum).
   4) Accessories:
      (1) Acoustic Insulation: ASTM C665; performed glass fiber, friction fit type, unfaced. Thickness to fit stud cavity, unless otherwise indicated.
      (2) Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
         (a) Equal to: Sheetrock Brand Acoustical Sealant as manufactured by U.S. Gypsum Corp. (www.usg.com).
         (b) At MEP and other through wall penetrations, provide sealant type as recommended by

manufacturer and as suitable for application. Do not use unsuitable products that may cause corrosion, discoloration or deterioration of any through wall penetration. Also refer to Section 07270 - Firestopping.

(3) Provide tapable 'J'-bead at all exposed drywall ends otherwise unprotected. Equal to Plastic Components, Inc. (www.plasticomponents.com), Miami, FL 1-800-327-7077. Product: #201. Or Vinyl Corp. (www.vinylcorp.com), Miami, FL 1-800-648-4695. Product: #MJB50 or MJB58.

(4) Provide tapable corner beads at all exposed corner conditions. Equal to Plastic Components, Inc. (www.plasticomponents.com), Miami, FL 1-800-327-7077. Product: #209. Or Vinyl Corp. (www.vinylcorp.com), Miami, FL 1-800-648-4695. Product: #CB125.

(5) Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
   (a) Ready-mixed vinyl-based joint compound with mold resistance inhibitor.

(6) Fasteners: ASTM C1002; self-piercing tapping type; cadmium plated for exterior locations.

(7) Anchorage to Substrate: Tie wire, nails, screws and other metal supports, of type and size to suit application; to rigidly secure materials in place.

(8) Adhesive: ASTM C557.

(9) Access Doors: Frames and doors shall be steel or aluminum, primed for painting, flush, tapable trim, panel type with continuous hinge and locking cam. Minimum size: 12" x 12", increase size as required to access mechanical and electrical equipment. General Contractor may make it the responsibility of either the drywall contractor or the trades requiring accessing to provide access panels. See Section 08305 for additional information.

3. **EXECUTION:**

A. Examination: Verify that project conditions are appropriate for work of this section to commence.

B. Preparation and Review: Contractor shall layout all partition locations using chalk line or similar method prior to fastening of stud track. The Architect/ Owner shall reserve the right to review layout prior to further execution. The intent is to verify all dimensions as indicated on the drawings are complete and accurate.

C. General Requirements:
   1) All work shall meet applicable ASTM standards, and the 7th edition of "The Gypsum Construction Handbook" as published by United States Gypsum Company.
   2) Work shall conform to the printed specifications of the manufacturer, and fire-resistive requirements of UL and other applicable testing agencies where applicable.
   3) Gypsum drywall construction work shall be erected, rigidly supported and securely fastened in place, in such manner that plumb, level, and true finished lines and surfaces will result in the finished work.
   4) Deep head track, bridging, bracing, control joints, taped edge and corner beads and all other applicable drywall system details shall be provided in accordance with industry standards.
   5) Gypsum wallboard installation and finishing shall also conform to ANSI Standard Specification A97.1, "Standard Application, and Finishing of Wallboard".

D. Framing Installation:
   1) Metal Framing: Comply with ASTM C754 and manufacturer's instructions.
   2) Suspended Ceilings and Soffits: Space framing and furring members as indicated.
      (1) Level ceiling system to a tolerance of 1/1200.
      (2) Laterally brace entire suspension system.
   3) Studs: Space studs at 16 inches on center.

(1) Extend partition framing to structure where indicated.

4) Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
5) Standard Wall furring: Where wall furring is indicated, install furring members not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 16 inches on center.
   (1) Orientation: Horizontal.
   (2) Spacing: At 16 inches on center.
6) Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.
7) Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, and hardware. Bolt or screw steel channels to studs.

E. Acoustic Accessories Installation:
   1) Acoustic Insulation: Place acoustic insulation tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
   2) Acoustic Sealant: Install in accordance with manufacturer's instructions.
      (1) Place two beads continuously on substrate before installation of perimeter framing members.
      (2) In non-fire-rated construction, seal around all penetrations by conduit, pipe, ducts and rough-in boxes.

F. Gypsum Board Installation:
   1) Comply with ASTM C840. Install to minimize butt end joints, especially in highly visible locations.
   2) Single-layer non-rated partitions: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.
   3) Single-layer fire-rated partitions: Install gypsum board vertically, with edges and ends occurring over firm bearing.
   4) Double-layer non-rated partitions: Use gypsum board for first layer, placed perpendicular to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.
   5) Gypsum Soffit Board: Install perpendicular to framing, with staggered end joints over framing members or other solid backing.
   6) Installation on Metal Framing: Use screws for attachment of all gypsum board.
   7) Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

G. Installation of Trim and Accessories:
   (1) Control Joints: Place control joints consistent with lines of building spaces and as follows:
      (a) Not more than 30 feet apart on continuous wall and ceiling surfaces over 50 feet long.
   (2) Corner Beads: Install at external corners, using longest practical lengths.
   (3) Edge trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.
   (4) Access panels shall be installed wherever required to access an operate installed work. General Contractor is solely responsible for coordinating and providing adequate access to operate all installed work.

H. Joint Treatment:
   1) Finish all gypsum board in accordance with ASTM C840. Level 5.

2) Tape, fill and sand exposed joints, edges and corners to produce smooth surface ready to receive finishes. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
3) Tape and fill all joints at each layer of wallboard, including applications of double-layer gypsum wallboard at fire-resistance rated construction.
4) Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

I. Clean-up:
1) Debris and waste of this Section shall be picked up and disposed of daily.
2) Leave work smooth, uniform and ready for installation of wall finishes.

-END OF SECTION-

SECTION 09511
SUSPENDED ACOUSTIC CEILINGS

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install new suspended acoustic ceilings as indicated. Work includes but is not limited to:
      a) Acoustic ceiling panels.
      b) Exposed grid suspension system.
      c) Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

   B. Related Sections:
      1) Section 09 20 00 (09260) - Gypsum Board Systems
      2) Divisions 23 (15) - HVAC
      3) Division 26 (16) Sections - Electrical Work.

   C. References:
      1) ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
      2) ASTM A 641 Standard Specification for Zinc-coated (Galvanized) Carbon Steel Wire.
      3) ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
      4) ASTM C 423- Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
      5) ASTM C 635- Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
      6) ASTM C 636- Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
      7) ASTM C 754- Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
      8) ASTM E 1414- Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
      9) ASTM E 1111- Standard Test Method for Measuring the Interzone Attenuation of Ceiling Systems.
      10) ASTM E 1264- Classification of Acoustical Ceiling Products.
      11) ASTM E 1477- Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
      12) ASTM D 3273- Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
      13) ASTM D 3274- Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth of Soil and Dirt Accumulation.
      14) ASTM D 5116-06- Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/ Products.
      15) ASTM E 84- Standard Test Method for Surface Burning Characteristics of Building Materials.
      16) ASTM E 119- Standard Test Methods for Fire Tests of Building Construction and Material.
      17) STM E 1264- Classification for Acoustical Ceiling Products.
      18) ASTM E 1414- Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
      19) CISCA (Ceilings and Interior Systems Contractors Association) - Acoustical Ceilings: Use and Practice.
      20) UL- Fire Resistance Directory.

21) USG Test No. 3104A- Wind Load Tests by Dynamic Pressure on an Exterior Suspended Steel and Drywall Panel Ceiling System.

D. System Description:
   1) Installed System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1/360. Exposed pop rivets are acceptable where securing to perimeter wall angle molding, color to match grid color.

E. Submittals:
   1) Submit under provisions of Section 01300.
   2) Product Data: Submit manufacturer's technical data for each type of acoustical ceiling unit and suspension system required.
   3) Samples: Submit five (5) samples 6 x 6 inch in size illustrating material and finish of acoustic units.
   4) Samples: Submit five (5) samples each, 8 inches long, of suspension system main runner, cross runner, perimeter molding.
   5) Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
   6) If the material supplied by the acoustical subcontractor does not have an Underwriter's Laboratory classification of acoustical performance on every carton, subcontractor shall be required to send material from every production run appearing on the job to an independent or NVLAP approved laboratory for testing, at the Architect's or Owner's discretion. All products not conforming to manufacturer's current published values must be removed, disposed of and replaced with complying product at the expense of the Contractor performing the Work.

F. Quality Assurance:
   1) Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer. Materials supplied by more than one manufacturer are not acceptable.
   2) Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
      a) Surface Burning Characteristics: As follows, tested per ASTM E84 and complying with ASTM E 1264 for Class A products.
         i) Flame Spread: 25 or less.
         ii) Smoke Developed: 50 or less.
   3) Source quality control:
      a) Test Reports: Manufacturer will provide test certification for minimum requirements as tested in accordance with applicable industry standards and/ or to meet performance standards specified by various agencies.
      b) Changes from system: System performance following any substitution of materials or change in assembly design must be certified by the manufacturer.
      c) All ceiling panel cartons must contain UL label for acoustical compliance.
      d) All suspension system cartons must contain UL label for load compliance per ASTM C635.
   4) Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

G. Coordination: Coordinate acoustical ceiling work with installers of related work including, but not limited to: building insulation, gypsum board, light fixtures, mechanical systems, electrical systems and sprinklers.
   1) Contractor shall design and engineer ceiling suspension system components, when required to

satisfy code required seismic bracing and support, in accordance with applicable building codes.

H. Delivery, Storage, and Handling:
   1) Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination and other causes. Store ceiling suspension system in a manner that will prevent warping, scratches, or damage of any kind.
   2) Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
   3) Handle ceiling products carefully to avoid racking, distortion, chipping edges or damage of any kind.
   4) Damaged or deteriorated materials should be removed from the premises. Immediately before installation, to stabilize tile and panels, store them at a location where temperature and humidity conditions duplicate those ambient during installation and anticipated for occupancy.

I. Regulatory Requirements: Conform to applicable code for fire rated assembly and combustibility requirements for materials.

J. Environmental Requirements: Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustic unit installation.

K. Project Conditions:
   1) Sequence work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
   2) Install acoustic units after interior wet work is dry.

L. Warranty:
   1) Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include but are not limited to:
      a) Acoustical Panels: Sagging and warping and manufacturer defects.
      b) Grid System: Rusting and manufacturer's defects.
   2) Warranty Period:
      a) Acoustical Panels: Thirty (30) years.
      b) Grid:Thirty (30) years.
   3) The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

M. Maintenance:
   1) Extra Materials: Deliver extra materials to the Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
      a) Acoustic Ceiling Units: Furnish quality of full-size units equal to 5 percent of amount installed.
      b) Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 2 percent of amount installed.

2. **PRODUCTS:**

A. Suspension Materials- Exposed Grid:
   1) Manufacturers: Armstrong World Industries, Inc. (www.armstrong.com/commceilingsna), Lancaster, PA 1-877-276-7876. Model: Prelude XL.
   2) Exposed Grid Materials: Commercial quality cold rolled steel with galvanized coating.
   3) Exposed Grid Surface Width: 15/16 inch.
   4) Grid Finish: White except as otherwise noted.
   5) Accessories: Splices, perimeter moldings and all other accessories required for suspended grid system.
   6) Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified. Provide manufacturer recommended shadow molding or Architect approved wall angle molding at tegular tile applications.
   7) UL Fire Classification: All suspension components and details shall conform to applicable fire rating assemblies.

B. Acoustic Unit Materials:
   1) Manufacturers:
      a) Ceiling Panels: Armstrong World Industries, Inc. (www.armstrong.com/commceilingsna), Lancaster, PA 1-877-276-7876.
   2) Acoustic Panel Types: ASTM E1264 and ASTM E84, conforming to the following:
      a) SAC-1: Armstrong; #1937, Ultima Health Care, Beveled Tegular:
         i) Size: 24 x 24.
         ii) Thickness: 3/4 inches.
         iii) Composition: Wet-formed Mineral fiber.
         iv) Density/ Weight: 1.08 lb/sf.
         v) Light Reflectance: Average LR 0.86.
         vi) Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.70.
         vii) Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 38.
         viii) Fire Performance: ASTM E 1264; Class A: Flame Spread 25 or under. (UL)
         ix) Insulation Value: Average R Factor 2.2.
         x) Sag Resistance: Standard.
         xi) Edge Profile: Beveled Tegular for interface with compatible Armstrong grid.
         xii) Surface Color: White.
         xiii) Surface Finish: DuraBrite with factory-applied latex paint.
         xiv) 50% (or greater) max recycled content.

C. Accessories:
   1) Touch-up Paint: Type and color to match acoustic and grid units.

3. **EXECUTION:**

A. Examination: Do not proceed with installation until all wet work including but not limited to concrete and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations. Verify that layout of hangers will not interfere with other work.

B. Installation- Lay-In Grid Suspension System:
   1) Install suspension system in accordance with ASTM C 636, manufacturer's instructions and as supplemented in this section.
   2) Install system in accordance with ASTM E 580.

3) Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
4) Locate system on room axis according to reflected plan.
5) Install after major above ceiling work is complete. Coordinate the location of hangers with installers of related work including, but not limited to: building insulation, gypsum board, light fixtures, mechanical systems, electrical systems and sprinklers.
6) Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
7) Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and provide carrying channels to span the extra distance.
8) Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
9) Do not eccentrically load system, or produce rotation of runners.
10) Perimeter Molding:
    a) Install edge molding at intersection of ceiling and vertical surfaces.
    b) Use longest practical lengths.
    c) Overlap and rivet corners.
    d) Provide at junctions with other interruptions.
11) Form expansion joints to accommodate plus or minus 1 inch movement. Maintain visual closure.
12) Install light fixture boxes constructed of acoustic panel above light fixtures in accordance with UL assembly requirements and light fixture ventilation requirements.

C. Installation - Acoustic Units:
1) Install acoustic units in accordance with manufacturer's instructions.
2) Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
3) Lay directional patterned units one way. Fit border trim neatly against abutting surfaces.
4) Install units after above ceiling work is complete.
5) Install acoustic units level, in uniform plane, and free from twist, warp, and dents.
6) Cutting Acoustic Units:
    a) Cut to fit irregular grid and perimeter edge trim.
    b) Cut square edges to field cut units.
    c) Field paint exposed edges.
7) Tegular Edges: Tegular tile shall sit level with all field cut edges seated properly to match factory edges.
8) Where round obstructions occur, provide preformed closures to match perimeter molding.

D. Field Quality Control:
1) Replace damaged and broken panels.
2) Clean exposed surfaces of acoustical ceilings, including trim, edge moldings and suspension members. Comply with manufacturer’s instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

E. Erection Tolerances:
1) Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
2) Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

-END OF SECTION-

SECTION 09650
RESILIENT FLOORING

1. **GENERAL:**
   A. Scope: Furnish and install resilient flooring as indicated and as required for a complete project. Work includes, but is not limited to:
      1) Resilient floor tile.
      2) Resilient base.
      3) All floor preparation required to meet manufacturer's recommendations for substrate conditions found on the project, including but not limited to flash patching, and cement or wood underlayment.
      4) Accessories.

   B. Standards:
      1) ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
      2) ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
      3) ASTM E84- Surface Burning Characteristics of Building Materials.
      4) ASTM F710-8- Preparation of Concrete Slabs To Receive Resilient Flooring.
      5) ASTM F1066- Vinyl Composition Floor Tile.
      6) ASTM F 1482 - Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring.
      7) ASTM F 1861 - Standard Specification for Resilient Wall Base.
      8) ASTM F2170-16 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes.
      9) FS L-F-1641 - Floor Covering Translucent or Transparent Vinyl Surface With Backing.
      10) FS L-F-475 - Floor Covering, Vinyl Surface (Tile & Roll), with Backing.
      11) FS SS-W-40 - Wall Base: Rubber & Vinyl Plastic.
      12) NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
      13) NFPA 258 - Standard Test Method for Measuring the Smoke Generated by Solid Materials
      14) ASTM E1347 - 06 (2011) - Standard Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry.

   C. Regulatory Requirements:
      1) Conform to applicable code for flame/smoke rating requirements in accordance with ASTM-84. (ASTM E 648, Critical Radiant Flux - 0.45 watts/cm2 or more - Class 1; ASTM E 662, Smoke - 450 or less).

   D. Submittals:
      1) Submit under provisions of Section 01000.
      2) Shop Drawings: Indicate seaming plan, borders, patterns, and material color and model.
      3) Product data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
      4) Samples: Submit one (1) sample, 2x4 inch in size illustrating color and pattern for each floor material for each color specified.
      5) Submit one (1) 2 inch long samples of base material for each color specified.
      6) Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and preparation of existing floor surfaces.

7) Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

E. Delivery, Storage and Handling:
1) Deliver, store, protect and handle products to site under provisions of Section 01000.
2) Protect roll materials from damage by storing on end.
3) Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

F. Environmental Requirements:
1) Store materials for three days prior to installation in area of installation to achieve temperature stability.
2) Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.

G. Extra Materials:
1) Furnish under provisions of Section 01000.
2) Provide all full width flooring waste as selected by owner and one sealed box of base in each color. All material not selected by owner for extra material shall be disposed of by the contractor.

2. **PRODUCTS:**
A. Resilient Materials:
1) Vinyl Composition Tile: (NOT USED)
(1) 1/8 in. thick, 12 in. by 12 in., as manufactured by Armstrong (www.armstrongflooring.com),Lancaster, PA 1-888-276-7876, or approved equal.
(2) Adhesive, Crack Filler, and Primer: Shall be type and brand recommended by manufacturer for each of the various conditions and flooring materials. Where manufacturer lists more than one recommended material, the manufacturer's "preferred choice" shall be used.
(3) Colors: As indicated on Finish Materials Legends.

2) Luxury Vinyl Tile:
(1) 0.200 inches thick, 9 inches by 59 inches, as manufactured by Mohawk Group (www.mohawkgroup.com), Calhoun, GA 1-800-241-4494, or approved equal.
(2) Colors: As indicated on Finish Materials Legends.

3) Vinyl Base:
(1) 5-1/4 inch high, 3/8 in. thick, Millwork Wall Finishing System - Inflection base by Tarkett, Inc. (commercial.tarket.com), Solon, OH 1-800-899-8916
(1) Colors: As indicated on Finish Materials Legends.
(2) 4 inch high, 1/8 in. thick continuous roll, vinyl cove base by Tarkett, Inc. (commercial.tarket.com), Solon, OH 1-800-899-8916
(1) Colors: As indicated on Finish Materials Legends.

4) Trim and/or Terminations: Vinyl type by Tarkett or equal, color to be selected and approved by Architect.

5) Adhesives: All adhesives and installation conditions shall conform to manufacturer's recommendation for each specific installation condition found on this project.

3. **EXECUTION:**

A. Examination:

1) Examine all surfaces to receive new materials to verify they are suitable for application of material.
2) Verify concrete floors are dry to a maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization, or dusting. Confirm in writing that floor has been tested and proven to be in conformance with ASTM F710. Perform ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes. Owner may elect to retain his own testing agent to perform these tests.
3) Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.
4) Review all project conditions against manufacturer's recommendations, and consult manufacturer for proper methods and materials to suit specific or unusual conditions.
5) Report all defects that cannot be reasonably prepared to Owner.

B. Preparation:

1) Remove all raised areas down to a flat smooth surface.
2) Flash patch all cracks and depressions to achieve a flat smooth surface.
3) Prohibit traffic until filler is cured.
4) Vacuum clean substrate.
5) Apply primer to floor surfaces as recommended by flooring manufacturer.

C. Installation: VCT, LVT & Resilient Wall Base:

1) Lay resilient materials in strict accordance with manufacturer's printed instructions, in manner to insure good, uniform contact with subsurface materials, and to produce finished surfaces which are smooth, even, and in true planes, free of buckles, waves and other imperfections.
2) VCT tile grain shall run in the same direction for the same color, unless only one color is used. Rotate grain 90 degrees when changing color at adjacent tiles and 90 degrees when laying only one color. See Floor Patterns Plan for additional information.
3) Install resilient materials neatly into breaks and recesses, against bases and thresholds, and around pipes, columns, and other projections. Cut, fit, and scribe interior borders.
4) Install vinyl base tight to floors and walls. Use manufacturer's preformed corner pieces at inside and outside corners.

D. Completion:

1) Remove excess adhesive from floor, base, and wall surfaces without damage.
2) VCT: Wash resilient floor tile and apply three coats of buffable polish, using cleaners and polish recommended by manufacturer of tile. Buff tile to a sheen.
3) LVT: Immediately remove any adhesive from surface of tile as directed by the manufacturer and roll the tile in both directions as instructed by manufacturer's installation instructions.

E. Protection:

1) Prohibit traffic on floor finish for 48 hours after installation.
2) Do not permit any work to occur on finished floors without protection board.

-END OF SECTION-

SECTION 09900
PAINTING

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, materials, equipment and services to paint and finish all surfaces exposed to view throughout the interior and exterior of the project, not otherwise factory finished or as required for a complete project. Work includes but is not limited to the following:
      1) New interior and exterior hollow metal doors and frames. Paint any existing doors and frames that may remain in the finished project. Paint vision panel frames to match doors, unless otherwise indicated.
      2) Interior gypsum wallboard ceilings, facias and soffits, unless otherwise indicated.
      3) New interior gypsum wall board partitions.
      4) Paint all existing plaster, concrete and/or gypsum wallboard finishes exposed to view, unless otherwise indicated.
      5) Electrical panel covers in exposed locations (not within electrical closets).
      6) Exterior concrete columns, soffits, facias, unless otherwise indicated.
      7) All unprotected metals exposed to weather, including existing exterior metal.
      8) All existing painted work in areas of the building not otherwise indicated as new work.
      9) Paint unfinished exposed mechanical, plumbing and electrical items.
      10) Paint all items, existing or new, that do not conform to overall color scheme, including factory finished items if required, or as directed by Architect.
      11) Related Work:
         (1) Preparation of surfaces as required for the application of painting work.
         (2) Priming or priming and finishing of certain surfaces may be specified to be factory performed or installer performed under other Division (See Divisions 5 & 8)
         (3) Metal surfaces of aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require painting under this section unless so specified or indicated on drawings.
   B. Quality Assurance:
      1) Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
      2) Paint Coordination:
         (1) Provide finish coats compatible with prime coats actually used.
         (2) Review other Sections of these Specifications and verify the prime coats used by others to assure compatibility of the total coating system
   C. Submittals:
      1) Submit under provisions of Section 01300.
      2) Submit materials list of items proposed to be provided under this Section, and schedule of locations identifying where each will be used.
      3) Submit technical data on base coat finish for all paint types used.
      4) Submit manufacturers Specifications and other data verifying appropriateness of proposed coatings and compliance with Specifications.
      5) Submit samples of all proposed coatings in the finish and colors specified herein or selected by the Architect, for Architect's approval prior to covering work. Samples shall be 18" x 18" in size, labeled with corresponding paint number as indicated on Finish Schedule on Drawings.
      6) Contractor shall provide a 4' x 4' sample of color on jobsite for owner to review and approve prior to the purchase of paint. The contractor shall ensure the paint color is viewed under the

permanent lighting type intended for the space.

7) Color scheme shall be in accordance with schedule indicated or as approved by the Architect. Where specific manufacturer's colors are indicated, the Contractor shall be responsible for satisfactory color matches where substitute manufacturers are used. Where a specific manufacturer's factory finished standard colors are not indicated, the Contractor shall be responsible for providing a custom color to match that noted in the specifications or drawings.

D. Job Conditions:

1) Do not apply paint when the temperature is below 45 degrees Fahrenheit, or when the relative humidity exceeds 85%, unless specifically permitted by the manufacturer's specifications.

2. **PRODUCTS:**

A. Materials:

1) All painting materials used shall be best grade products of their respective kinds, as manufactured by recognized leading manufacturers, equal to and no substitutions permitted:
   (1) Benjamin Moore (www.benjaminmoore.com), Montvale, NJ 1-800-344-0400
   (2) Sherwin Williams (www.sherwin-williams.com) Cleveland, OH 1-800-474-3794
   (3) Glidden Co. (www.gliddenpaint.com) Cleveland, OH 1-800-454-3336
   (4) PPG Industries (www.ppghpc.com) Pittsburgh, PA (412)-434-3131 or
   (5) Pratt and Lambert (www.prattandlambert.com), Cleveland, OH 1-800-289-7728
   (6) Flame Control Coatings, Inc. (www.flamecontrol.com) Niagra Falls, NY (716)-282-1399

2) Contractor shall assume full responsibility for the proper performance of all materials used, and shall be responsible for the compatibility of any paint with other coats previously applied.

3. **EXECUTION:**

A. Acceptance of Surfaces:

1) Before doing any work, this Subcontractor shall notify the Architect of any materials and surfaces that are not suitable for receiving paint finish.

2) All surfaces shall be perfectly clean, smooth, free from sandpaper scratches and mill marks and thoroughly dry before painting. The application of the first coat of paint by this Subcontractor will be construed as an acceptance by him of the material to be painted; any defects occurring in the substrate or surface of the paint thereafter shall be corrected by this Subcontractor without additional cost to the Owner.

3) All spaces shall be broom clean before painting is started.

B. Preparation: Perform preparation and cleaning procedures in accordance with the paint manufacturers recommendations. Clean each surface to be painted immediately prior to applying paint. Remove all oil with solvent. Schedule the cleaning and painting to minimize the possibility of dust and other contaminants falling on wet newly painted surfaces.

1) Remove removable items which are in place and are not scheduled to receive paint, or provide surface protection prior to preparation and painting operations. Re-install removed items after final paint coat is thoroughly dry.

2) Preparation of wood surfaces:
   (1) Fill all gouges, scratches and other imperfections to restore surface.

(2) Sand wood surfaces as required to produce a uniformly smooth unmarred surface to receive paint. Sand previously painted surfaces to provide sufficient "tooth" for proper adhesion.

3) Preparation of metal surfaces:
   (1) Remove all rust, scale, oil and other foreign matter.
   (2) Sand glossy surfaces before application of paint.
   (3) On galvanized surfaces, use solvent for the initial cleaning, then treat the surface thoroughly with phosphoric acid etch. Remove solution completely before proceeding. Thorougly dry before painting

4) Materials Preparation:
   (1) Mix and prepare painting materials in accordance with the manufacturer's directions. Use only thinners approved by the paint manufacturer. Do not thin paint without specific permission from the Architect.
   (2) Store materials not in use in tightly covered containers. Maintain containers used for storage, mixing and application of paint in clean condition, free from foreign materials and residue.
   (3) Stir materials before application to produce a mixture of uniform density and stir as required during the application of materials. Do not stir surface film into the materials. Remove surface film and strain materials before using if necessary.

C. Application:
   1) General
      (1) Apply paint in accordance with the manufacturer's directions. Use applicators and techniques best suited to the type of material being applied.
      (2) Touch up shop applied prime coats which have been damaged with same primer originally used.
      (3) Number of coats specified is minimum. Provide all additional coats required for complete coverage and hiding, and for uniform finished appearance.
      (4) Sand and dust between coats to remove defects visible to the unaided eye from a distance of five feet.
      (5) Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
      (6) Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in the first coat to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. All wood finish shall be backprimed prior to, or immediately upon, delivery of materials to job site. Backprime painted surfaces with paint primer and natural finishes with clear varnish or polyurethane. All exposed wood surfaces shall be fine sanded between each coat of finish for a smooth finished surface.

E. Electrical and telephone backboards to be painted prior to installation of associated equipment, color to match adjacent wall finish.

F. Protection: Protect all surrounding surfaces in rooms and areas where painting and finishing is being done during the painting work. Remove and protect plated hardware, accessories, device plates, light bases, factory finished work, and similar items; or provide ample in-place protection.

G. Upon completion of painting work, thoroughly clean all surfaces adjacent to painted finish of paint or varnish drops, taking care not to damage these surfaces.

H. Stain and polyurethane work shall be shop finished whenever feasible, unless otherwise directed. Paint work shall be site finished, unless otherwise directed.

I. Clean-up: Clean all equipment as directed by manufacturer and tightly cap all unused containers. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from the site.

J. Painting Schedule:
1) Painting of Interior Surfaces: Notwithstanding anything in this schedule to the contrary, interior painting and finishing shall conform to applicable Federal, State, and local laws and codes regarding fire hazard classification of finish materials in the various areas.

2) Apply paint coatings equal to the following Benjamin Moore paint systems:
(1) Exterior Painting: (NOT USED)
(1) Type E1: Exterior Metals: Ferrous, galvanized and non-ferrous metals (low luster finish):(NOT USED)
(1) One Coat: Super Spec HP Alkyd Metal Primer (P06) for ferrous metals.
(2) One Coat: Super Spec HP Acrylic Metal Primer (P04) for galvanized and non-ferrous metals.
(3) Two Coats: Super Spec HP Acrylic Low Luster DTM (P25).

(2) Type E2: Exterior Concrete: Walls, ceilings, soffits (flat finish) (NOT USED)
(1) One Coat: BM Acrylic Masonry Sealer (N066).
(2) Two Coats: Moorlastic Acrylic Elastomeric Waterproof Coating (056).

(2) Interior Painting:
(1) Type I1: Interior Metals: Ferrous, galvanized and non-ferrous metals, registers, grilles, exposed conduit, exposed ducts, including hangers and supports, to be painted in with wall or ceiling against which they occur unless otherwise indicated (satin finish):
(1) One Coat: Corotech Acrylic Metal Primer (V110),Waterborne Bonding Primer (V175) or other compatible primer.
(2) Two Coats: Pre-Catalyzed Waterborne Epoxy Semi-Gloss (V341).

(2) Type I2: Interior Painted Wood: Trim & Chair Rails (satin finish): (NOT USED)
(1) One Coat: Advanced Waterbourne Interior Alkyd Primer (790).
(2) Two Coats: Advanced Waterbourne Interior Alkyd Satin Finish (792).

(3) Type I3: Interior Masonry: Walls (satin finish): (NOT USED)
(1) One Coat: Fresh Start Acrylic Latex Primer (023).
(2) Two Coats: Regal Select Pearl Finish (550).

(4) Type I4: Interior Drywall/Plaster: Walls (eggshell finish).
(1) One Coat: Fresh Start Acrylic Latex Primer (023).
(2) Two Coats: Regal Select Eggshell Finish (549).

(5) Type I5: Interior Drywall/Plaster/Concrete: Ceilings (flat finish).

(1) One Coat: Fresh Start Acrlyic Latex Primer (023).
(2) Two Coats: Regal Select Flat Finish (547).

(6) Type I6: Clear Wood Finish: Trim (clear satin finish): (NOT USED)
(1) One Coat: Benwood Interior Wood Finishes Wood Grain Filler (238).
(2) Three Coats: Benwood Acrylic Polyurethane Finish Low Luster (423).

(g) Type I7: Class "B" Fire Retardant Varnish (low luster finish) (NOT USED)
(i) Stain: Stain to match interior flush wood doors.
(ii) One Coat: Benwood Interior Wood Finishes Wood Grain Filler (238).
(iii) Base Coat: Flame Control No. 129 Fire Retardant Varnish.
(iv) Top Coat: Flame Control No. 130 Class "B" Fire Retardant Varnish Overcoat.

(h) Type I8: New Concrete Floors: Light Traffic (no fork-lifts) gloss finish: (NOT USED)
(3) One Coat: Corotech 100% Solid Epoxy Pre Prime (V155).
(4) Two Coats: Corotech Waterborne Amine Epoxy (V440).
(5) Aggregate: All high gloss surfaces can be slippery. Where non-skid properties are required a non-skid additive should be used.

3) Color Schedule:
(1) Submit manufacturer's colors samples for record purposes and changes in selection by Architect, if any.
(2) Color selections are indicated on the Finish Materials Legend in the drawings. Note that all paint colors are selected from BENJAMIN MOORE colors.
(3) Interior gypsum wall board ceilings, soffits and facias shall be painted white, unless otherwise noted.
(4) Where the Contractor elects to substitute other manufacturer's materials intending to match indicated colors, the Architect's approval of submitted color chips shall not relieve the Contractor of exact color matches. Where matches do not occur after painting is started or complete, the Contractor at his sole cost shall repaint all colors that are found to be unacceptable.

-END OF SECTION-

SECTION 10260
WALL & DOOR GUARDS

1. **GENERAL:**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install all wall and door guards as indicated. Work includes:
      1) Corner guards.

   B. Standards:
      1) UL 723 - Testing of vinyl/acrylic extrusions for flame spread and smoke.
      2) ASTM F476 - Testing for impact resistance.

   C. Performance Requirements:
      1) Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.
      2) Flame Spread and Smoke Generation: UL tested and labeled Class I Fire Rating.

   D. Submittals:
      1) Submit under Provisions of Section 01300.
      2) Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
      3) Samples: Submit (1) section each of all wall protection specified, each 24 inches long, illustrating component design, configuration, color and finish.
      4) Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
      5) Maintenance data: Include maintenance procedures, recommended maintenance materials, and manufacturer’s recommended cleaning method.

   E. Field Measurements: Verify that field measurements are as indicated on Drawings and as instructed by the manufacturer.

   F. Coordination: Coordinate the work with wall or partition sections for installation of concealed blocking or anchor devices.

   G. Quality Assurance:
      1) Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.
      2) Chemical and stain resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D-1308.

   H. Qualifications:
      1) Installer qualifications: Engage an installer who has no less than 3 years experience in installation of systems similar in complexity to those required for this project.
      2) Manufacturer’s qualifications: Not less than 5 years experience in the production of specified products and a record of successful in-service performance.
      3) Code compliance: Assemblies shall conform to all applicable codes.
      4) Fire performance characteristics: Provide wall protection system components with UL label indicating that they are identical to those tested in accordance with ASTME84 (CAN/ULC S102.2) for Class 1 characteristics listed below:
         a. Flame Spread: 25 or less.

b. Smoke Developed: 450 or less.

I. Delivery, Storage & Handling:
1) Deliver materials to the project site in unopened original factory packaging clearly labeled to show manufacturer.
2) Store materials in original, undamaged packaging in a cool, dry location out of direct sunlight and exposure to the elements. A minimum room temperature of 40 degrees Fahrenheit and a maximum of 100 degrees Fahrenheit should be maintained.
3) Material must be stored flat.

J. Environmental Requirements:
1) Materials must be acclimated in an environment of 65-75 degrees Fahrenheit for at least 24 hours prior to beginning the installation.
2) Installation areas must be enclosed and weatherproofed before installation commences.

2. **PRODUCTS:**
A. Manufacturers:
1) Construction Specialties Inc., Muncy, PA, (717) 546-5169 (www.c-sgroup.com)
2) Provide all protection as indicated on Wall Protection Plan and as described in the Finish Materials Legend.

B. Materials:
1) Corner Guards/ End Guards:
a. Engineered PETG: Extruded material shall be high impact Acrovyn with shadow grain texture, nominal .078 inch thickness. Chemical and stain resistance should be per ASTM D-543 standards as established by the manufacturer.
b. Aluminum Retainers: Extruded continuous aluminum retainers should be 6063-T6 alloy, nominal .062 inch thickness. Minimum strength and durability properties as specified in ASTM B221.
2) Crash Rails & Combination Crash Rail / Handrails (NOT USED):
a. Engineered PETG: Extruded material shall be high impact Acrovyn with shadow grain texture, nominal .078 inch thickness. Chemical and stain resistance should be per ASTM D-543 standards as established by the manufacturer.
b. Aluminum Retainers: Extruded continuous aluminum retainers should be 6063-T6 alloy, nominal .062 inch thickness. Minimum strength and durability properties as specified in ASTM B221.
c. Regrind Bumper Cushion: Recycled vinyl/acrylic compound.
3) Wall Covering: (NOT USED)
a. Engineered PETG: Rigid sheet shall be high impact Acrovyn with suede (standard) texture, nominal .040 inch thickness and supplied in 4' x 8' or 4' x 10' sheet sizes in suede (standard) texture.
b. Where field cutting of sheets is required, score and cut panels clean and straight in strict accordance with manufacturer's instructions. Prevent fraying and other irregularities to cut edges.
4) Door Protection: See Door Hardware Specifications 08710.

C. Components:
1) Corner Guard - Surface Mounted:
a. Model: SSM-20AN & SM-20MN.
b. Material: Surface mounted guards consisting of continuous aluminum retainer with snap-on

Acrovyn cover.
c. Exposed Corner Radius: 1/4 inch.
d. Length: One piece.
e. Preformed end caps where exposed. Color of endcaps to match corner guard color.
f. Color: #102 Desert Sand

2) Wall End Guard - Surface Mounted (NOT USED):
a. Model: SSM-25AN.
b. Material: End guard assembly composed of (2) SSM-20AN surface mounted corner guards with .040 inch thick Acrovyn sheet as a spacer.
c. Exposed Corner Radius: 1/4 inch.
d. Length: One piece.
e. Preformed end caps where exposed. Color of endcaps to match corner guard color.
f. Color: #102 Desert Sand

3) Rounded Crash Rails (NOT USED):
a. Model: SCR-50MN
b. Material: Extended mounted assembly consisting of a continuous aluminum retainer with snap-on Acrovyn cover and integral shock absorbing cushions.
c. Mounting: Surface.
d. Projection From Wall to Outside of Rail: 1-1/16 inches.
e. Clear Space From Wall: Tight to wall.
f. Section: Curved, 1-1/16 x 5 inches.
g. Length: Minimum one piece length not less than 48 inches on continuous runs; flush splicing.
h. Color matched end caps to be removable for ease of replacement.
i. Preformed return to wall end caps, internal and external corners.
j. Color: #102 Desert Sand

4) Crash Rails w/ Handrails (NOT USED):
a. Model: P-RSAN
b. Material: Extended mounted assembly consisting of stainless steel mounting brackets with aluminum retainers, snap-on Acrovyn cover and integral shock absorbing cushions. Stainless steel handrail.
c. Mounting: Surface.
d. Projection From Wall to Outside of Rail: 3 inches.
e. Clear Space From Wall: Varies.
f. Section: Rectangular, 1-1/4 x 4 inches & 1-1/2 inch handrail
g. Length: Minimum one piece length not less than 48 inches on continuous runs; flush splicing.
h. Color matched end caps to be removable for ease of replacement.
i. Preformed return to wall end caps, internal and external corners.
j. Color: #102 Desert Sand & stainless steel handrail

5) Mounting Brackets & Attachment Hardware:
a. Appropriate to component and substrate.
b. All fasteners to be non-corrosive and compatible with aluminum retainers.
c. All necessary fasteners to be supplied by the manufacturer.

D. Fabrication:
1) General: Fabricate wall protection systems to comply with requirements indicated for design,

dimensions, detail, finish and member sizes.
2) Fabricate components with tight joints, corners and seams.
3) Pre-drill holes for attachment.
4) Form end trim closure by capping and finishing smooth.

3. **EXECUTION:**

A. Examination: Verify that rough-in for components are correctly sized and located. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion. Do not proceed until unsatisfactory conditions have been corrected.

B. Installation of Corner Guards, Crash Rail and Hand Rail:
1) Install the work of this section in strict accordance with the manufacturer's recommendations, using only approved mounting hardware, and locating all components firmly into position, level and plumb, secured rigidly in position to wall framing members only.
2) Temperature at the time of installation must be between 65-75 degrees Fahrenheit and be maintained for at least 48 hours after the installation.
3) Position corner guard/end guard from top of base to underside of crash rail/transaction top as noted on the drawings. Refer to Wall Protection Plan for corner guard mounting height information.
4) Position top of crash rail 2'-10" (34 inches) from finished floor, run continuous with no interruptions unless indicated.
5) Terminate rails tight to edge of door frames.
6) Return rails to wall.
7) Where splices occur in horizontal runs, splice aluminum retainer and cover at different locations along the run.
8) Coordinate installation of wall covering with a wall protection.
9) Adjust installed end caps at corner guards/end guards as necessary to ensure tight seams.

C. Installation of Wall Covering: (NOT USED)
1) Prior to installation, clean substrate to remove dirt, dust, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.
2) Install the work of this section in strict accordance with the manufacturer's recommendations, using approved adhesive.
3) Temperature at the time of installation must be between 65-75 degrees Fahrenheit and be maintained for at least 48 hours after the installation to allow for proper adhesive set up.
4) Relative humidity shall not exceed 80%.
5) Place sheeting plumb and square with tight butting joints.
6) Do not expose wall covering to direct sunlight during or after installation. This will cause the surface temperature to rise, which in turn will cause bubbles and delamination.

D. Erection Tolerances - Horizontal Crash Rails:
1) Maximum Variation From Required Height: 1/4 inch.
2) Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

E. Cleaning: Immediately upon completion of installation, clean covers and accessories in accordance with manufacturer's recommended cleaning method. Remove surplus materials, rubbish and debris resulting from installation as work progresses and upon completion of work.

F. Protection of Finished Work: Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

G. Schedule: See Finish Materials Schedule on drawings for color selections.

-END OF SECTION-

SECTION 13095
RADIATION PROTECTION

1. **GENERAL**
   A. Scope: Contractor shall furnish all labor, equipment and material required to provide and install all radiation protection as indicated or as required for a complete project. Work of this section shall be coordinated with and/or incorporated into other related sections. This work applies to the Linear Accelerator room where lead protection is indicated. Work includes, but is not limited to:
      1) Lead sheets applied to wall framing.
      2) Lead lined gypsum board at walls.
      3) Lead bricks in walls.
      4) Lead lined doors and frames.
      5) Lead foil applied at penetrating items.
      6) Accessories as required for complete protection.

   B. Related Sections:
      1) Section 08110 - Standard Steel Doors & Frames: Hollow metal door frames requiring lead lining.
      2) Section 08211- Flush Wood Doors: Wood doors requiring lead lining.
      3) Section 08712 - Door Hardware.
      4) Section 09260 - Gypsum Board Systems: Installation of lead lined gypsum board and accessories.

   C. Standards:
      1) ASTM B749 - Lead and Lead Alloy Strip, Sheet, and Plate Products.
      2) ASTM C36 - Gypsum Wallboard.
      3) NBS - National Council on Radiation Protection and Measurement (NCRP Report #49 - Diagnostic) "Structural Shielding Design and Evaluation for Medical Uses of Xrays and Gamma Rays of Energies up to 10 MeV".

   D. System Description:
      1) Radiation Protection: Contain, without leakage, emitted radiation, measured at wall surface with measuring device simulating the emitting equipment.
      2) Protection: Walls, fixed control screens, including wall interruptions for doors, glazing, thresholds, and hardware.

   E. Submittals:
      1) Submit under provisions of Section 01300.
      2) Shop Drawings: Indicate layout, details, dimensions, interface with adjoining work, and all accessories.
      3) Product Data: Provide data on all radiation protection products.

   F. Quality Assurance:
      1) Perform Work in accordance with NBS (NCRP Report) requirements.

   G. Qualifications:
      1) Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
      2) Installer: Company specializing in performing the work of this section with minimum three years experience.

H. Regulatory Requirements:
   1) Conform to applicable health and occupation codes for integrity of radiation protection and continuity of protected construction.

2. **PRODUCTS**

A. General: All radiation protection shall have a protection rating equivalent to or better than 3/8 inch thick lead, unless otherwise indicated.

B. Sheet Lead & Associated Materials:
   1) Sheet Lead: ASTM B749, thickness as indicated on drawings.
   2) Gypsum Board: ASTM C36, paper/paper faced, tapered edges and square ends; 5/8 inch thick; Type X.
   3) Fasteners: Lead headed to twice thickness of sheet lead.

C. Fabrication:
   1) Lead Laminated Gypsum Board: Fabricate with monolithic sheet lead bonded to one surface of board, extend lead sheet 1 inch beyond one side and one end of board.
   2) Lead Laminated Plywood: Fabricate with monolithic sheet lead bonded to one surface of plywood, extend lead sheet 1 inch beyond one side and one end of board
   3) Lead Lined Doors: Fabricate with two independent lead sheets, 3/16 inch thick, bonded to a solid wood core provided by Section 08211 to form rigid door leaf, 2-1/4 inch finished door thickness. Trim lead, flush with door leaf edges.
   4) Hardware: As required to provide continuous radiation protection.
   5) Threshold: N/A

D. Components & Accessories:
   1) Gypsum Board Partition Accessories: Shields for junction boxes and breaks in gypsum board.

3. **EXECUTION**

A. Examination:
   1) Verify that existing surfaces, and substrate construction are ready to receive work and opening dimensions are as indicated on shop drawings and as instructed by the applicable manufacturers.

B. General Requirements:
   1) Lead barriers shall be mounted in such a manner that they will not sag or cold-flow because of their own weight. Lead sheets of 1/32 inch or less shall be bonded to rigid supporting panels.
   2) Surfaces of lead sheets at joints in barrier shall be in contact with a lap at least 1/2 inch or twice the thickness of the lead sheets whichever is greater.
   3) Welded or burned lead seams are acceptable provided the lead thickness at the seam is equal to or greater than the lead sheet.
   4) Joints between different types of protective barrier material shall be so designed that the protection of the barrier is not impaired.
   5) Joints at the floor and ceiling where applicable shall be designed to maintain barrier to adjoining material.
   6) Provide overlap shielding at doors and frames.
   7) Holes in protective barriers shall be protected to maintain barrier. Louvers and holes for all items including pipes, conduits, service boxes and air ducts shall be protected. Obtain Owner's technical support prior to installations for guidance.

C. Installation - Sheet Lead:

1) Install lead laminated board to wall substrate by mechanical attachments; lead headed fasteners spaced as recommended by manufacturer, attached to framing members. Install lead laminated products concealed with lead face against supports.
2) Extend lead protection from finished floor to a underside of roof above.
3) Lap edges and ends of lead sheets 1 inch. Apply lead patches, same thickness as lead sheet, over penetrations, to achieve continuity of protection.
4) All corners shall be sealed to prevent gaps.
5) Conduit and Outlet Box Protection: Install lead baffles behind all service boxes making penetrations in the lead barrier.
6) Apply lead sheet patches around penetrations to sheet lead protection, extending 4 feet beyond penetration or as permissible to Physicist of Record.

D. Installation - Doors & Frames:
1) Doors and frames shall have the same lead equivalent as that required of the adjacent wall. Where thick concrete walls are tapered into openings, provide protective lead flanges around frames to compensate for difference in concrete thickness.

E. Installation - Components & Accessories:
1) Install components and accessories in accordance with manufacturer's instructions.
2) Install lead lined frames in accordance with Section 08110 and lead lining fabricator instructions.
3) Install lead lined doors in accordance with Section 08211. Coordinate installation of door hardware.
4) Install lead lined panels as indicated.

F. Field Quality Control:
1) Inspection and testing will be performed by a licensed radiologist technician as provided by the Owner in coordination with regulatory agency requirements, to ascertain conformance of installation regarding radiation passage or leakage.
2) Notify the Owner when work is scheduled to occur, and cooperate and offer assistance in such work. Execute instructions given.

-END OF SECTION-

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TRUEBEAM / VITALBEAM

PRODUCT PLANNING GUIDE

P/N: P1026768-04

PPG-HT-D NOVEMBER 2020

Introduction to the Varian Product Planning Guide (PPG)

(Adobe© Acrobat .PDF format)

Language of Origin

The origin of this publication is of English-language, the English version should always be considered the master.

Conventions

The dimension and tolerance format is shown as SI followed by Imperial units in brackets – Metric [Imperial], the default is cm [inches] unless otherwise noted. Tolerances are given where critical, otherwise, general tolerances from ISO 4463-1: 1989 should be used.

All listed component weights are within a ±5% tolerance, not including system cabling or coolant., if applicable.

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Release Notes (please see the Revision History for a list detailed of changes)

EXECUTIVE SUMMARY

Intended Audience

The intended audiences of this PPG are any Varian external customers or their representatives.

Purpose

This document is designed to assist customers and their representatives to understand the minimum requirements to enable a Varian TrueBeam/VitalBeam to be installed. This document is a reference for the machine and site planning and does not cover specific site conditions that may require additional detailed design or safety solutions.

The information herein will be useful to project managers, architectural and site planners, construction engineers, contractors' trade personnel, and others. Good site preparation and coordination between Varian and the customer's representative is essential for smooth and efficient machine installation.

It is important to finalize the detailed design of the site configuration before construction is started. Once the site is completed, it will be difficult, and costly to make revisions.

Document Structure

This document has four main sections:

Product Overview	- System pictures, identification of deliverables, shielding, and references.
Varian System	- Varian delivered parts, size, weight, and limitations.
Customer Requirements	- Room sizes, utility, and environmental requirements in trade sections.
Project Management	- Contractor tasks, durations, and responsibilities.

Project Planning

Once an order is placed, Varian will assign an Installation Project Manager (PM) to assist the customer and their representatives with the installation of the TrueBeam/VitalBeam system. Refer to 4 Project Management for more information.

Typical Lead-times and Durations

Min. lead-time from Customer order – **~ 4 months** (+ 1-month shipment for non-US orders)
Cable lengths required – **6 weeks** before delivery (+ 1-month shipment for non-US orders)
Third-party products (Power Conditioner, Chiller, Lasers, etc.) – **12 weeks**
BaseFrame installation – **2 days**
Concrete cure time before machine install – **4 weeks** recommended.
Standard Installation (including rig and acceptance) – **4 weeks**
SuperFast Installation (including rig and acceptance) – **2 weeks**
Accelerator Commissioning - approximately **6 weeks**, may vary.

Table 4-1 shows the detailed process and responsibilities for each major project milestone.

Site Readiness

The room must be clinically ready, meeting all the requirements within the PPG. All services and utilities must be available with the final finishes completed. The [1] Varian Accelerator Pre-Installation Checklist is used to measure compliance. Any tasks that are NOT complete must be approved by the Varian PM before the machine can be delivered. The Varian engineer must have exclusive possession of the treatment area during machine installation.

REVISION HISTORY

REV	DATE	DESCRIPTION OF CHANGE	AUTHOR NAME

C	October 2020	• Updated cover page
		• Removed Project Planning paragraphs from page 3, duplicated in Section 4
		• Updated the Typical Lead-times and Durations on page 3
		• Moved Note from page 9 to Section 3.1.2
		• Removed 1.3 Glossary and Abbreviations
		• Revised metric dimensions in Figure 2-1
		• Moved Turntable weight from Table 2-2 to Table 2-1
		• Added new Note on monitors to 2.5
		• Revised 2.6.1 MCB description text and removed duplicate information
		• Removed Note from 2.6.2, duplicate information
		• Updated Figure 2-8, added hinges
		• Moved Notice from 2.7.2 to 3.2.4
		• Moved bullet points from 2.7.3 to Notice in 3.1.4.2
		• Moved Note to 2.7.4 descriptive text
		• Moved bullet points from 2.7.4 to Notice in 3.1.4.1
		• Moved Notice 2.7.4 to 3.1.4.1
		• Moved bullet points from 2.7.5 to Notice in 3.1.4.3
		• Removed bullet on another set of IRMs, duplicate
		• Revised the Warning from 213 [7'-0"] to 203 [6'-8"] in 2.7.5
		• Added Support Document reference to Notice in 3.1
		• Section 3.1.1
		  • Corrected detail metric dimension from 305cm to 30.5cm
		  • Added bullet on pit depth variation
		  • Added bullet for cooling line reference
		• Revised the shaded area required for minimum floor clearances
		• Separated recommended and minimum ISO to rear wall dimensions
		• Revised the Caution in 3.1.2.1, moved text to create a new Note on obstruction consideration
		• Updated Figure 3-5, front clearance, added Console Cabinet outline
		• Updated Figure 3-6, flipped LV camera to reflect sample layout
		• Moved bullet points from 3.1.4 to 3.1.4.1
		• Moved bullet points from 3.1.4 to 3.1.4.2
		• Revised Table 3-1, removed LV camera lens column, revised Front Wall to Sagittal Wall
		• Added new Section 3.1.4.1 CCTV Cameras
		• Added new Section 3.1.4.2 Laser Mounting Plates
		• Moved IRM wall mount bullet to 2.7.5
		• Revised 3.2.2, removed duplicate specifications, removed isolation transformer Note
		• Section 3.2.3
		• Removed Conduit Access and Labeling, 3.2.3
		• Added wiring and cable key
		• Updated Table 3-3 and Figure 3-9
		• Moved Note for 1-phase for accessories to 3.2.5.1
		• Added Note for customer wiring from MCB to Modulator.
		• Removed Conduit Access, 3.2.4
		• Added new Section 3.2.4.1 RJB Customer Connections
			DKU

		• Moved Dedicating Grounding Section in front of Cable Containment
		• Revised 3.2.6 description, moved text to Caution, removed duplicate text
		• Updated Figure 3-12, added Laser Plates and RJB
		• Revised 3.2.7 bullets
		  • Removed place components shortest path
		  • Removed verify room penetrations
		  • Moved “conduit must be shorter than cable” to new Note
		• Added maximum run length to Table 3-4
		• Added new Section 3.2.8 Cable Access
		• Moved room lighting to Section 3.2.9, moved power requirement Note to Figure 3-10
		• Moved 3.2.10.1 warning light requirements to bullet points
		• Revised 3.2.10.1 aural indicator Note to a Notice
		• Revised 3.2.10.3 EMO Switch to EMO Button
		• Moved 3.2.10.3 EMO Button requirement to a bullet point
		• Added new Section 3.2.10.4 for Emergency Disconnect Button
		• Removed Table on Safety Devices, moved options to bullet points, 3.2.10.5
		• Moved treatment room Wi-Fi bullet to a Note, Section 3.2.11
		• Added maximum input pressure to Table 3-8
		• Updated Figure 3-16, added Varian hose kit and stand entry point
		• Added do not locate floor drains in Notice, Section 3.3.1
		• Added new Section 3.3.2 Cooling Line Access
		• Added new Section 3.3.4 Optional Plumbing Considerations
		• Moved 3.4.1 Ventilation requirements to bullet points, removed duplicate Note
		• Revised the 3.7.1 Flooring requirement, changed from “static dissipative” to “Anti-Static”, removed the resistance range.
		• Added new Figure 3-18, for flooring voids
		• Removed text from Section 3.7.2, duplicated requirement in 3.1.2.2
		• Revised 4.1 Responsibilities description
		• Revised 4.3 BaseFrame customer materials to “S2” and to “~1.6 cu. yds.”
		• Added new Notice to Appendix A Section 2 Rigging
		• Revised 2.1 Standard rigging weight to “6123kg [13,500lb]”	

D	November 2020	• 2.5, Removed monitor risers • 3.1.4.3, Added optical imager reference to the longitudinal axis line • Table 3-2, Console Current, added neutral • Table 3-4, Revised AC Door Interlock to 120 VAC • 3.2.5, Revised from 24 VDC to 24 VAC • 3.2.10.5, Revised Light Curtain, controls door interlock circuits • 3.2.11, Added WiFi in the control area • 3.7.4, Revised the Fire Protection statement	DKU

TABLE OF CONTENTS

1 OVERVIEW

The Varian TrueBeam is the only system specifically designed to deliver both radiotherapy and radiosurgery. A sophisticated and highly intelligent technology, this breakthrough system unlocks the ability to do tailored ground-breaking treatments with unprecedented ease, versatility, and speed. The TrueBeam system brings together state-of-the-art, real-time imaging with the ability to deliver higher doses with high precision. Because of this intelligent design, physicians can treat more complex cases and more patients. As sophisticated as it is, the TrueBeam system has been developed for ease of use. Designed with an emphasis on efficiency, the TrueBeam system is easy for a technician or a clinician to learn and operate.

VitalBeam is a new cost-effective technology package for offering high-quality, high-throughput radiation therapy, and for expanding clinical capabilities over time. VitalBeam leverages the best of Varian's technology; incorporating many of the innovations we developed for our popular TrueBeam radiosurgery system to enhance precision, safety, and speed of treatment. It is a flexible and upgradeable system that affordably meets the clinical needs today as they grow in the future. Each of the five VitalBeam configurations offers up to three photons and four electron energy levels for flexibility in treatment. Customers can choose to start with one configuration and add capabilities over time, at a pace that suits them. It is distinct from our versatile TrueBeam radiotherapy and radiosurgery platform in that VitalBeam is optimized for advanced radiotherapy while TrueBeam systems were designed to handle both.

Figure 1-1 VitalBeam Stand, Gantry, and Couch

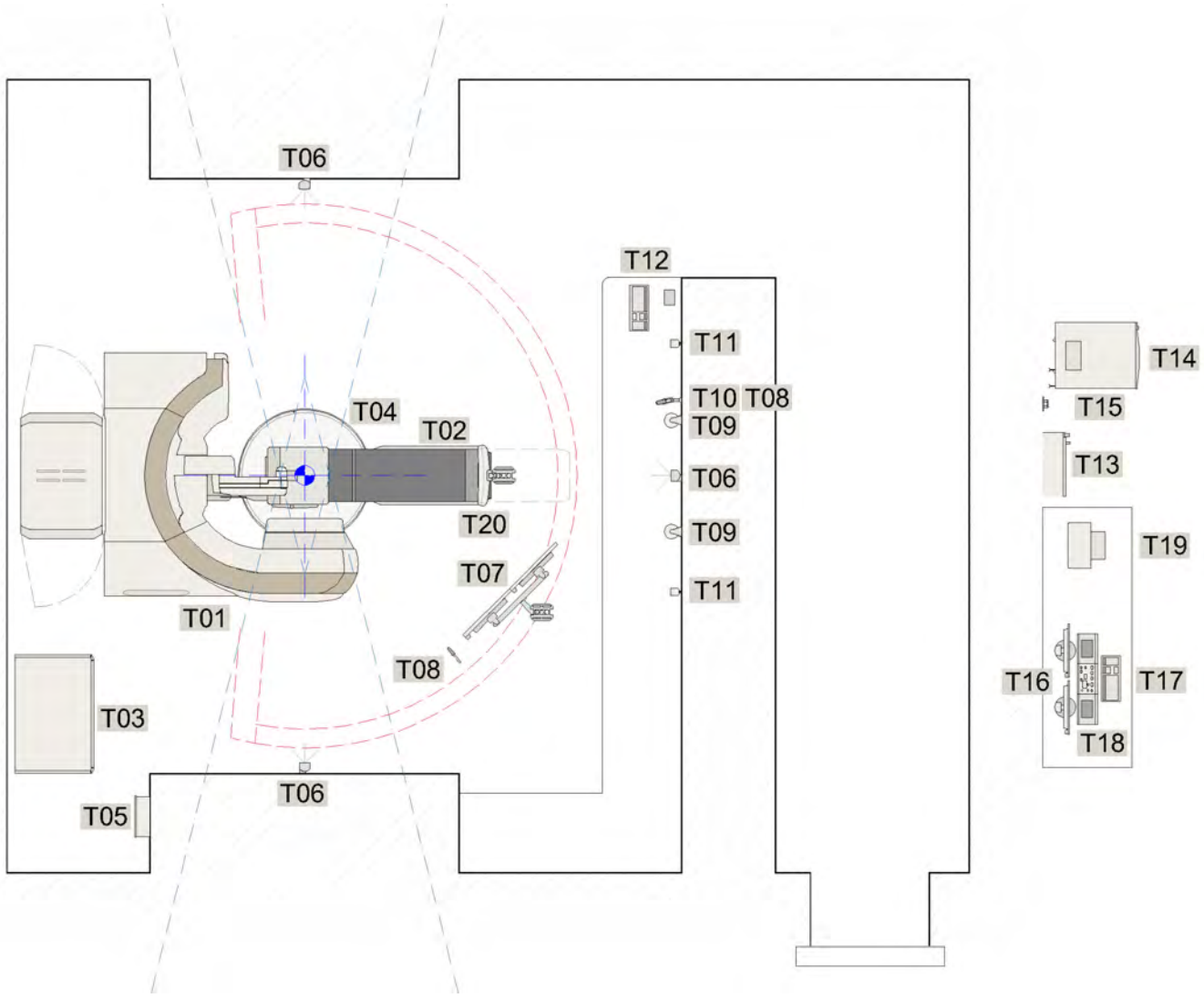


Figure 1-2 TrueBeam/VitalBeam System Components *(sample layout)*

Table 1-1 TrueBeam System Components			
T01	Stand & Gantry	**T11**	Speaker *(x2)*
T02	Treatment Couch	**T12**	USB Hub & Service Keyboard
T03	Modulator Cabinet	**T13**	Main Circuit Breaker, MCB *(opt. check SO)*
T04	BaseFrame	**T14**	Console Cabinet
T05	Relay Junction Box	**T15**	IEC 60309 Power Outlet *(opt. check SO)*
T06	Positioning Laser *(x4, opt. check SO)*	**T16**	System Monitors *(x2, Treat and Image)*
T07	In-Room Monitor Set *(Dual Screen)*	**T17**	Control Console, Keyboard, and Mouse
T08	Patient Microphone	**T18**	CCTV Monitor *(x2)*
T09	CCTV Camera *(x2)*	**T19**	Printer
T10	Live View Camera	**T20**	Optical Imaging Camera *(opt. check SO)*

1.1 SHIELDING

WARNING

Varian Medical Systems shall have no approval or other responsibility for any matter affecting or related to the adequacy of the radiation protection walls and barriers or related safety devices. All radiation shielding designs must meet codes and regulations of all Authorities Having Jurisdiction (AHJ) and must be approved by the Customer's or Facility's Physicist of Record and shall be the sole responsibility of the Customer/Facility. The hours of operation, patient workload, accelerator energy, and the shielding materials should all be taken into consideration when calculating shielding requirements. Severe injury or death can result from improper radiation shielding.

- Consideration should be taken when locating linear accelerator equipment in the proximity of Magnetic Resonance Imaging (MRI) units or other magnetic field generating equipment.
- The TrueBeam/VitalBeam Accelerator and associated video monitors should be located outside of the 100 µT (1 Gauss) magnetic field.

1.2 REFERENCES

These support reference documents and other more detailed documents are available from the Varian Planning Department or your Varian PM.

[1] Varian Accelerator Pre-Installation Checklist

[2] SD–HT–Moving Modulator

[3] SD–HT–MCB Panel

[4] SD–HT–Seismic

[5] D26947 TrueBeam/VitalBeam External Cooling Water Recommendations

2 VARIAN SYSTEM DIMENSIONS

2.1 STAND, GANTRY, AND COUCH

The Stand, Gantry, and Couch are the main functional components of the machine that the users and patients will have contact with. Isocenter is the primary reference point for Varian equipment in the treatment room.

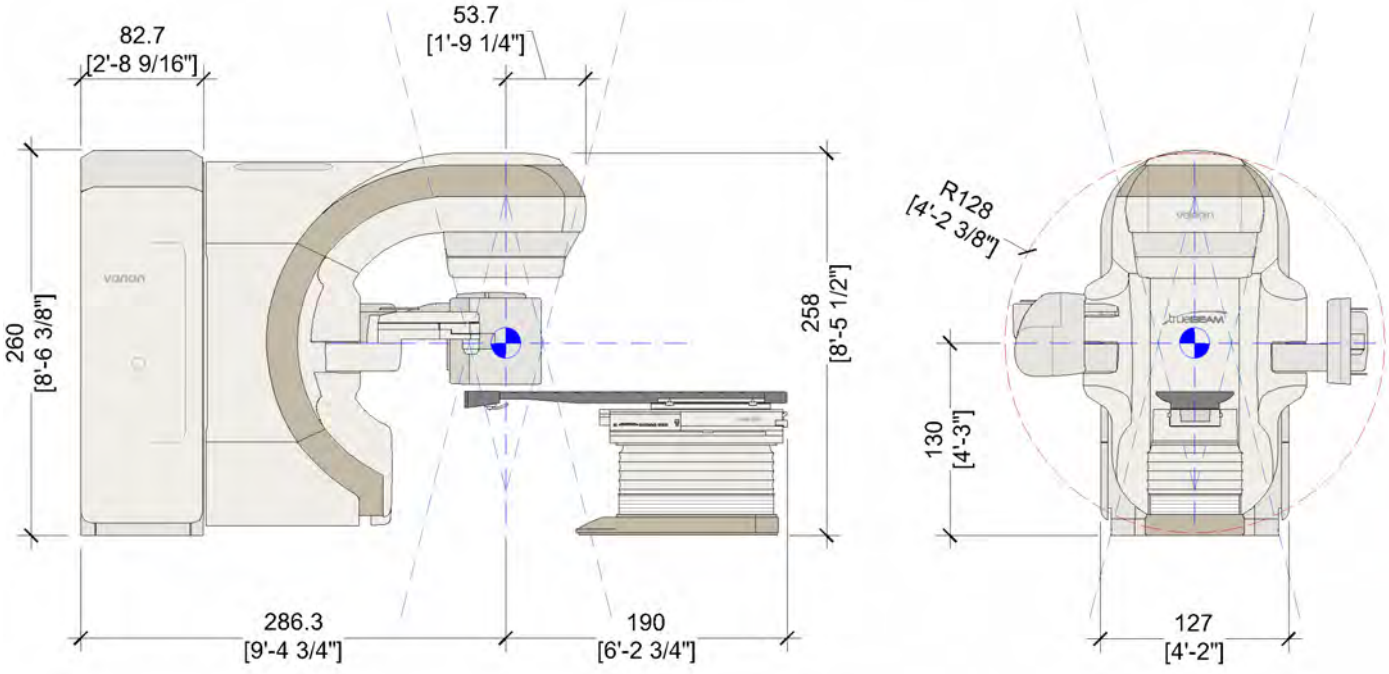


Figure 2-1 TrueBeam/VitalBeam Stand, Gantry, and Couch (Side and Front View)

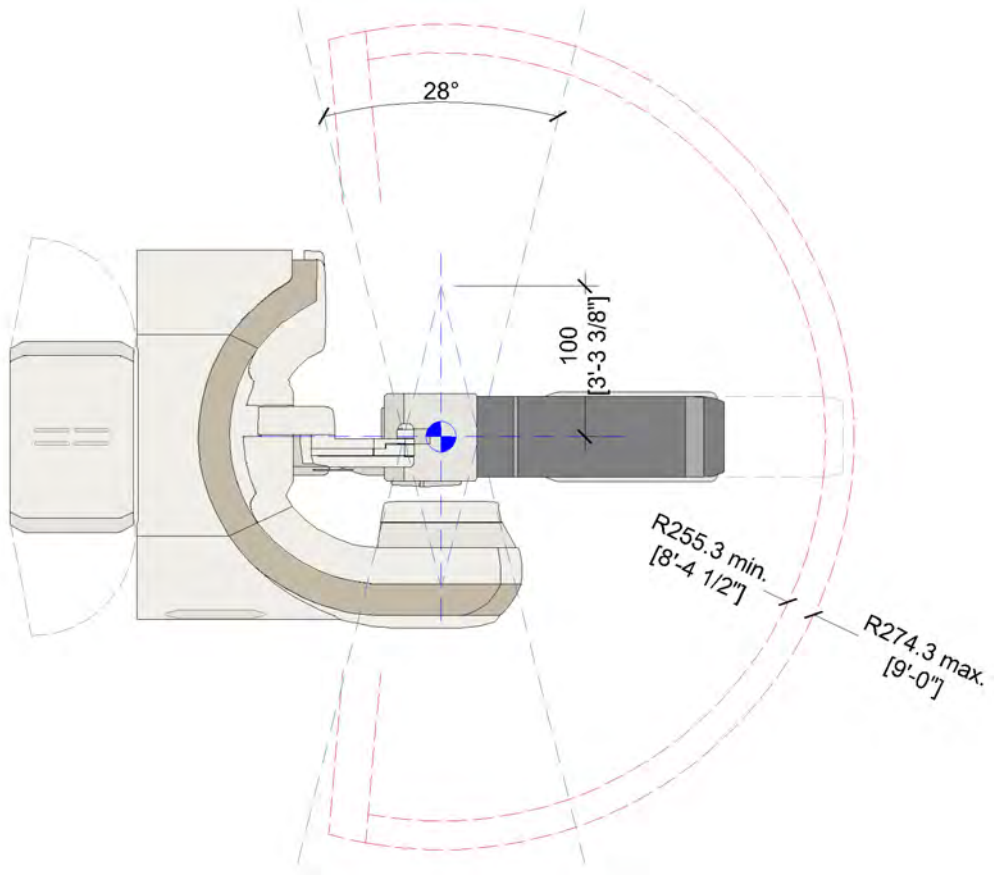


Figure 2-2 Couch Radius, Primary Beam Angle and Source to Isocenter Distance

Table 2-1 Treatment System Weights		
Description	**Kg**	**Lb**
Stand and Gantry	8507	18754
Couch and Couch Top	627	1382
Turntable Assembly	391	862
Total System excluding BaseFrame	9525	20998

2.2 BASEFRAME

The BaseFrame is used to connect the Stand, Gantry, and Couch to the building. It is installed into a recessed equipment pit below the finished floor and held in place with concrete.

The BaseFrame is secured to the pit slab to avoid floating during final concrete placement. Non-Seismic anchors are provided and installed at the red dots indicated in the plan view. See Section 3.1.1 and Section 4.3 for more information.

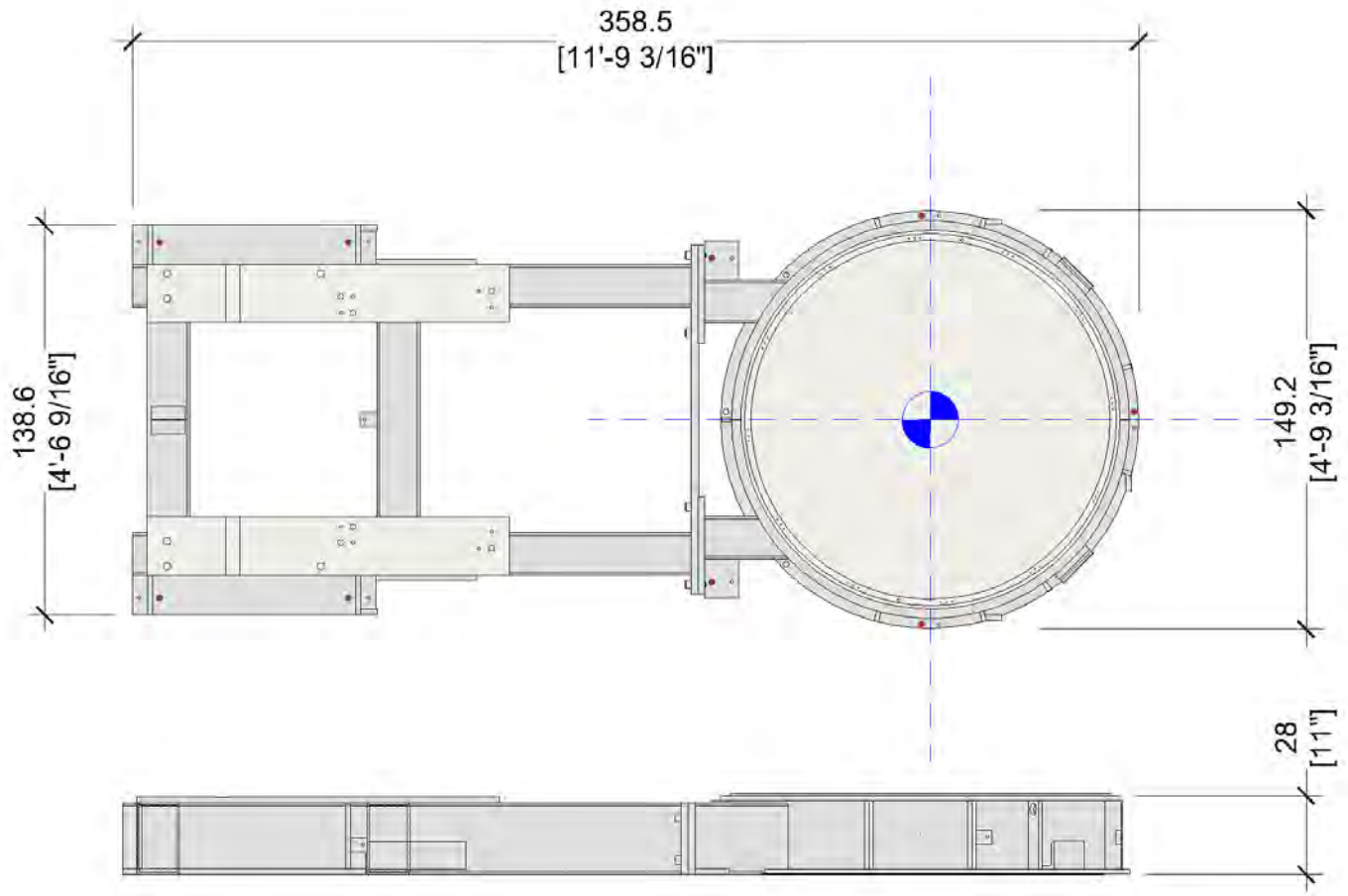


Figure 2-3 Universal BaseFrame (Plan and Side View)

For Varian machine replacements, the existing BaseFrame may be able to be reused, the Varian Planning Department or Varian Sales can provide more information.

Table 2-2 BaseFrame Weight		
Description	**Kg**	**Lb**
BaseFrame	757	1669

2.3 MODULATOR

The Modulator is the power supply cabinet to the TrueBeam system. The Modulator cabinet may be located either in the treatment room or remotely. Ventilation, acoustics, service provisions, and cable length must be considered in the final placement. See Section 3.1.3 for the required clearances.

NOTICE **Do not locate the Modulator in the primary beam path.**

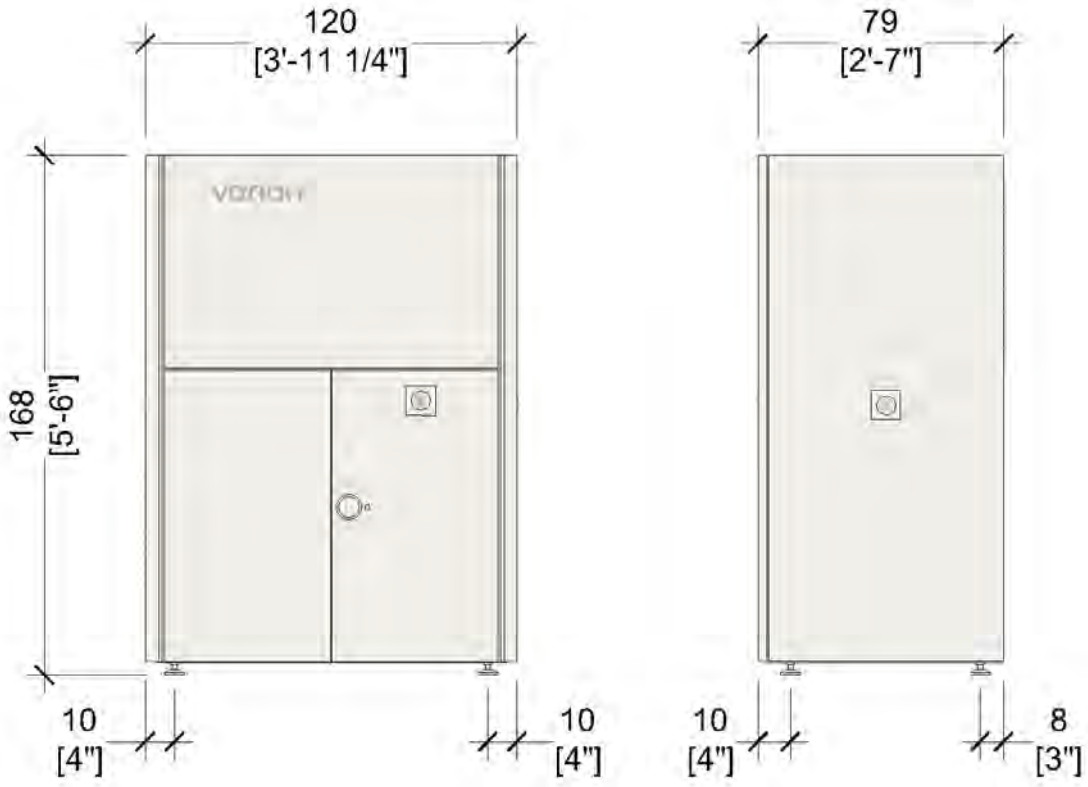


Figure 2-4 Modulator Size (Front and Side View)

An optional Moving Modulator Kit is available that permits the Modulator Cabinet to be installed in areas that cannot meet the required service clearance area, as shown in Figure 3-4. This kit positions one side of the Modulator Cabinet closer to the wall during clinical use while allowing it to be rolled away from the wall for service. This kit can be ordered from the Varian PM. There is a requirement for a service pit below the modulator to manage the interconnection power cables. The Varian Planning Department or Varian PM can provide more information, [2] SD–HT–Moving Modulator.

Table 2-3 Modulator Weight

Description	Kg	Lb
Modulator	900	1985

2.4 CONSOLE CABINET

The Console Cabinet houses rack-mounted computers and imaging equipment required to run the system and user interface. It is powered from the Main Circuit Breaker panel (MCB). See Table 3-2 and 3.2.5.2 Control Area for details on the specific electrical requirements for the cabinet.

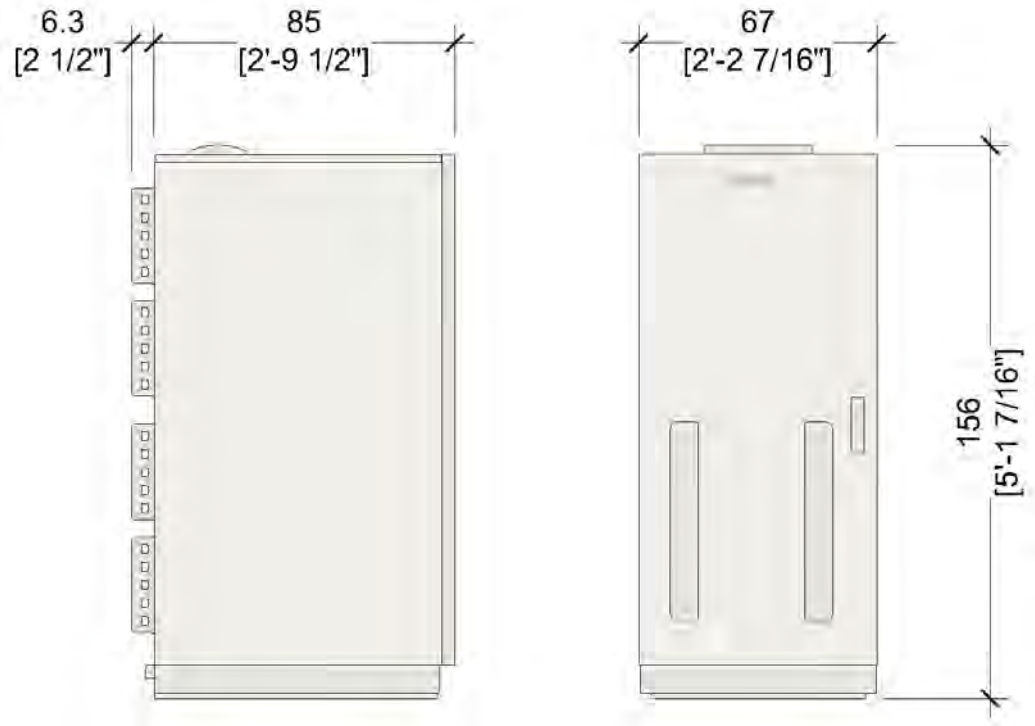


Figure 2-5 Console Cabinet Dimensions (Front and Side View)

Table 2-4 Console Cabinet Weight		
Description	**Kg**	**Lb**
Console Cabinet	290	640

2.5 CONSOLE

The Console is used to operate the TrueBeam/VitalBeam. The components consist of:

(2) System Monitors (Treat and Image), (1) Control Console, (1) Standard Keyboard and Mouse, and (2) CCTV Monitors.

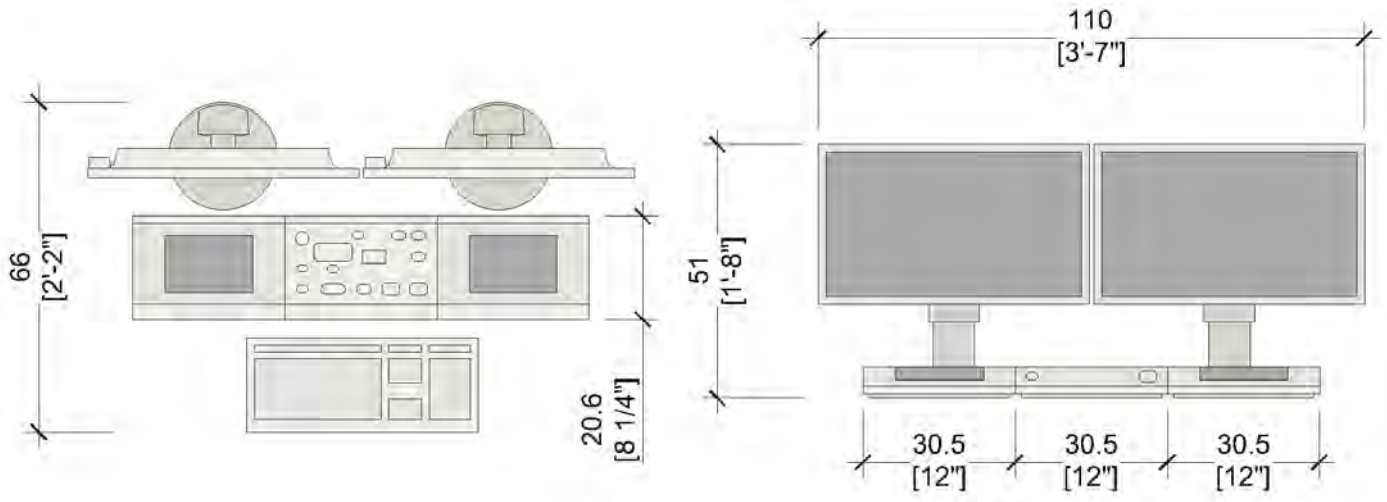


Figure 2-6 Console Desk Layout

The System and CCTV monitors are powered from the Console Cabinet.

2.6 MCB AND CABLES

2.6.1 MAIN CIRCUIT BREAKER (MCB), SALES OPTION

The MCB panel is the main distribution point for power to the TrueBeam/VitalBeam system. The MCB panel includes safety features to properly control power to the system and depending on the model, may offer additional safety circuits. The Varian Planning Department or Varian PM can provide more specific information based on the MCB manufacturer and model, refer to [3] SD-HT-MCB Panel.

- Provides a single point of connection for the site's 3-phase power to the TrueBeam/VitalBeam System
- Splits the mains power into two independent switchable power outputs
    - To the Modulator Cabinet
    - To the Control Cabinet
- Provides for various system safety features:
    - Overcurrent protection for the outputs
    - Mains Incoming Power Switch (non-emergency)
    - Emergency Disconnect Button
    - System Start

The MCB panel and IEC 60309 receptacle are not a standard part of the TrueBeam/VitalBeam system but can be supplied by Varian as part of the equipment order. If the MCB is not part of the equipment sales order, then it can be ordered directly from the manufacturer. The Varian Planning Department or Varian PM can provide more information.

2.6.2 CABLES

This section shows you the point to point connection and the maximum cable length available for the Varian-supplied system cables. See 3.2.7 Cable Containment.

Table 2-5 TrueBeam/VitalBeam System Cables				
Cable Route	**Maximum Cable Length**	**# of Cables**	**Start**	**Finish**
A	30m [100’]	12	**T01** - Stand	**T03** - Modulator
B	45m [150’]	18		**T14** - Console Cabinet
C	45m [150’]	7		**T17** – Control Console
D	45m [150’]	1	**T14** - Console Cabinet	**T20** - Optical Imaging Camera
E	30m [100’]	2 (up to x4)	**T14** - Console Cabinet	**T07** - In-Room Monitor
F_1	15m [50’]	3		**T17** - Control Console
F_2	15m [50’]	6		**T16** - System Monitors
F_3	15m [50’]	2		**T18** - CCTV Monitor
G	15m [50’]	1		**T13** - MCB
H	45m [150’]	1	**T13** - MCB	**T03** - Modulator
I	45m [150’]	2	**T05** - RJB	**T01** - Stand
J	45m [150’]	2	**T08** - Microphone	**T17** - Control Console
K	38m [125']	1	**T14** - Console Cabinet	**T10** - Live View Camera
L	45m [150’]	2	**T11** - Speaker	**T17** - Control Console
M	45m [150’]	2 (up to x6)	**T09** - CCTV Camera	**T18** - CCTV Monitor
N	45m [150’]	1	**T14** - Console Cabinet	**T12** - USB Hub, Treatment Room
O	7.5m [25']	1		**T19** - Printer

Table 2-6 Customer Specified Cables				
P	as required	3	**T13** - MCB	**T03** - Modulator
Q	as required	4		**T15** - IEC Outlet

2.7 PRE-INSTALLATION KIT (PIK)

The PIK consists of Varian-provided mounting brackets, plates, posts, and electrical components. This kit is ordered and shipped to the site by the Varian PM for the customer to install before the TrueBeam/VitalBeam delivery. The Varian-supplied components must be installed per local code and regulations using Customer-provided and appropriately-sized mounting hardware engineered to support a combined maximum load as shown in Table 2-7.

Table 2-7 Pre-Installation Kit Weights

	Bracket Weight		Supporting Weight	
Description	**Kg**	**Lb**	**Kg**	**Lb**
Console Cabinet Bracket	22	49	See Section 2.4	
Relay Junction Box (RJB)	N/A		11	24
Laser Mounting Plates	1	2.2	≤ 2.6	≤ 5.7
CCTV Cameras	1	2.2	2	4.5
Mounting Plates & Post - IRM	16	35	32	70
Mounting Plates & Posts - Optical Imager	13	29	13.6	30
Live View Camera	0.5	1	3.2	7
Speakers	N/A		2.3	5

2.7.1 CONTROL CABINET BRACKET

Varian provides a floor positioning bracket plate that must be attached to the floor under the Console Cabinet. This provides stops and locking pins to prevent the cabinet from moving unintentionally.

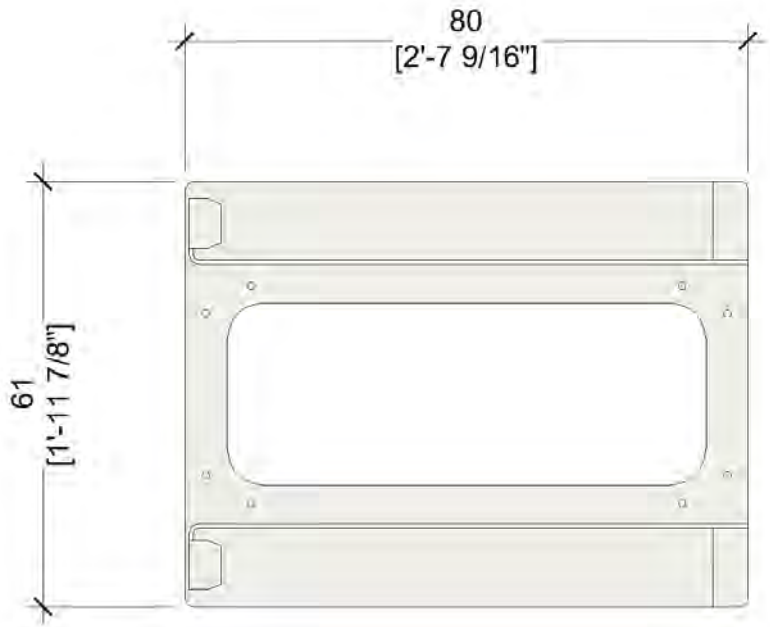


Figure 2-7 Floor Bracket for Console Cabinet

2.7.2 RELAY JUNCTION BOX

The Relay Junction Box (RJB) is a factory assembled and tested control panel that provides a central interface connection point between the TrueBeam/VitalBeam Accelerator and the treatment room main room lights, system status warning lights, patient positioning lasers, door interlocks, and remote emergency off push buttons. Refer to 3.2.4 Relay Junction Box (RJB) for more information.

- The door hinges are on the left side of the RJB.

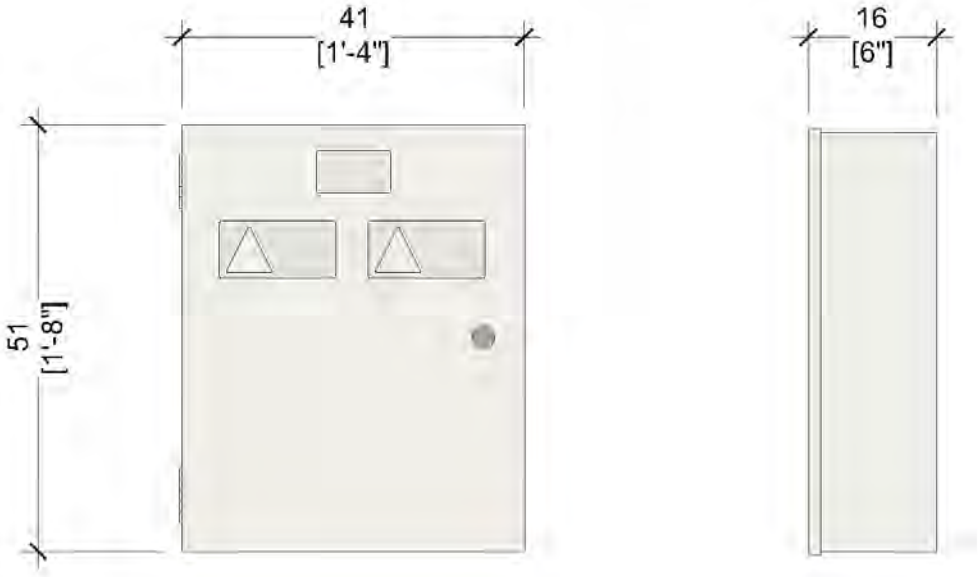


Figure 2-8 Relay Junction Box (Front and Side View)

2.7.3 LASER MOUNTING PLATES

The patient is aligned to the accelerator's isocenter with positioning lasers. The lasers are powered and controlled by a common circuit that is connected to the RJB.

- Four steel Laser Mounting Plates are provided. (2) side lasers at isocenter height, (1) ceiling laser directly above isocenter, and (1) sagittal wall laser, refer to 3.1.4.2 Laser Mounting Plates.

Lasers are not a standard part of the TrueBeam/VitalBeam system but may be supplied by Varian as part of the equipment order. Contact Varian Sales or the Varian Planning Department for more information on available options.

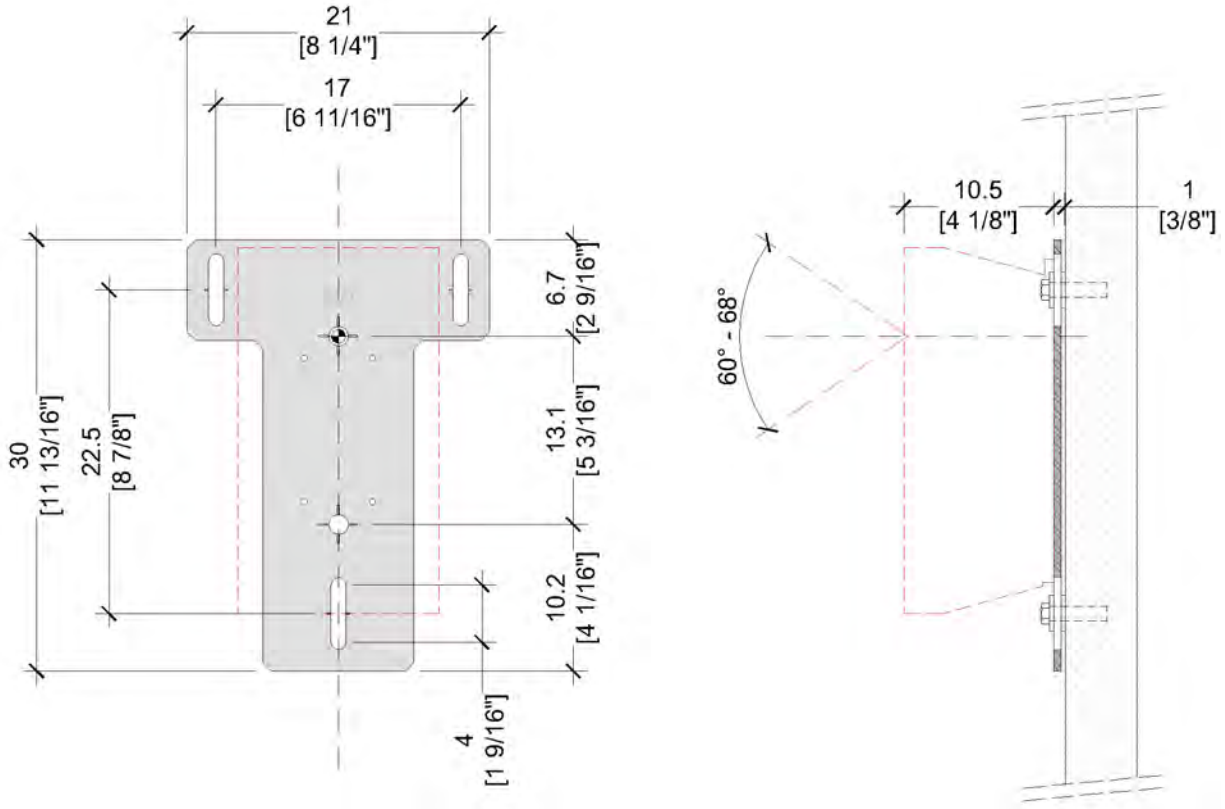


Figure 2-9 Laser Mounting Plate

2.7.4 MOTIONVIEW CCTV CAMERAS

A Closed-Circuit Television (CCTV) system is required for safe operation. It is critical to patient safety that the therapist always maintain visual contact with the patient, see Figure 3-6 and Section 4.5 for more information.

- A two-camera MotionView CCTV camera system is standard with TrueBeam/VitalBeam.
- Additional two-camera MotionView CCTV camera systems may be purchased as an option, up to a maximum of 6 cameras.
- Each CCTV camera has a dedicated monitor in the console area, see 2.5 Console.

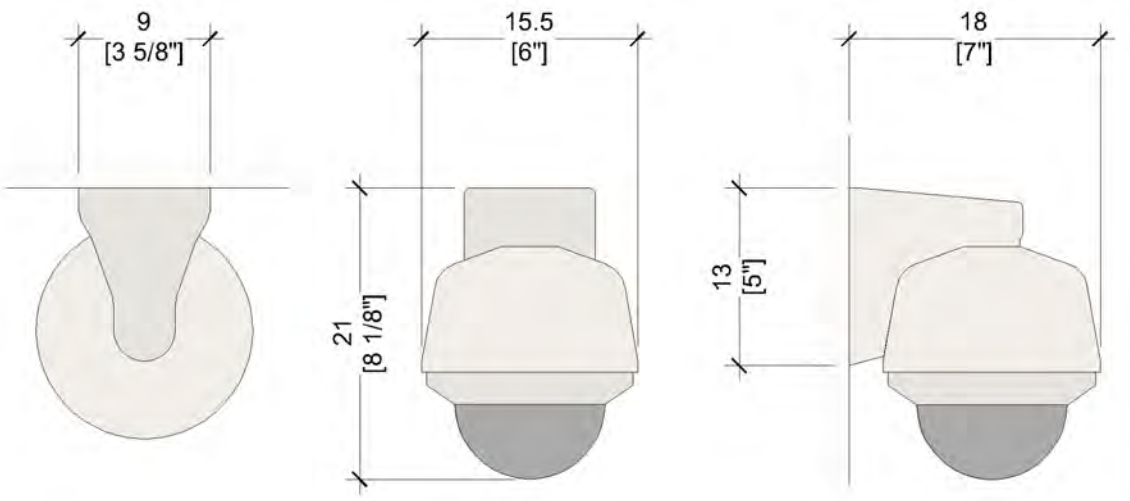


Figure 2-10 CCTV Camera Mounts (Plan, Front and Side Views)

2.7.5 OPTICAL IMAGER AND IN-ROOM MONITOR MOUNTING POSTS

An aluminum ceiling mounting plate, configurable post, and mounting bracket are provided as part of the PIK for installing the Optical Imaging Single Gating (SGC) or Dual (NDI), camera and the Dual In-Room Monitors (IRM's).

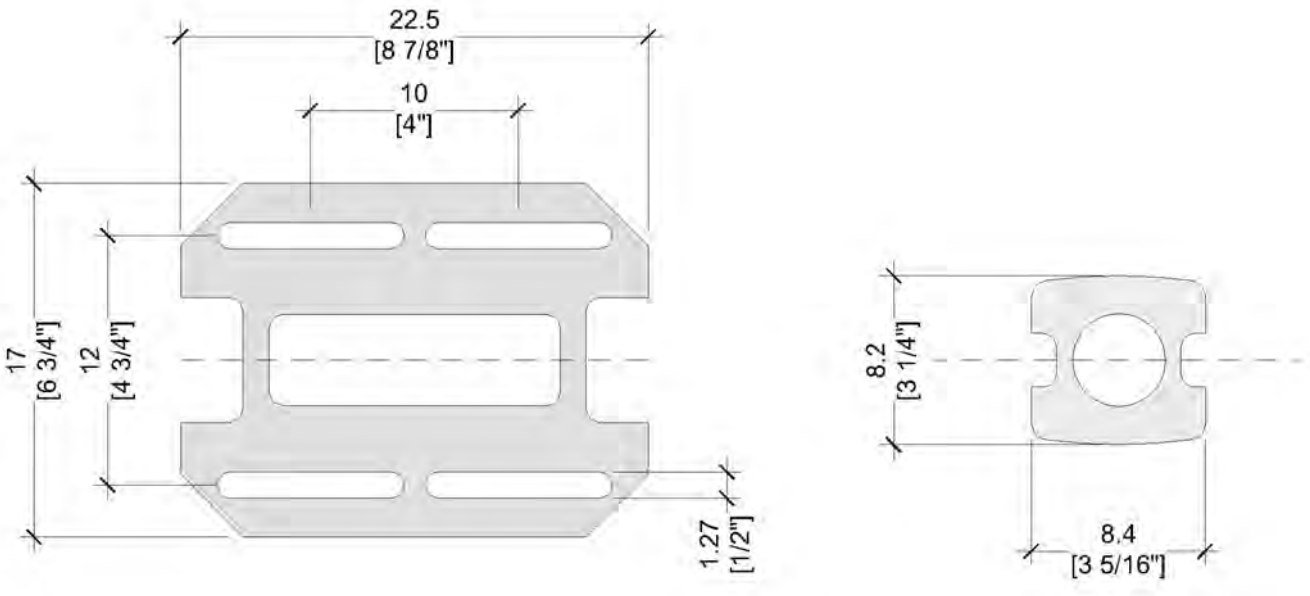


Figure 2-11 Ceiling Mounting Plate and Post Section

- Post length can be configured in 15cm [6"] increments between the minimum and maximum post length, refer to Figure 2-12 IRM and Optical Camera Mounting Heights.
- See Figure 3-7 Treatment Room Ceiling Mounted Components (Plan) for mounting locations.
- The IRMs may be wall-mounted. Contact the Varian PM to order wall mount brackets.

One set of ceiling-mounted Dual IRM displays is included as part of the standard TrueBeam/VitalBeam equipment package. An additional set of Dual IRM displays can be purchased as an option, verify with the final sales order, or the Varian PM.

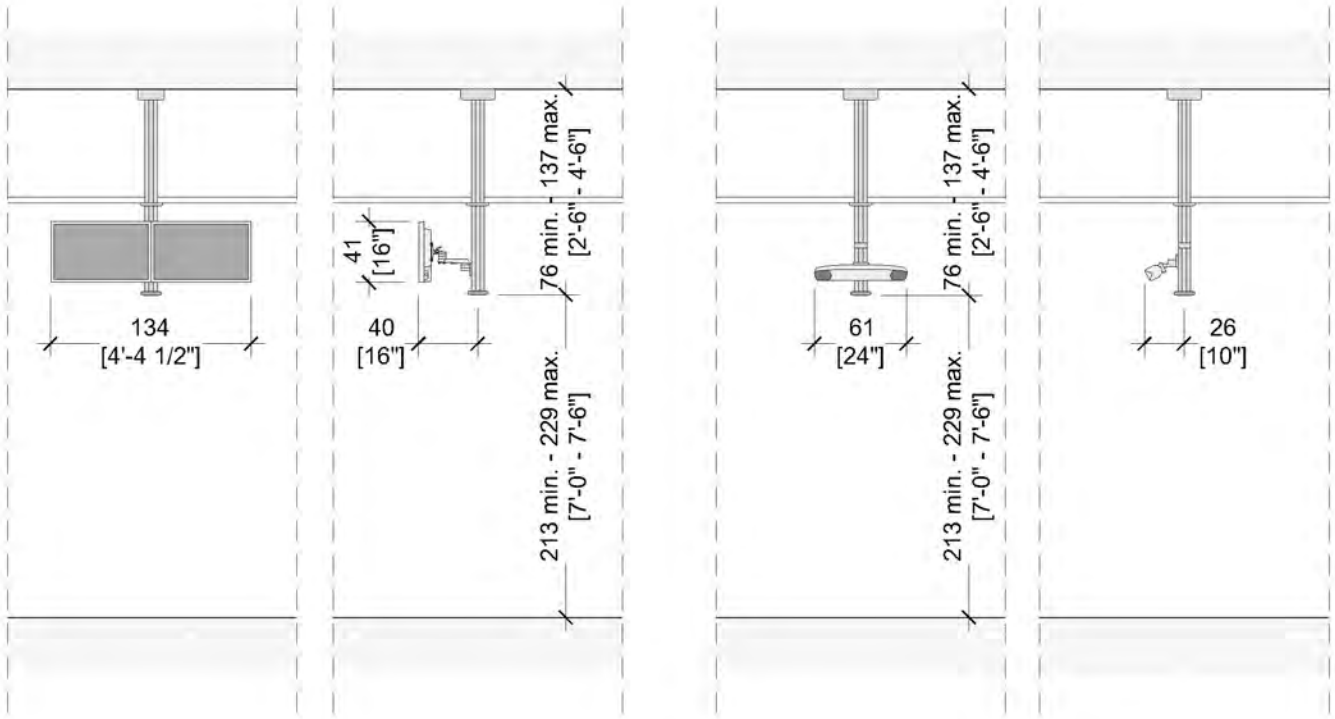


Figure 2-12 IRM and Optical Camera Mounting Heights

WARNING **The customer must maintain a minimum clearance of at least 203cm [6'-8"] between the floor and ceiling-mounted equipment.**

2.7.6 LIVE VIEW CAMERA MOUNT

The Live View (LV) Camera is a radiation-hardened system that enables monitoring of the TrueBeam/VitalBeam and the patient, the system provides proximity information while the machine is moving to help prevent injury to the patient.

- A wall-mount post is Varian-provided, Customer-installed.
- The LV camera is Varian-installed.
- See Figure 3-6 Treatment Room Sagittal Wall (Elevation) for mounting post location.

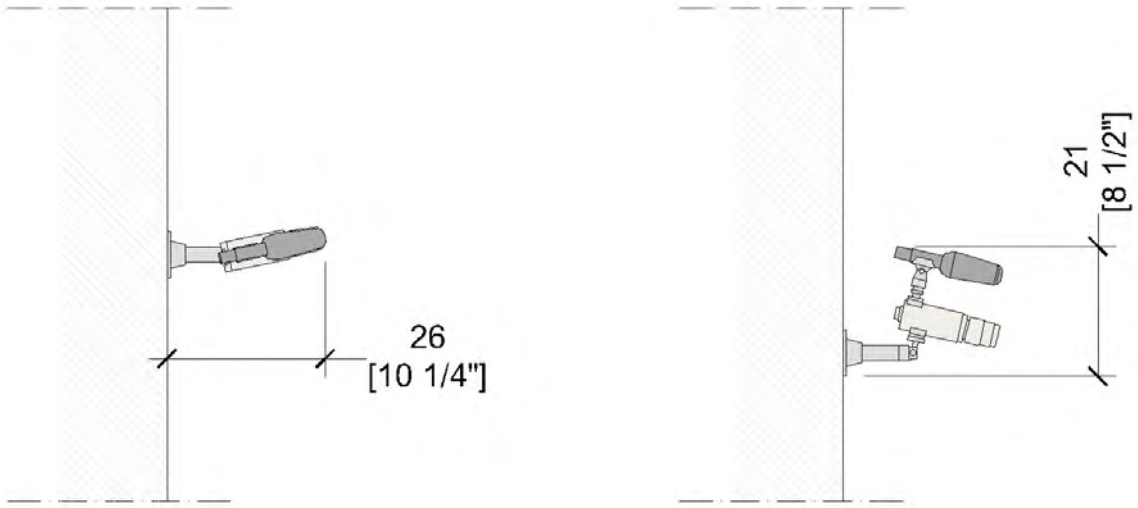


Figure 2-13 Live View Camera Wall Mount (Plan and Side View)

2.7.7 SPEAKERS AND MICROPHONE

Two speakers and two microphones are a standard part of the TrueBeam/VitalBeam system that provide intercom and audio services in the treatment room, operated by the Control Console.

- The microphones are Varian-installed, typically one is installed on the LV Camera and one is installed to the false ceiling grid, near the IRM.
- The speakers are Customer-installed
- See Figure 3-6 Treatment Room Sagittal Wall (Elevation)

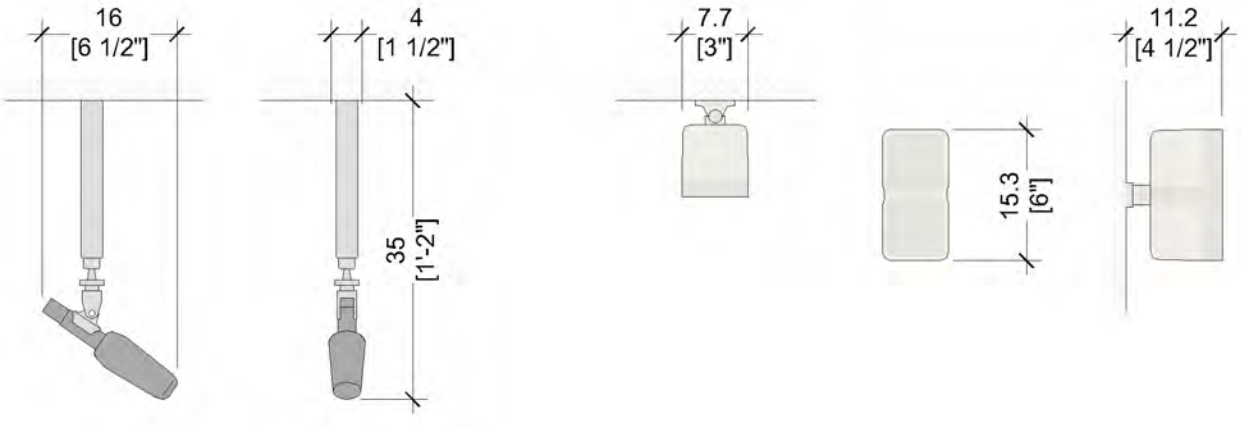


Figure 2-14 Microphone and Speaker Side and Front Elevations

3 CUSTOMER REQUIREMENTS

3.1 SPATIAL

NOTICE

It is the customer's responsibility to determine the quantity, size, and type of mounting hardware required to adequately and seismically anchor the Varian-provided components to the floor, walls, and ceiling per local, state, and national codes and regulations.

3.1.1 BASEFRAME PIT

WARNING

The BaseFrame is supplied with mounting hardware that is NOT suitable for sites subject to seismic activity. It is the responsibility of the customer to provide a qualified structural engineer to determine the quantity, size, and type of mounting hardware required for seismically anchoring the Varian-provided components to the pit floor, refer to [4] SD–HT–Seismic for sample calculations.

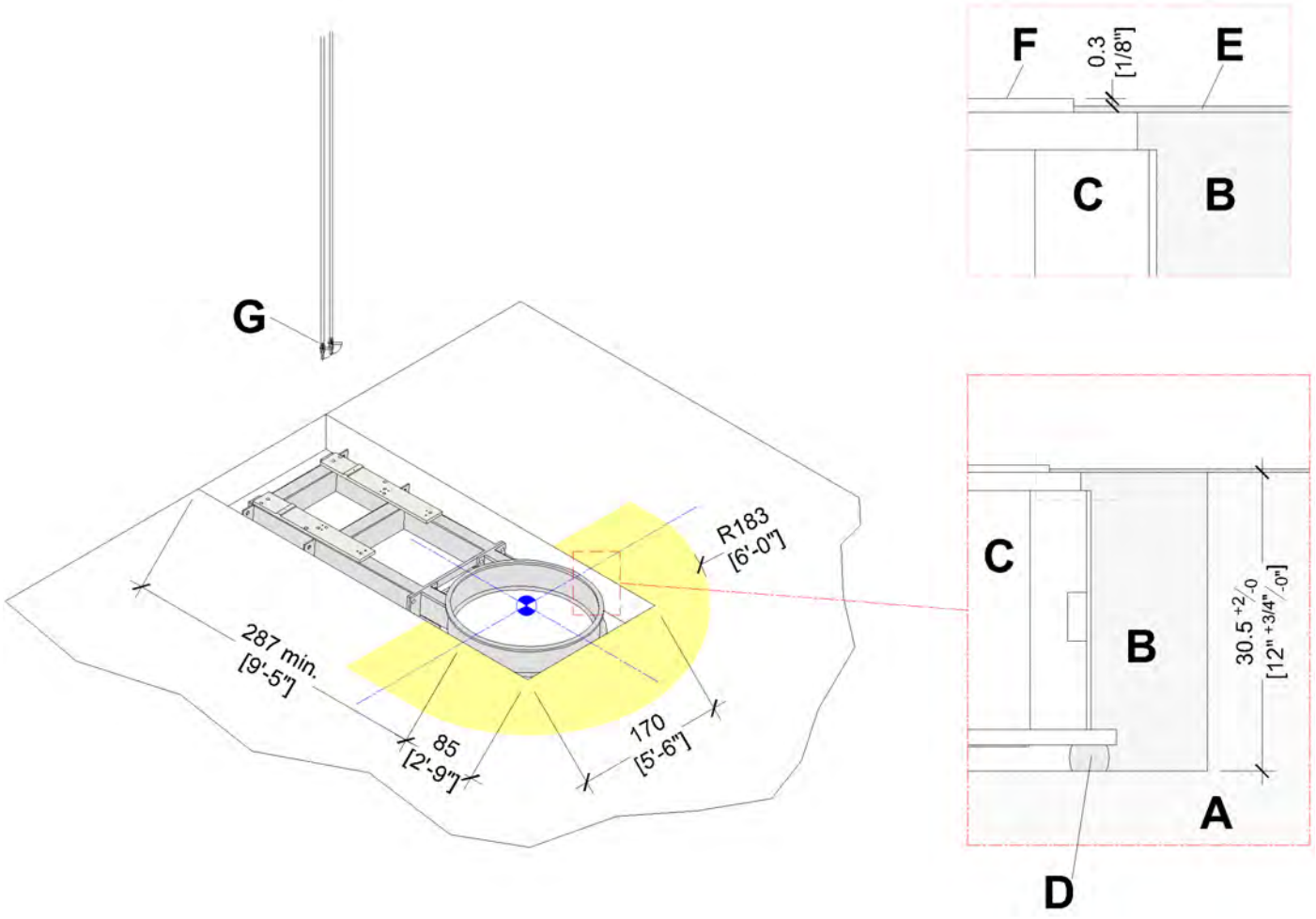


Figure 3-1 Minimum BaseFrame Pit Dimensions

A	Structural Concrete (by Customer)	**E**	Finished Flooring (by Customer)
B	Backfill Concrete (by Customer)	**F**	Turntable Trim Ring, BaseFrame
C	BaseFrame (by Varian)	**G**	Chilled Water Supply and Return Isolation Valves (by Customer)
D	Foam Backer (by Varian)		

- The pit floor shall be designed by a qualified structural engineer capable of carrying the total weight of the fully assembled accelerator, see Table 2-1 and Table 2-2.
- The yellow shaded area must be level to the top of the outer ring of the BaseFrame within ±3mm [±1/8”] for a radius of 183cm [6’-0”] from isocenter.
- The BaseFrame pit depth shall not vary more than 6mm [1/4"].
- All exposed concrete shall be suitably sealed before the BaseFrame Installation.
- Access for cables and chilled water must be considered before backfilling the pit with concrete.
- Refer to 3.3.2 Cooling Line Access for details to the chilled water connection point.
- See Section 4.3 BaseFrame Installation, for a detailed explanation of the installation procedure.

3.1.2 MINIMUM TREATMENT ROOM CLEARANCES

NOTICE

It is the customer’s responsibility to ensure that the site-specific design documents for the Varian system to be installed complies with any applicable local, regional, and national codes and regulations.

Compliance must address but is not limited to proper egress, adequate separation of services, and required clearances for equipment with hazardous voltages.

The customer is responsible for the safety of the equipment layout in the Control Area and Treatment Room, particularly with the ceiling and wall-mounted equipment.

3.1.2.1 FLOOR CLEARANCES

The area highlighted in Figure 3-2 shows the operational and service clearances required for the TrueBeam/VitalBeam Stand, Gantry, and Couch.

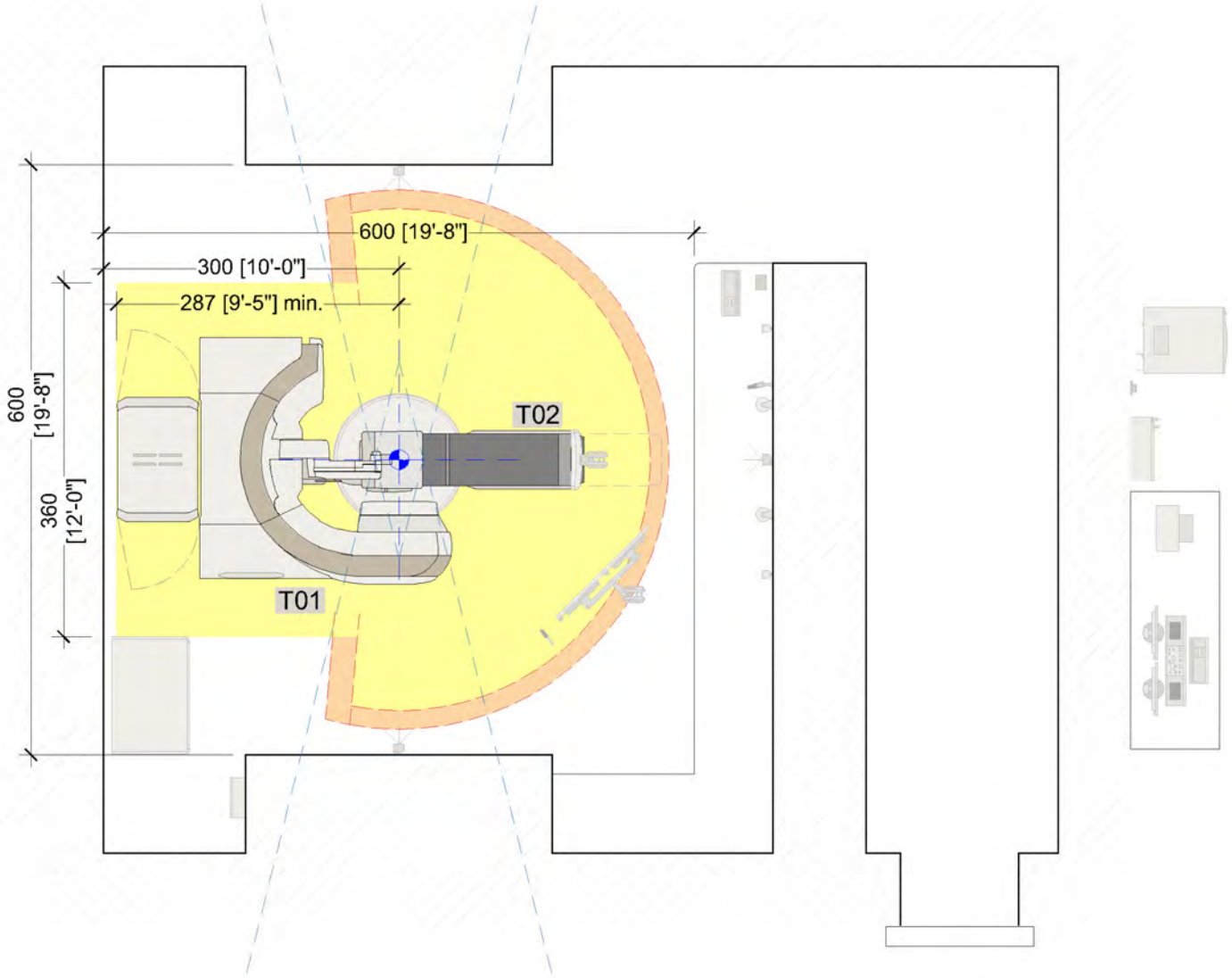


Figure 3-2 Minimum Room Clearances

CAUTION

The maximum couch arc allows complete rotation of the Couch Top at full retraction. Obstructions inside the minimum required couch arc are unacceptable, as they can result in injury to patients and medical personnel as well as equipment damage.

- Refer to Figure 2-2 for the minimum and maximum couch arc radii

Obstructions between the minimum required couch arc and the maximum couch arc may be considered provided they are reviewed and approved by Varian and the Customer. In specific situations, such as dynamic stereotactic treatment, a larger area may be required.

3.1.2.2 OVERHEAD CLEARANCES

The area highlighted in Figure 3-3 shows the overhead installation, operational, and service clearances required for the TrueBeam/VitalBeam Stand, Gantry, and ceiling-mounted components.

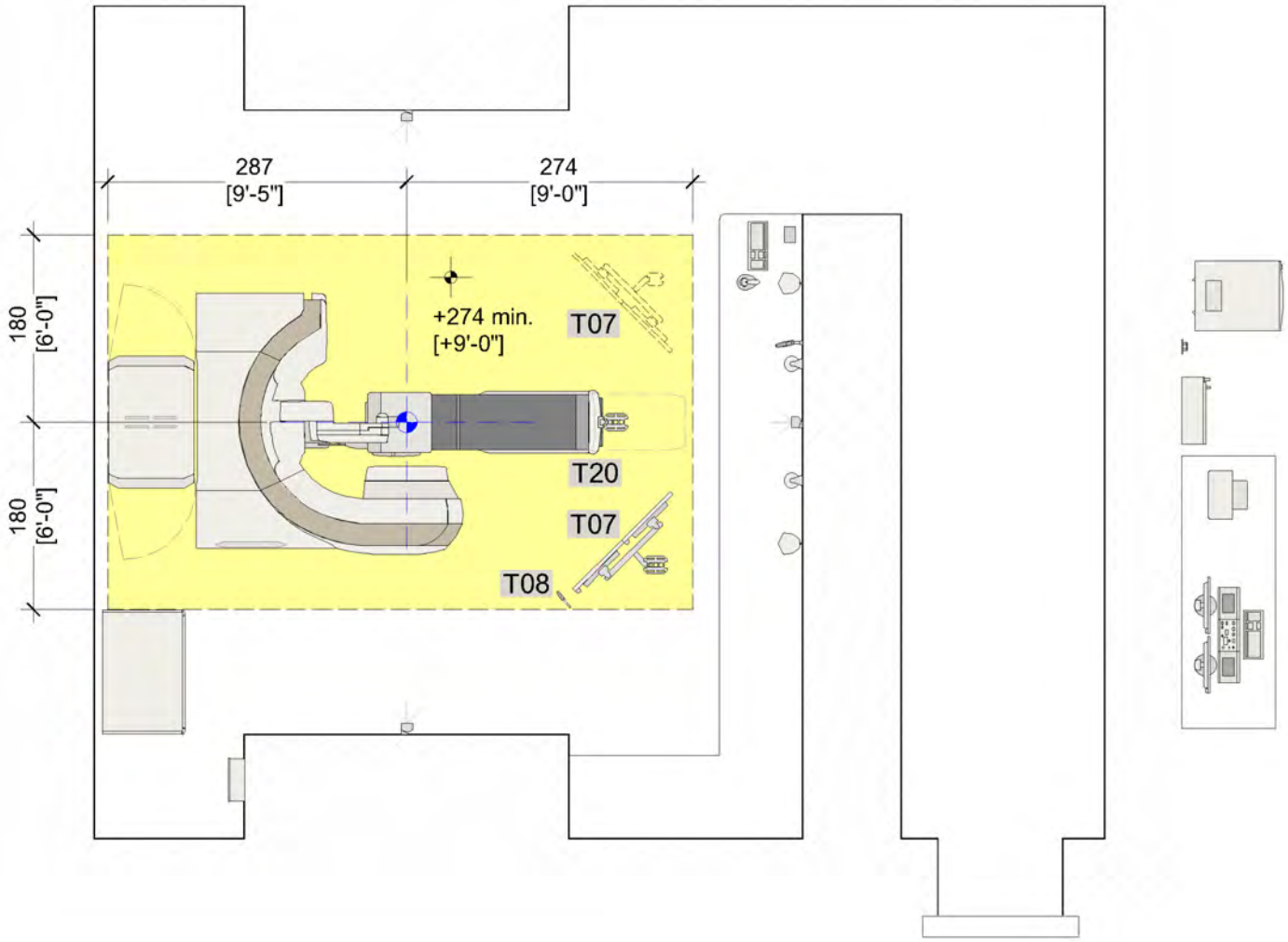


Figure 3-3 Minimum Overhead Clearances

- Provide 274cm [9'-0"] minimum clearance from the finished floor to the finished ceiling.
- Additional clearance height will be required for the ceiling laser that is mounted directly above isocenter.

3.1.3 CABINET CLEARANCES

The area highlighted in Figure 3-4 and Figure 3-5 provides the operational, cabling, and service clearances required for the Modulator and the Console Cabinet. Refer to 2.3 Modulator and 2.4 Console Cabinet for more information.

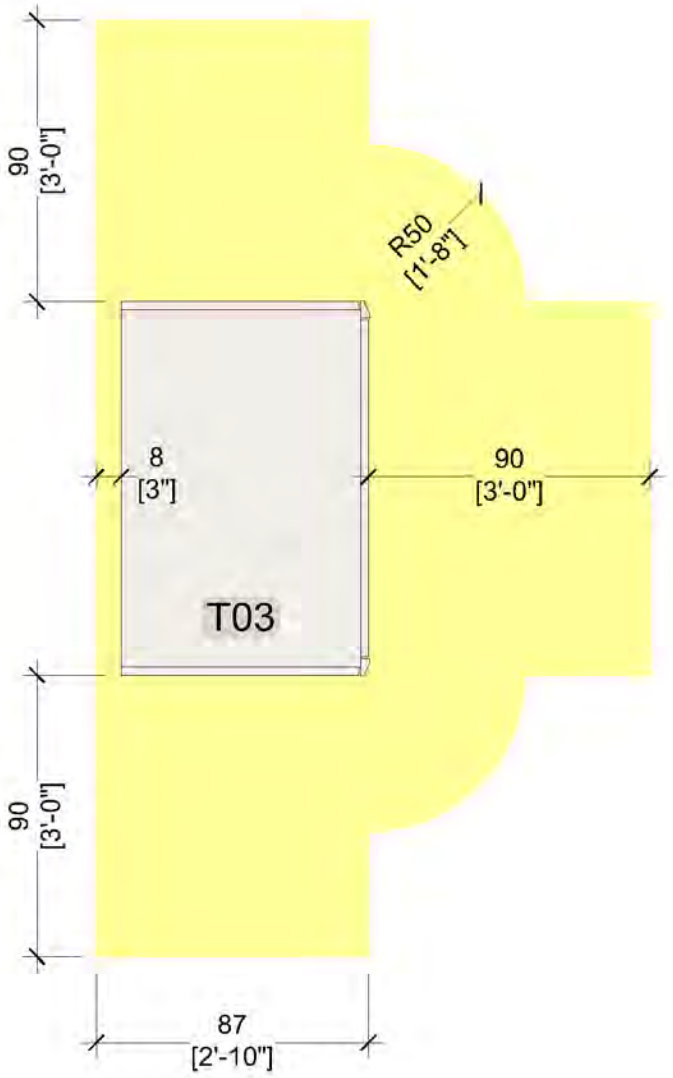


Figure 3-4 Modulator Service Clearances

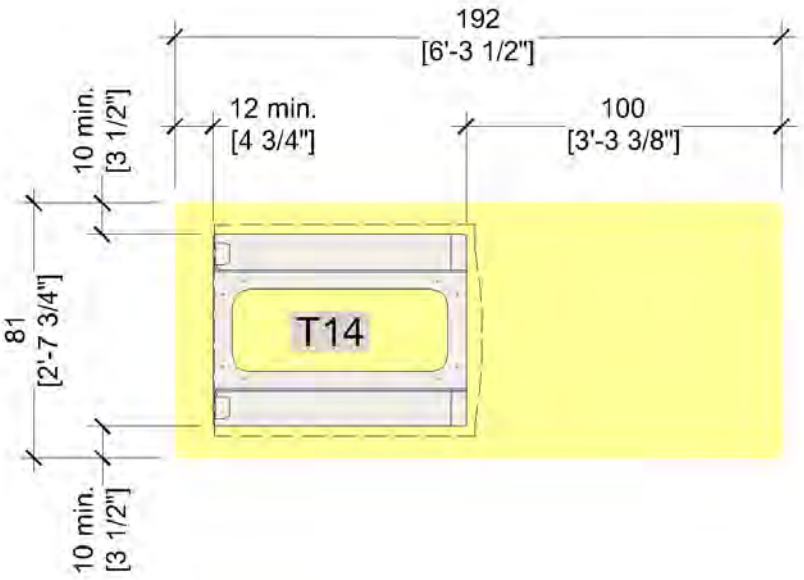


Figure 3-5 Console Cabinet Service Clearances

3.1.4 ACCESSORY COMPONENTS LOCATIONS

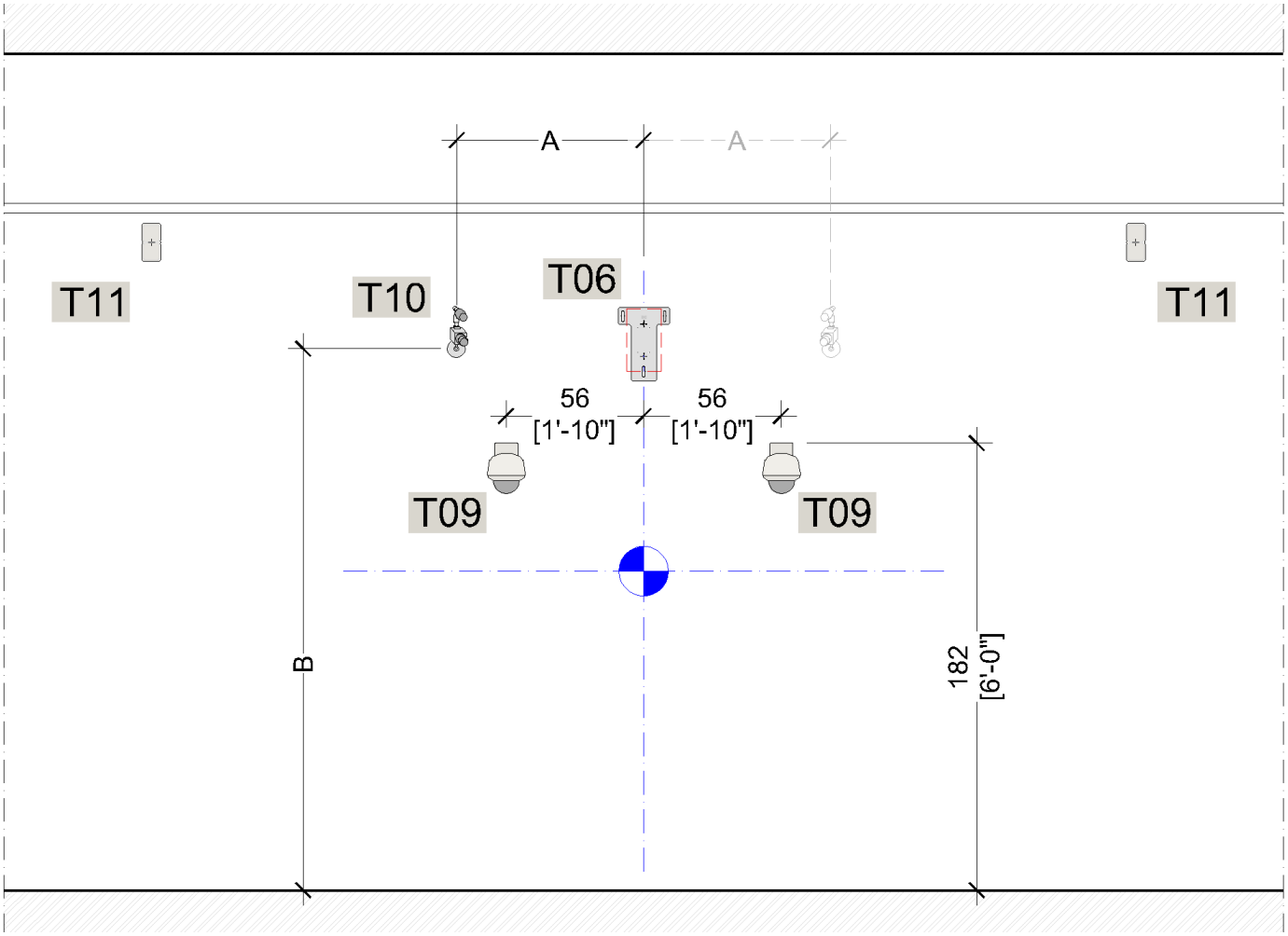


Figure 3-6 Treatment Room Sagittal Wall (Elevation)

- Wall mount the LV camera on either side of isocenter, refer to Table 3-1 for the installation area for the LV camera (**T10**).
- Wall mount the Speakers (**T11**) towards the front of the treatment room outside the primary beam path. The installation location is Customer preference.
- The primary Microphone (**T08**) will be Varian-installed on the LV camera.
- The secondary microphone will be Varian-installed to the false ceiling typically near the ceiling-mounted IRMs using the 25mm [1”] T-bar clip post (not shown), see Figure 2-14.
- Refer to Table 2-7 for component weights, provide structural support as required.

Table 3-1 Live View Camera Post Installation Area

Distance from Isocenter to Sagittal Wall	Dimension "A" from The Sagittal Plane	Dimension "B" from Finished Floor
260 - 300cm [8'-6" - 9'-10"]	50 - 100cm [1'-8" - 3'-3"]	200 - 220cm [6'-6" - 7'-3"]
300 - 350cm [9'-10" - 11'-6"]	50 - 100cm [1'-8" - 3'-3"]	210 - 240cm [7'-0" - 7'-10"]
350 - 400cm [11'-6" - 13'-2"]	50 - 150cm [1'-8" - 4'-11"]	220 - 250cm [7'-2" - 8'-2"]
400 - 610cm [13'-2" - 20'-0"]	50 - 150cm [1'-8" - 4'-11"]	230 - 270cm [7'-6" - 8'-10"]

3.1.4.1 MOTIONVIEW CCTV CAMERAS

The MotionView CCTV camera housing is wall-mounted by the customer. The CCTV cameras are Varian-installed.

- The primary MotionView CCTV (**T09**) two-camera system location shown in Figure 3-6 is MANDATORY for patient safety.
- If additional MotionView CCTV camera systems are purchased, the installation location is Customer preference (not shown).

NOTICE

Do not locate the CCTV cameras in the primary beam path.

3.1.4.2 LASER MOUNTING PLATES

- The sagittal Laser Mounting Plate (**T06**) installation height is variable, 230cm [7'-6"] is the recommended height to avoid any obstructions with the laser alignment beam, see Figure 3-6. Consult with the laser manufacturer and customer on the desired elevation.
- Install the two side Laser Mounting Plates at 130cm [4'-3"] above the finished floor (not shown).
- Install the ceiling Laser Mounting Plate directly above isocenter, the mounting plate may be installed parallel or perpendicular to isocenter.

The Sagittal Laser may be installed vertically (shown) or horizontally, depending on the laser model. Contact the Varian PM or laser manufacturer on installation orientation options.

NOTICE

The mounting structure must be vibration-free and accessible for service.

DO NOT mount to wood, gypsum board, light gauge steel framing, or suspended ceiling grid.

The mounting plate has two isocenter alignment holes for installation flexibility.

3.1.4.3 IRM AND OPTICAL IMAGER

- The IRMs (**T08**) in Figure 3-7, may be located on either side of isocenter, typically on the opposite side of the maze entrance, refer to Section 2.7.5 and Section 4.5 for more information.
- The Optical Imager is located along the longitudinal axis line of the couch.

NOTICE

The mounting structure must be vibration-free and accessible for service.

DO NOT mount to wood, gypsum board, light gauge steel framing, or suspended ceiling grid.

Orient the plate's long centerline parallel with the longitudinal axis line of the couch.

DO NOT locate the IRMs inside or within 60cm [24"] of the primary beam path.

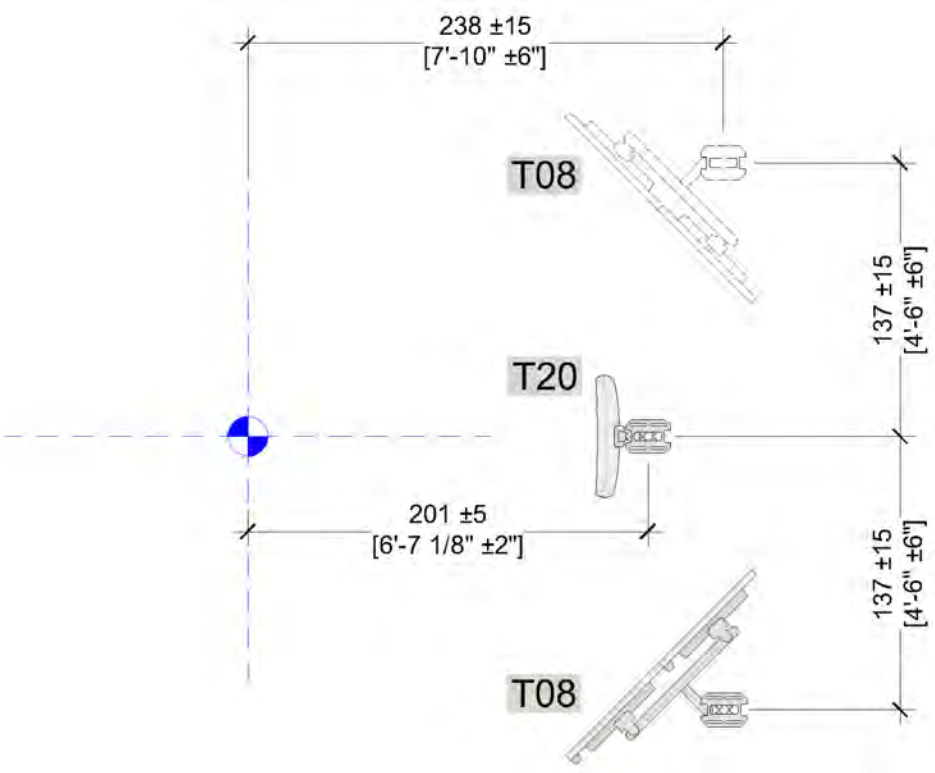


Figure 3-7 Treatment Room Ceiling Mounted Components (Plan)

3.1.5 CONTROL AREA LAYOUT

Figure 3-8 is a generic layout, component positioning may vary per site-specific conditions, consult with the Customer on the desired layout, and if any additional space is required.

- See Figure 3-5 for Console Cabinet Clearance requirements.
- Refer to Table 2-5 for maximum cable lengths from the Console Cabinet to the desktop components.

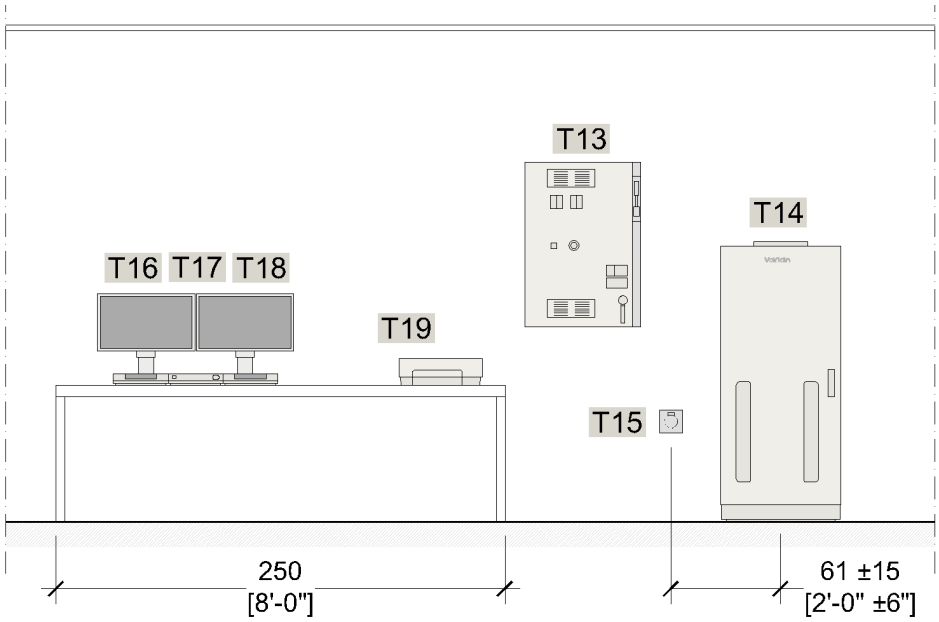


Figure 3-8 Generic Control Console Layout

If additional MotionView CCTV camera systems are on the final sales order, provide additional space at the Control Console for the extra CCTV monitors.

3.2 ELECTRICAL

3.2.1 POWER REQUIREMENTS

Table 3-2 System Power Requirements	
Input Voltage	200VAC, 208VAC, 240VAC, 380VAC, **400VAC**, 415VAC, or **480VAC** (nominal), Line-to-line, 5-wire (3-phase, neutral, and ground [equal in size to the conductors]).
System Current	100A @ 400V 50Hz or 80A @ 480V 60Hz
Console Current	20A @ 208-230V (50/60Hz) (1-phase, neutral, and ground, via the MCB panel)
Line Voltage Regulation	±5%. This is the maximum allowable steady-state deviation from the nominal value selected. Sinusoidal with less than 5% total harmonic distortion.
Maximum Phase Voltage Imbalance	3% of the nominal value. This is the maximum difference between any 2-phase voltages when operating at full load (Beam-On).
Input Frequency	50 or 60 Hz ±1 Hz.
Electrical Loads	7kVA in Stand-By state, 48kVA in Beam-On state. (Including console, 3kVA)
Long-Time Load	48kVA (Including console, 3kVA)
Power Factor	Equal to or greater than 90% The load is inductive and can exhibit a non-sinusoidal current waveform
Source Impedance	2.5% maximum For 45kVA: 208VAC = 24.0mOhm; 400VAC = 88.8mOhm For 48kVA: 208VAC = 22.5mOhm; 400VAC = 83.3mOhm
Max. Fault Current	10,000A.
Mandatory Grounding	See 3.2.6 Dedicated Ground/Protective Earth Requirements

Caution should be taken when powering the TrueBeam/VitalBeam from the same distribution source as elevators, HVAC equipment, and other phase-controlled loads, because of potential adverse effects on the operation of the X-ray equipment.

3.2.2 POWER CONDITIONING REQUIREMENTS

The equipment is sensitive to line voltage variations and source impedance. A complete survey of the electrical supply should be conducted before the equipment installation and a copy of this survey should be sent to the Varian PM for the equipment file. Isolation transformers and/or power conditioners are required where the electrical power requirements specified in Table 3-2 cannot be met.

Transients lasting no more than a few cycles will not cause harm if limited to the specified steady-state line voltage regulation. Transient suppression is required where larger, long-lasting or frequent transients occur as these can cause interruption of operation and/or equipment damage.

3.2.3 MAIN CIRCUIT BREAKER (MCB) PANEL

- Wall mount the MCB panel.
- Insight and within 3m [10'-0"] of the TrueBeam/VitalBeam Console Cabinet.

Table 3-3 Generic MCB Components	
A	Circuit Breaker 1
B	Circuit Breaker 2
C	K1 Contact
D	Transformer *(optional per A input voltage)*
E	Circuit Breaker 3
F	K3 Contact
G	Transformer
H	Start Button
I	Emergency Disconnect Button

Customer-provided wiring

Varian-provided cables

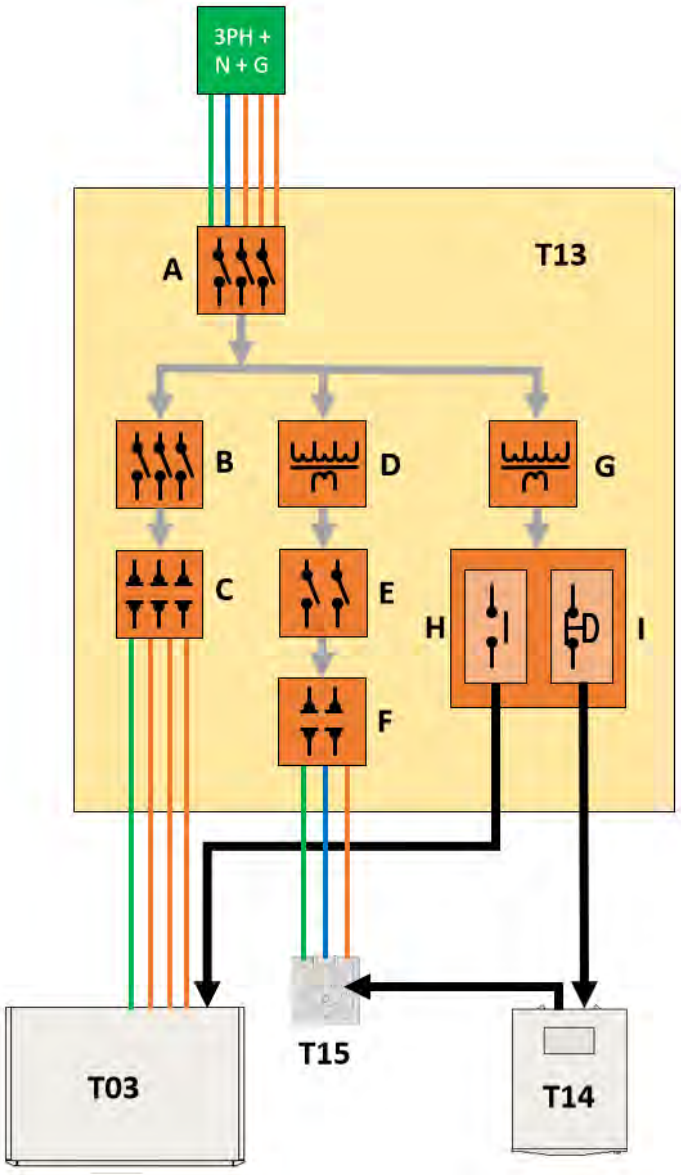


Figure 3-9 Generic MCB Panel Components

The Customer wiring from the MCB (**T13**) to the Modulator (**T03**) shall be 4-wire (3-phase and ground).

3.2.4 RELAY JUNCTION BOX (RJB)

- Wall mount the RJB in the treatment room at a standing height from the finished floor for service accessibility.
- The RJB may be surface-mounted or semi-recessed, up to a maximum of 12cm [4 3/4”].

NOTICE **Do not locate the RJB in the primary beam path.**

3.2.4.1 RJB CUSTOMER CONNECTIONS

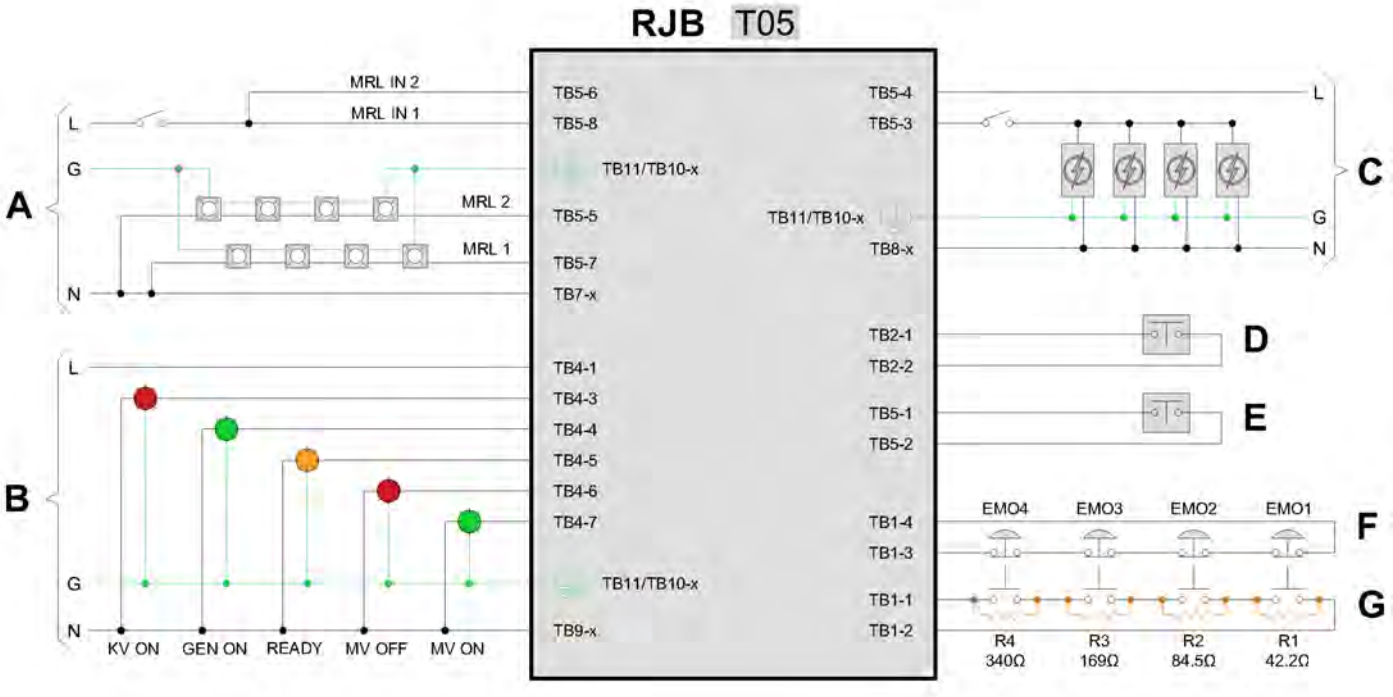


Figure 3-10 RJB Customer Connections

Table 3-4 RJB Connections			
A	Main Room Lights	100 – 277 VAC (50/60Hz), 20A maximum	see 3.2.9 Room Lighting
B	Warning Lights	100 – 250 VAC (50/60Hz), 10A maximum	see 3.2.10.1 Warning Lights
C	Lasers Power Outlet	100 – 250 VAC (50/60Hz), 10A maximum	see 3.2.5.1 Treatment Room
D	DC Door Interlock	24 VDC provided by Varian	see 3.2.10.2 Door Interlock Switches
E	AC Door Interlock	120 VAC provided by Varian	
F	EMO, “safety loop”, Normally Closed	24 VDC provided by Varian	see 3.2.10.3 Emergency Off
G	EMO, “sensor loop”, Normally Open	24 VDC provided by Varian	

Additional 24 VDC system interlocks are available in the RJB, contact Varian Planning or Varian PM for more information.

3.2.5 POWER OUTLETS

3.2.5.1 TREATMENT ROOM

- (1) Standard power outlet within 92cm [3'-0"] of each Laser (**T06**), controlled from the RJB (**T05**)
- (1) Standard power outlet, within 122cm [4'-0"] of each IRM (**T07**)
- (1) Standard power outlet within 30cm [1'-0"] of each CCTV camera (**T09**)
  - (Optionally the CCTV cameras can be powered by a Customer-provided 24VAC source)
- (1) Standard power outlet for the USB Hub (**T12**)

The 1-phase power to some accessory items can be provided by the MCB, depending on the design and functionality of the MCB. Contact Varian Planning or Varian PM for more information.

3.2.5.2 CONTROL AREA

- (1) IEC 60309 outlet, blue, 30-32A connector.
  - 1-phase, N, and G see Figure 3-8 and Figure 3-9.
- (1) Standard power outlet for the Printer (**T19**).
- Provide additional convenience power outlets as required by the Customer.

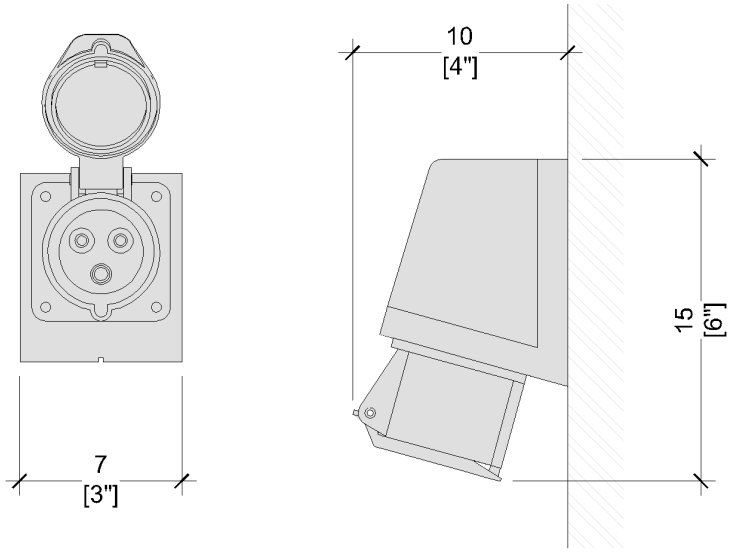


Figure 3-11 Console Cabinet - IEC 60309 Outlet

NOTICE

Do not install the IEC outlet directly behind the Console Cabinet. Locate to either side of the Console Cabinet.

3.2.6 DEDICATED GROUND/PROTECTIVE EARTH REQUIREMENTS

The TrueBeam/VitalBeam accelerator requires two Ground/Protective Earth (G/PE) circuits. The first circuit is part of the main power supply and provides grounding for the TrueBeam/VitalBeam Accelerator's major system components. Varian provides and installs the internal grounding cable between the Stand/Gantry, Modulator, Couch, and the Console Cabinet. The Customer provides the ground from the MCB (**T13**) to the Modulator (**T03**) in Figure 3-12, for more information refer to 3.2.3 Main Circuit Breaker (MCB) Panel.

CAUTION

The customer-provided G/PE conductor for the main power supply must meet or exceed code requirements and be equal in size to the supply/power conductors but, no smaller than 16mm2 [#6 AWG].

Ground all Varian equipment through the "Hospital Grid System." Do not use water supply piping for ground.

The second G/PE circuit is for the wall- and ceiling-mounted TrueBeam/VitalBeam accessory components that are located at or below 250cm [8'-2 1/2"] from the finished floor.

The Contractor shall install a G/PE conductor, 6 mm2 [10 AWG] minimum, from each of the components in Figure 3-12 to the facility's main ground. This grounding system provides compliance with IEC 60101 and -01. This G/PE conductor can be combined with the cable runs outlined in 3.2.7 Cable Containment.

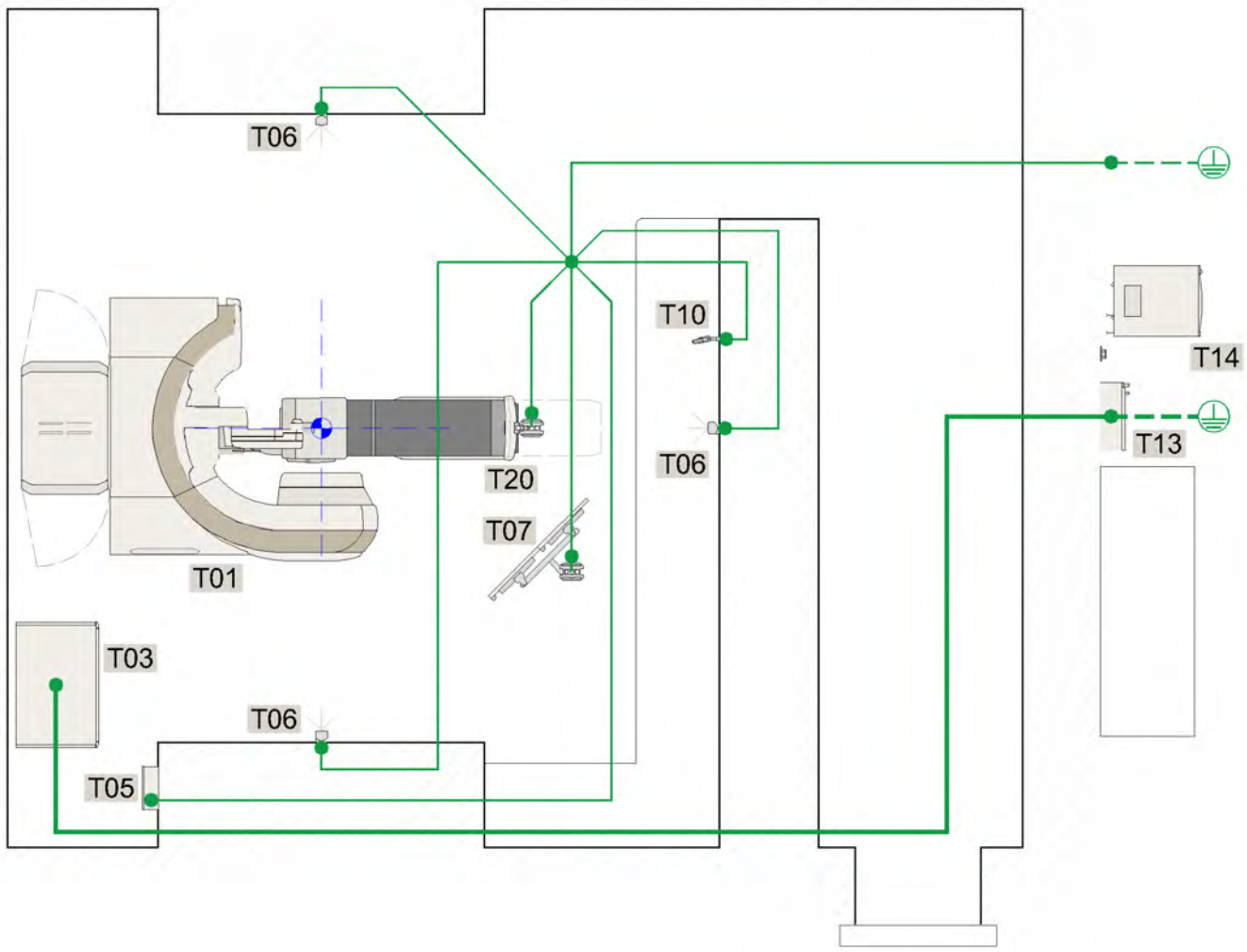


Figure 3-12 Ground/Earthing Conductor Diagram

- RJB (**T05**)
- LV Camera and Microphone (**T10**)
- IRMs and Post (**T07**)
- Optical Imaging Camera and Post (**T20**)
- Laser Mounting Plates (**T06**)

3.2.7 CABLE CONTAINMENT

NOTICE

The customer is responsible for ensuring that the cable installation meets applicable local codes and requirements. This might affect the choice of cable routes, number of conduits/ducts, specifications of mains power and data cables, and the choice of installation locations of system components.

The customer shall provide conduit or raceway duct for all system cables, as described in this section.

System cables are not plenum rated.

System cables shall not be permanently installed through a walking path.

- All underground conduits must be properly sealed so they are dry and watertight.
- Terminate conduits with insulating bushings or similar means to protect cables from abrasion.
- Conduit bends shall have a radius no less than 6 times the conduit's diameter.
- There shall be no more than three 90-degree bends per conduit (or equivalent).
- Reference Table 2-5 TrueBeam/VitalBeam System Cables for maximum cable lengths.

Cable conduit/duct route must be shorter than the maximum cable length, allow 3m [10'-0"] of excess cable at each end for connection and service, unless otherwise noted.

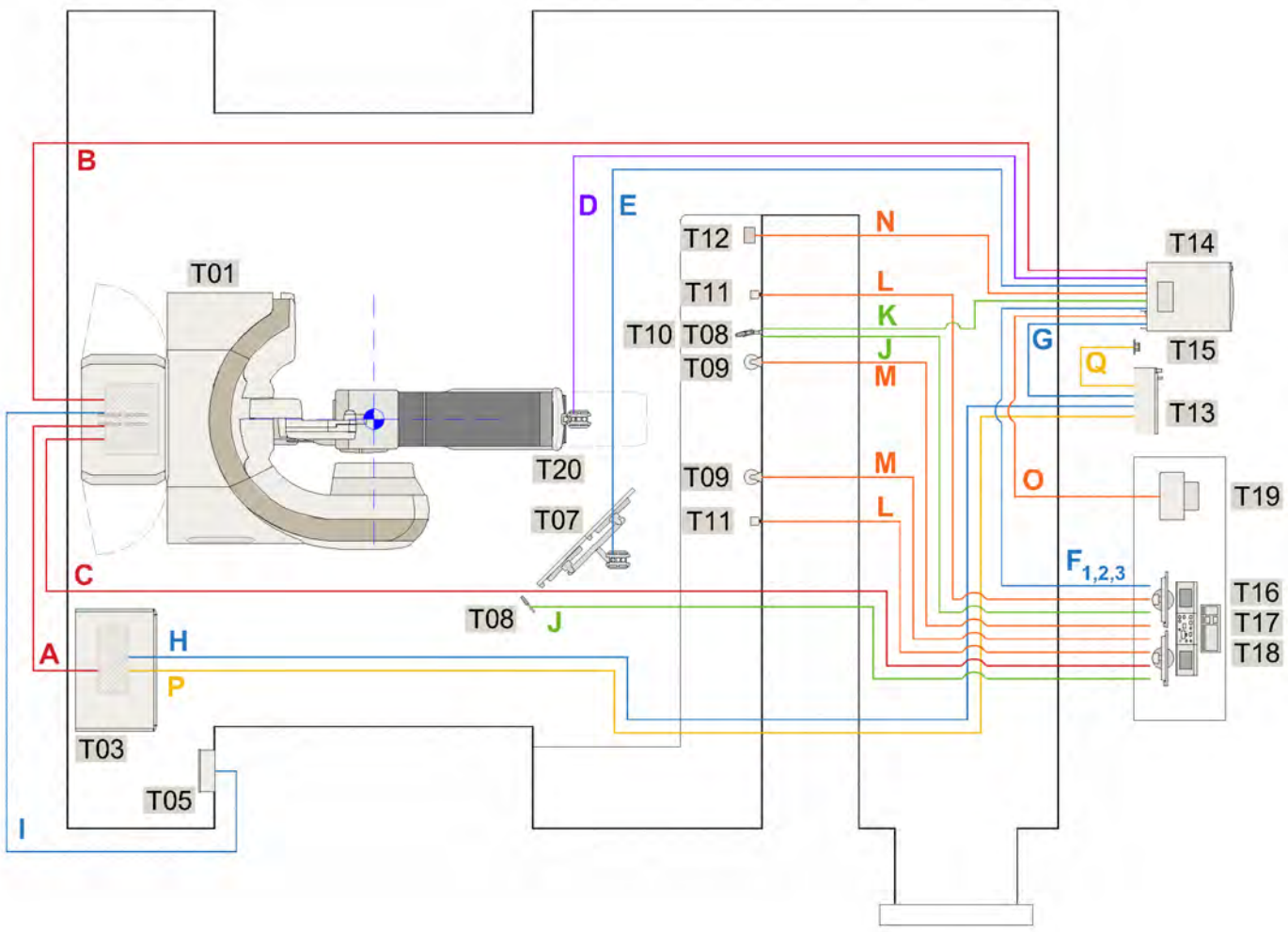


Figure 3-13 Containment Identification

Table 3-5 Minimum Recommended Containment Sizes					
Minimum Conduit Size Ø	**Cable Route**	**Conduit Quantity**	**Maximum Run Length**	**Start**	**Finish**
100mm [4”]	**A**	3	24m [80’]	**T01** - Stand	**T03** - Modulator
	B	3	38m [125’]		**T14** - Console Cabinet
	C	1	38m [125’]		**T17** - Control Console
75mm [3”]	**D**	1	38m [125’]	**T14** - Console Cabinet	**T20** - Optical Imaging Camera
50mm [2”]	**E**	1 (up to x2)	24m [80’]	**T14** - Console Cabinet	**T07** - In-Room Monitor
	F_1	1	n/a		**T17** - Control Console
	F_2	1	n/a		**T16** - System Monitors
	F_3	1	n/a		**T18** - CCTV Monitor
	G	1	11m [36’]		**T13** - MCB
	H	1	41m [135’]	**T13** - MCB	**T03** - Modulator
	I	2	41m [135’]	**T05** - RJB	**T01** - Stand
32mm [1.25”]	**J**	1	41m [135’]	**T17** - Control Console	**T08** - Microphone
	K	1	35m [115’]	**T14** - Console Cabinet	**T10** - Live View Camera
25mm [1”]	**L**	2	41m [135’]	**T17** - Control Console	**T11** - Speaker
	M	2 (up to x6)	41m [135’]	**T09** - CCTV Camera	**T18** - CCTV Monitor
	N	1	41m [135’]	**T14** - Console Cabinet	**T12** - USB Hub
	O	1	n/a		**T19** - Printer
Customer Specified	**P**	1	41m [135’]	**T13** - MCB	**T03** - Modulator
	Q	1	per site		**T15** - IEC Outlet

The information above is the minimum conduit size required to install the cables and provide separation requirements for functional operation.

Other options are acceptable to achieve these system interconnections in existing or new installations. Larger conduits may be used to group cables together to optimize the cable runs between the control area and treatment room before separating to their final locations, per local codes and regulations. The Varian Planning Department can provide more information on these options.

Cable Runs F1, F2, F3, and O may be bundled together and run below the countertop, it is recommended to provide a wire management system for cable protection and aesthetics

3.2.8 CABLE ACCESS

Cable access zones to the BaseFrame and Modulator are indicated in Figure 3-14, refer to Figure 3-1 for BaseFrame pit depth.

- Zone **A** is accessible from below the pit slab or from the rear through Zone **B**.
  - The maximum dimension for zone **A**, from front to back, is shown below.
  - Underground conduits must be a minimum of 15cm [6”] below the top of the BaseFrame pit slab.
- Zone **B** is centered on the BaseFrame.
  - The minimum width for zone **B** is shown below, coordinate with the chilled water access, see Figure 3-17.
- Zone **C** is accessible from below the Modulator, refer to Figure 3-4 for Modulator clearances.

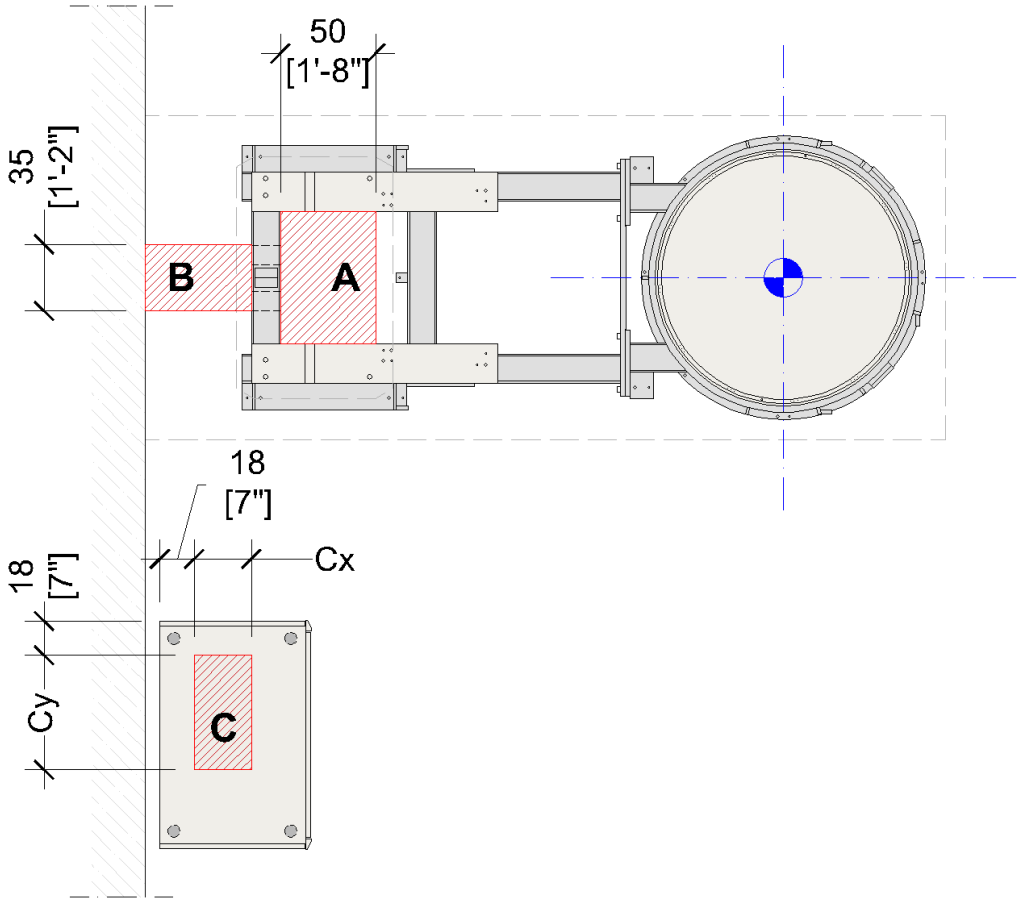


Figure 3-14 BaseFrame and Modulator Cable Access

Table 3-6 Modulator Zone C		
Cx	**Cy**	**C Depth**
30 – 45cm [12” – 18”]	60 – 80cm [24” – 30”]	15 – 30cm [6” – 12”]

NOTICE

If the isocenter to rear wall is less than 335cm [11’-0”] contact the Varian Planning Department when using zone B for cable access for assistance.

Excess cable storage must be considered when sizing the Modulator cable access zone C.

3.2.9 ROOM LIGHTING

Main room lights are used for general illumination and room maintenance. Typically, the main room lights are controlled (on/off) from the treatment couch during patient setup through voltage-free contacts located in the RJB, refer to Figure 3-10.

Setup lights are normally dimmable fixtures that allow the intensity to be adjusted by the therapists while aligning the patient to the laser lights. The setup lights are typically located above and to either side of the treatment couch. Their control is independent of the equipment.

Room lighting can be configured in multiple ways as defined by the customer's requirements. Contact the Varian Planning Department for more details.

3.2.10 EMERGENCY AND SAFETY DEVICES

To meet safety regulations, the following customer-provided safety device systems must be installed per the customer's Radiation Safety Officer and to comply with regional regulatory agency requirements.

3.2.10.1 WARNING LIGHTS

System warning lights are required inside and outside the treatment room to indicate beam-on/beam-off conditions. They may be required to blink when the beam is on. Colored (usually red) lights must be placed such that one is visible from any point in the treatment room. There are five individual warning light circuits available in the RJB, refer to Figure 3-10.

- Provide an individual warning light for each circuit.
- Incandescent lamp load, 60W maximum, each circuit.
- 5A maximum, resistive load, including any short duration switching transients.
- LED fixtures are acceptable, the inrush current for all fixtures must be less than the rating above.
- Fluorescent fixtures are not allowed.
- Combination signs with superimposed lettering are not allowed.

If a greater load is required, these circuits can be used to control separate, customer-provided relays.

Table 3-7 Warning Lights

Beam READY	Illuminates to show the MV system has no open interlocks and is ready to treat.
Beam ON	Illuminates during MV beam treatment, mandatory.
Beam OFF	Illuminates when the accelerator is not in a radiation-generating state.
Generator ON	Illuminated to show the KV system is ready to image the patient.
X-Ray ON	Illuminates during KV imaging, mandatory for accelerators with On-Board Imaging.

To comply with IEC 60601-2-1: 2009 +A1:2014 aural indicator requirements (Clause # 201.10.1.2.101.10) the customer shall provide and install a suitable aural indicator in parallel with any warning lights connected to the RJB.

3.2.10.2 DOOR INTERLOCK SWITCHES

Safety door interlock switches are mandatory for all installations to ensure the room doors are closed during accelerator operation. Provide two normally open type switches, one 24VDC (1 mA typical load) and one 120VAC (500 mA typical load) switch, refer to Figure 3-10.

For paired entry doors, an additional set of door interlock switches (24VDC and 120VAC) is required to be wired in series.

For secondary neutron doors, a 24VDC switch should be independently wired to the neutron door inputs in the RJB.

3.2.10.3 EMERGENCY OFF BUTTON

The Emergency-Off (EMO) button will remove the mains power from the Accelerator and Modulator while still allowing power to the Console Cabinet UPS. EMO buttons are built into the Accelerator Stand (x2), Couch (x2), Control Console (x1), and Modulator (x3).

Additional EMO buttons, Customer-provided, are typically required in the treatment room, consult with the hospital's Radiation Safety Officer to verify the site requirements. Locate the EMO buttons to avoid unintentional activation.

- Provide an Allen-Bradley 800T-FX6AV or equivalent, two-pole, dry contact type, manual reset.

Four buttons can be identified by sequentially rated resistors that are Varian-provided, contractor-installed across the "sensor loop" contacts, refer to Figure 3-10 and Section 4.5.

WARNING **Do not locate the EMO buttons in the primary beam path.**

3.2.10.4 EMERGENCY DISCONNECT BUTTON

An Emergency Disconnect Button must be mounted in the control area. When activated it will remove mains power from all system components -- Accelerator, Modulator, and the Console Cabinet. This button may be integrated into the MCB panel, refer to 2.6.1 Main Circuit Breaker (MCB) for more information.

3.2.10.5 OPTIONAL SAFETY DEVICES

The following optional safety devices are Customer-provided and installed.

- Light Curtain – Optional sensing method to control the AC and DC door interlock circuits.
- Last Person Out (LPO) – A low voltage, timer switch used with the door interlock system to ensure the treatment room is clear.

3.2.11 NETWORK

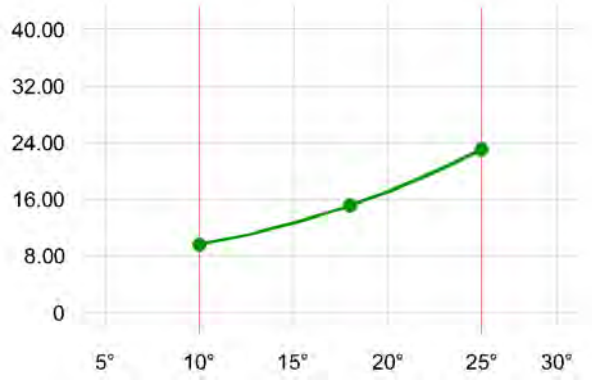
- Provide (1) network outlet near the Console Cabinet (**T14**), (3) additional outlets (recommended).
- Cat 5e cable (minimum), CAT 6 (recommended).
- Bandwidth 100Mbps, full duplex 100BASE-T (minimum), 1Gbit/s or higher (recommended).
- The RJ-45 jack must meet TIA/EIA-568-A wiring pattern.

- Varian recommends isolating the Oncology domain from the Enterprise Network.
- The Console Cabinet (**T14**) requires a static IP address.
- Refer to Varian network configuration guide - MICAP, contact Varian PM for document details.

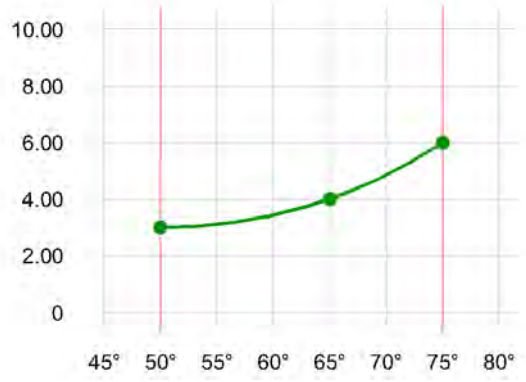
Wi-Fi is recommended in the control area and treatment room for training, education, and serviceability.

3.3 PLUMBING

Table 3-8 Coolant Requirements and Heat Loads	
Ideal Coolant Flow	18° C. at 15 LPM [65° F. at 4 GPM]
Flow Range	10 - 23 LPM [3 - 6 GPM]
Incoming Coolant Temperature Range	10 – 25° C [50 - 75° F]
Glycol Content of Coolant	Not to exceed 50%
Minimum, Low Power Coolant Heat Load *(Required, 24 hours)*	2 kW (6,830 Btu/hr)
On State Coolant Heat Load *(no energy selected)*	10 kW (34,152 Btu/hr)
Ready/Energy Select State Coolant Heat Load	12.5 kW (42,690 Btu/hr)
Maximum, Beam-On Coolant Heat Load	25 kW (85,379 Btu/hr)
Normal Treatment Cycle Coolant Heat Load	13.3 kW (45,422 Btu/hr)
Pressure Differential between the Inlet and Outlet Fittings at the TrueBeam Stand *(while in the Ready State)*	Adjusted to between: 0.7 bar and 1.7 bar @ 11.4 – 18.9 LPM [10 PSI and 24 PSI @ 3.0 – 5.0 GPM]
Maximum Input Pressure	6.9 bar [100 PSI]
Pressure Drop *(under maximum heat load conditions)*	1.7 bar [24 PSI]
Average Water Temperature Rise *(during all states w/closed bypass valve)*	15° C [27° F]



Liters/Minute - Incoming Coolant, Celsius



[Gallons/Minute - Incoming Coolant, Fahrenheit]

Figure 3-15 Chilled Water Flow Rates

NOTICE

To prevent equipment damage due to condensation, ensure the incoming coolant temperature lower bound is above the dew point in the facility.

3.3.1 CHILLED WATER

The cooling water requirement can be satisfied with a Closed-Loop system (Facility Central Plant Chilled Water or a Dedicated Chiller Unit) or a One-Pass system (Domestic "City" Water). The design could also be a combination of methods to provide greater resilience and redundancy. This design detail is the responsibility of the customer's design team and water quality professional.

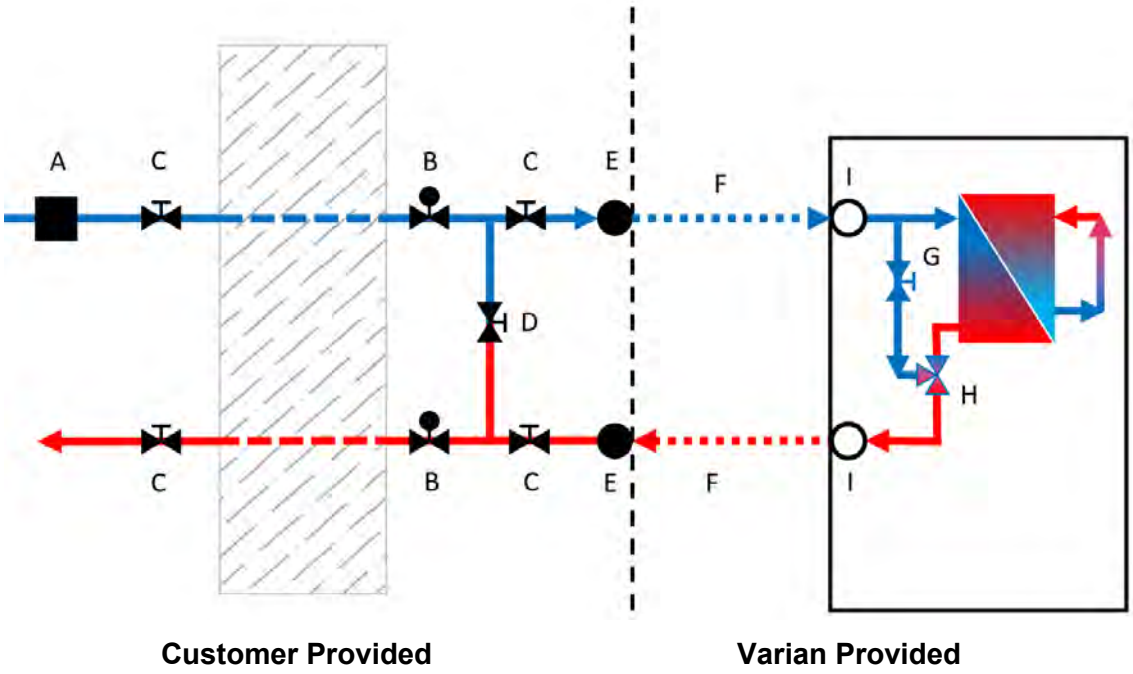


Figure 3-16 Coolant System Schematic

- Chilled water supply must not exceed the maximum inlet pressure shown in Table 3-8, controlled by a pressure regulator (**A**).
- Terminate piping with isolation valves (**C**) and a 1" FNPT Plug (**E**).
- An optional machine bypass valve (**D**) may be installed.
- Provide a minimum of one flow meter (**B**), may be installed on the supply or return line.
- Install additional isolation valves (**C**) in an accessible location outside the treatment room.
- Copper piping is recommended, install a filter/strainer for dissimilar metals.
- A Varian-provided, Contractor-installed flexible hose kit (**F**) is used to connect the piping to the accelerator at the Stand entry point (**I**).
- A bypass valve is located inside the system stand (**G**). This valve is open for Closed-Loop systems and closed for One-Pass systems.
- The modulating control valve (**H**) inside the system stand maintains an internal coolant loop temperature of 40°C [104°F].

If a Closed-Loop system is designed with domestic water (One-Pass) emergency backup, it is recommended to provide a means to notify the user that the accelerator bypass valve should be closed in the event the emergency backup system is used.

NOTICE

Do not route water piping directly above the accelerator or modulator. Inadvertent leaks may occur and can seriously damage the accelerator and mechanical systems.

Do not locate floor drains in the treatment room.

3.3.2 COOLING LINE ACCESS

Install isolation valves for the chilled water supply and return lines on the rear wall behind the Stand, refer to Figure 3-16 Coolant System Schematic.

- 290cm [9'-6"] is the maximum distance for the path of the Varian-provided hose (**F**) from the isolation valves (**C**, **E**) to the Stand entry point (**I**).
- The Varian-provided hose must be installed against the BaseFrame at (**I**). There is approximately 5cm [2"] clearance to enter the Stand under the rear cover.

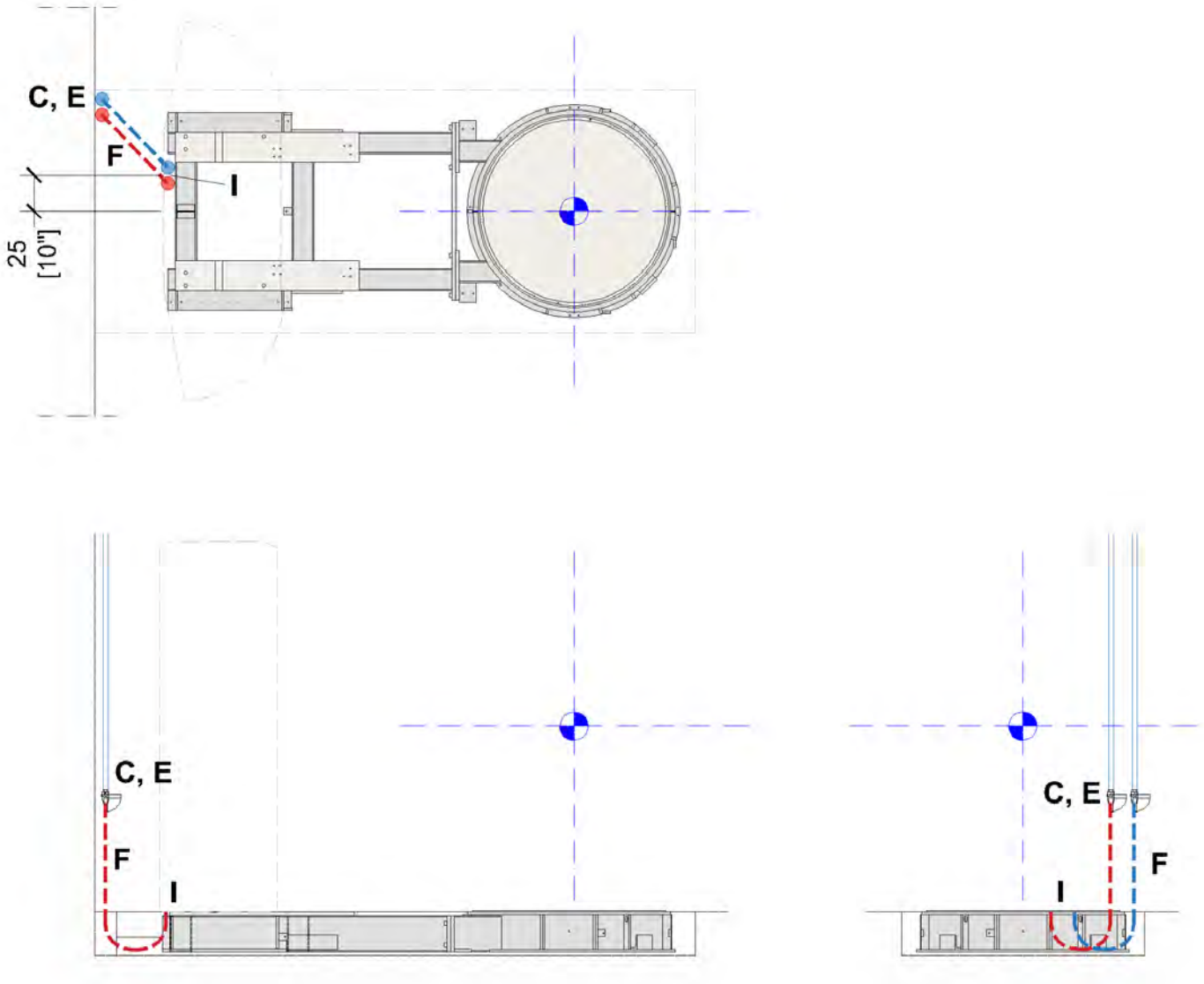


Figure 3-17 Cooling Line Access – Plan, Side, and Front

If the isocenter to rear wall dimension is less than 335cm [11'-0"] the isolation valves must be located to the side of the BaseFrame pit for accessibility.

The valve location (**C**) must not restrict the Stand door from opening to 90 degrees.

3.3.3 CHILLED WATER QUALITY

Table 3-9 Minimum Coolant Water Quality	
Quality	**Value**
Appearance	Clean, colorless, non-turbid, and disinfected; closed-loop systems should be treated with a corrosion inhibitor, which may add color.
Heterotrophic Plate Count (HPC) (CFU/ml)	<10,000
pH	7.0 – 10.0
Total Hardness (ppm $CaCO_3$)	>75

Experience has shown that some water supplies have caused excessive corrosion and frequent replacement of the internal heat exchanger. Consult a water treatment professional to design facility water quality specifications to prevent damage to the heat exchanger from corrosion, scale, biofilms, or other common issues. These specifications should include monitoring characteristics (for example pH, conductivity, total dissolved solids, chlorides, and hardness) to maintain values appropriate for the site's corrosion inhibitor and disinfection solutions. Ideal value ranges will vary depending on local conditions.

When glycol is added to external facility water, propylene glycol is preferred (due to its better environmental safety record compared to other glycols) at a strength not to exceed 50% by volume (v/v).

External water (from city or facility) may require secondary disinfection (in addition to any bleach/chlorine/chloramine reserve present) to avoid biofilm formation in the Accelerator's heat exchanger. Seek advice from a water treatment professional.

The water coolant specification in this section does not apply to the Accelerator's internal coolant water loop. Contact the Varian Help Desk at 1-(888)-Varian5 (827-4265) for information.

3.3.4 OPTIONAL PLUMBING CONSIDERATIONS

- A sink with running hot and cold water is highly recommended in treatment rooms.
- For convenience, a hose spigot is recommended to fill the water phantom.
- A sink drain is recommended to service the TrueBeam/VitalBeam' s internal cooling system and drain the water phantom.

3.4 ENVIRONMENTAL SPECIFICATIONS

- Ambient temperature range - 16° to 27°C [60° to 80°F]
- Humidity range - 30% to 75% Relative Humidity, Non-condensing
- Maximum allowable temperature shift of the Optical Imager from time of calibration to time of treatment - +/-2.0°C [+/-3.6°F]. This applies to the Stereotactic Optical Imager only.

3.4.1 VENTILATION

Accelerators will produce detectable levels of ozone under certain conditions.

- Four to six air changes per hour are typically required to maintain undetectable levels.
- Fresh air should be used as part of the HVAC design.
- Maintain a minimum ventilation space above the Modulator of 10cm [4”]

Table 3-10 Stand Heat Load

TrueBeam/VitalBeam Condition	kW	BTU/Hr
During Ready and Beam-On States	7.25	24,760
During No Mode State	1.5	5,119
During Power Save State	1.0	3,413

Table 3-11 Modulator Heat Load

Modulator Condition	kW	BTU/Hr
During Beam-On State	5.25	17,930
During other States	0.5	1,707

Table 3-12 Console Cabinet Heat Load

Description	kW	BTU/Hr
Control Console Cabinet	1.1	3,753
Optional ARIA workstation and monitor	0.5	1,707

The customer shall provide a means to remove the heat generated from the components listed in the Tables above.

3.5 ACOUSTIC

There are no recognized acoustical standards for therapy rooms. The primary sound source on TrueBeam/VitalBeam systems is the Modulator Cabinet. Varian has encountered no acoustical problems when the Modulator is in the treatment room. The patients are in the room for a very short time and observations indicate that some seem reassured by the changing sound levels as the machine goes through its cycles. If noise is a concern, the use of acoustically absorbent materials is recommended. The Modulator Cabinet can be located outside the treatment room. Access for service and safety must be considered along with the cooling requirements and cable length.

3.6 VIBRATION

The TrueBeam/VitalBeam is susceptible to vibration, creating self-resonance in the 2 - 10 Hertz range. Most installations are at or below grade, so vibration is normally not an issue. Equipment locations that should be considered in the overall design; large compressors or generators, elevators, and train lines. Contact the Varian Planning Department for more information on assessing site-specific situations.

3.7 FINISHES

3.7.1 FLOORING

The TrueBeam/VitalBeam contains electronic components that are sensitive to electrostatic discharge (ESD). Floor finishes used in the treatment room, maze, and control area should be selected to ensure they have “Anti-Static” properties that meet local and national codes. Carpet is not recommended as it can make gurney movement difficult and present an infection control risk. The floor finish should not have a propensity to create static electricity exceeding 2.0 kV at 20% relative humidity when measured using standard methods.

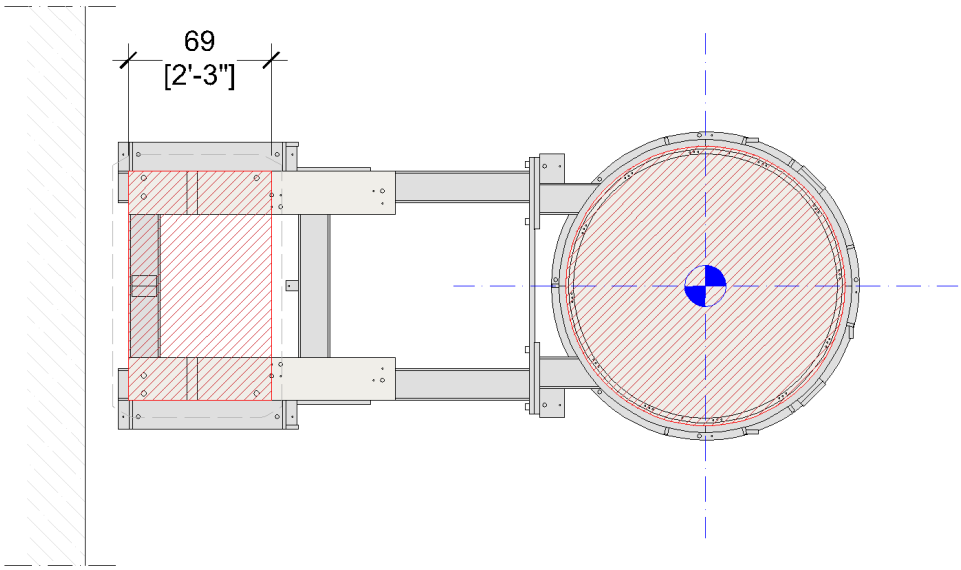


Figure 3-18 Finished Flooring Voids at the BaseFrame

Do not install the final flooring in the hatched area over the Stand mounting pads or inside the turntable trim ring.

It is recommended that the final floor covering be installed before the equipment is delivered, refer to 4.6 Delivery and RIG.

3.7.2 CEILING

There is no finished ceiling type specification. However, experience has shown there is a benefit of using a 60cm x 120cm [24” x 48”] or 60cm x 60cm [24” x 24”] lay-in acoustical tile ceiling. Among its benefits are easy access to above ceiling structures/systems and cables, low repair, acoustical attenuation, and the aesthetic benefits of modern ceiling grids and tiles. The ceiling grid layout must take into consideration the location of the overhead laser and the mounting posts for IRM and ceiling-mounted camera systems. If a solid ceiling is used, an access panel for service is required.

3.7.3 ACCESSORY STORAGE

It's recommended that custom cabinetry be built to store any patient immobilization devices and accessories for the accelerator. Due to differences in treatment practices, the exact quantity and types of accessories vary with each site, contact the Varian PM. Verify the requirements and storage preferences with the Customer.

3.7.4 FIRE PROTECTION

The fire protection system must comply with all local codes and regulations.

NOTICE

Sprinklers inside the treatment room are discouraged. Their discharge or inadvertent leakage into the couch pit or the Stand and Gantry can cause extensive equipment damage and shutdowns.

Consult with a local fire protection specialist so a code-compliant detector/extinguisher solution can be designed for the treatment room.

Heat detectors or photoelectric smoke detectors are preferred over ionization-type detectors due to the potential for false alarms.

If fire sprinklers are required by local authorities, do not locate sprinkler heads above the equipment. A pre-action sprinkler system, controlled by an independent detection system is preferred however if a wet pipe system is used, recessed high-temperature heads should be considered to reduce the chance of accidental breakage. If a chemical system is used, the safety of nonambulatory patients should be considered.

4 PROJECT MANAGEMENT

4.1 RESPONSIBILITIES

All pre-installation dates for Varian deliverables and milestones are scheduled by the Varian PM, based on an agreement between the customer and the Varian PM and communications with Varian Planning and Sales. The Varian PM will communicate regularly with the customer throughout all phases of the project. Also, the Varian PM will perform site inspection visits to help answer questions during the construction progress.

Site visits are commonly held for the Initial Site Meeting/Project Kick-off, the BaseFrame Pre-Installation Inspection or the BaseFrame installation, and the Pre-Installation Inspection. This final site visit typically occurs 10-14 days before the rig date to verify site readiness is at 100% completion as defined by the [2] Varian Accelerator Pre-Installation Checklist.

= Critical STOP/GO Inspections = Varian Install dates per customer schedule = Work by others

Table 4-1 Sample Project Schedule

Task *(estimated weeks)*	1	...	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	...
Place Machine Order	X																	
Design/Construction *(varies)*																		
BF Pre-Installation Inspection																		
BaseFrame Installation																		
Concrete Cure Time																		
MCB Installed																		
PIK Delivered & Installed																		
Pre-Installation Inspection																		
Machine Delivery *(weekend)*																		
Machine RIG *(weekend)*																		
System Installation																		
Machine Acceptance																		

4.2 OBJECTIVES

At a minimum, the items listed below must be completed before the Final Inspection can be performed by Varian so the equipment is released for delivery. Varian's installation timeline is based on these items being completed. The complete [2] Varian Accelerator Pre-Installation Checklist can be provided by the Varian PM on request.

- The treatment room and control area is finished to a clinical standard and is dust-free with no other construction trades having access.
- The customer has applied for obtained and signed all licenses and approvals required for this installation.
- A clear, load-bearing rig path exists – ensure all clearances from the unloading/staging area to the vault meet the minimum requirements.
- A live hospital network (internet access) with the Record and Verify system available.
- MICAP survey has been completed and submitted.
- All electrical requirements are completed including live permanent power, cable containment, wiring, circuit breaker, power conditioner, and power outlets.
- All safety-related items are installed and connected.
- The chilled water supply at the accelerator is tested and fully operational.
- Treatment and control room HVAC system is tested and fully operational.
- Flooring and casework are installed or prepared as previously agreed.

4.3 BASEFRAME INSTALLATION

Sub Project No.	**1**	This document's primary purpose is to provide an overview of the roles and responsibilities of Varian and the Customers appointed contractors during the installation. It should be read in conjunction with the PPG-HT. If you have any doubts, then ask the Varian PM for clarification.
Task Name	**Varian BaseFrame Installation**	
Task Overview	To deliver, level, anchor, shutter/formwork and pour mass concrete to complete the installation of the accelerator BaseFrame. The installation must occur a minimum of one month before machine delivery.	
Prerequisites	• BaseFrame pit concrete must be cured, per the Site-Specific Drawings (SSD). • The treatment room must be watertight • The floor around the isocenter must be level per 3.1.1 BaseFrame Pit of the PPG. • Power and lighting must be available in the room • Isocenter and the finished floor level (FFL) are defined. • An approved delivery path must be available • Customer Sub-contractors must be available. • Seismic calculations and fixings available (If required)	

Responsibilities	**Task**	**Varian**	**Customer**
	Schedule a delivery date	**X**	**X**
	Seismic calculations and anchors as required		**X**
	Suitability of pit base to support machine		**X**
	Provide suitable delivery route		**X**
	Inspect delivery route, treatment room & pit.	**X**	
	Deliver BaseFrame, unpack and move to the treatment room	**X**	
	Mark isocenter and FFL project the isocenter lines up the walls 1.5m [5'-0"]		**X**
	Establish the highest point of the floor to FFL		**X**
	Level and anchor the BaseFrame into the pit recess	**X**	
	Provide and weld seismic brackets on to the BaseFrame (if required)		**X**
	Install seismic anchors (if required)		**X**
	Build Shutter/formwork per the SSD		**X**
	Backfill with concrete, do not vibrate.		**X**
	Re-check BaseFrame level	**X**	
	Disposal of Varian packing material		**X**

Duration	2 days
Customer Supplied Resources & Materials	Single-phase power and light in the treatment room Carpentry contractor for shuttering or formwork plus material required Concrete/grout contractor to install concrete/grout of spec - C30, Slump 80 (consist S2) – aggregate 10mm ~ 1.2 m^2 [2000psi, 6-7" slump, 3/8" aggregate ~ 1. 6 yds^3] Welding contractor for seismic brackets plus approved anchors.
Results	BaseFrame installed to meet level and alignment specification with no grout/concrete contamination of the mounting pads, turntable tub, or ducts. All Varian packing material removed from the site.
Acceptance	Acceptance document filled in by Varian and returned - RIG-BF.

4.4 MCB AND RJB

<table>
<tr><td>Sub Project No.</td><td>2</td><td>This document's primary purpose is to provide an overview of the roles and responsibilities of Varian and the Customers appointed contractors during the installation. It should be read in conjunction with the PPG-HT. If you have any doubts, then ask the Varian PM for clarification.</td></tr>
<tr><td>Task Name</td><td colspan="2">Main Circuit Breaker (MCB) and Relay Junction Box (RJB)</td></tr>
<tr><td>Task Overview</td><td colspan="2">To accept delivery of Varian-provided MCB panel and IEC outlet (if supplied) and RJB, install them in their final position and connect the incoming supply and room interface cables.
Note - If the customer or contractor wishes to build or use another MCB then this needs to be agreed with the Varian PM in advance.</td></tr>
<tr><td>Prerequisites</td><td colspan="2">• The treatment room must be watertight.
• Site-Specific Drawings (SSD) for the location of MCB & RJB
• Isolated power source available
• Mains incoming wire installed.
• Dedicated earth termination bar installed</td></tr>
<tr><td>Responsibilities</td><td colspan="2">Task</td><td>Varian</td><td>Customer</td></tr>
<tr><td></td><td colspan="2">Schedule delivery date</td><td>X</td><td>X</td></tr>
<tr><td></td><td colspan="2">Unpack RJB and MCB (if supplied)</td><td></td><td>X</td></tr>
<tr><td></td><td colspan="2">Install the RJB, MCB, and IEC outlet per the SSD</td><td></td><td>X</td></tr>
<tr><td></td><td colspan="2">Install cable containment</td><td></td><td>X</td></tr>
<tr><td></td><td colspan="2">Connect to an isolated power source</td><td></td><td>X</td></tr>
<tr><td></td><td colspan="2">Install power to console cabinet per PPG</td><td></td><td>X</td></tr>
<tr><td></td><td colspan="2">Wire peripherals to RJB</td><td></td><td>X</td></tr>
<tr><td></td><td colspan="2">Testing as defined by Varian and local regulations</td><td></td><td>X</td></tr>
<tr><td></td><td colspan="2">Dispose of Varian packing materials</td><td></td><td>X</td></tr>
<tr><td>Duration</td><td colspan="3">Customer defined</td></tr>
<tr><td>Customer Supplied Resources & Materials</td><td colspan="3">General contractor to unbox and mount the MCB and RJB, using appropriate mounting hardware
Electrical contractor to connect the incoming power and peripherals.
Materials for installing, containment, interconnection, and finishing.
Materials for console power connection per PPG</td></tr>
<tr><td>Results</td><td colspan="3">MCB and RJB installed – incoming power supply connected and the power supply cable ready for connection to Modulator.
IEC Outlet is installed near the Console Cabinet and wired to the MCB.</td></tr>
<tr><td>Acceptance</td><td colspan="3">Inspected by Varian Project Manager, Pre-Installation checklist</td></tr>
</table>

4.5 PRE-INSTALLATION KIT (PIK)

Sub Project No.	**3**	This document's primary purpose is to provide an overview of the roles and responsibilities of Varian and the Customers appointed contractors during the installation. It should be read in conjunction with the PPG-HT. If you have any doubts, then ask the Varian PM for clarification.
Task Name	**Installation of the Pre-Installation Kit (PIK)**	
Task Overview	To take receipt of the Varian provided PIK, assemble components, and install them in their final position.	
Prerequisites	• Scheduled delivery date • BaseFrame installed and accepted • Ceiling height defined • Isocenter lines are marked on walls for the laser mounting plates • Site-specific plans available for component locations • Cable containment installed	

Responsibilities	**Task**	**Varian**	**Customer**
	Schedule delivery date for PIK	**X**	**X**
	Install Console Cabinet floor bracket		**X**
	Install laser mounting plates to walls and ceiling		**X**
	Install CCTV housings onto the wall		**X**
	Install speakers onto the wall		**X**
	Install optical imager camera plate and post		**X**
	Install In-room monitor plate and post(s)		**X**
	Install identification resistors into EMO switches		**X**
	Provide cable containment end to end distances and install pull string		**X**

Duration	1-2 Days dependent on options
Customer Supplied Resources & Materials	Electrical contractor for running cables. Mounting hardware for Console Cabinet positioning bracket. Mounting hardware for Optical Imaging camera and IRM ceiling mounting plate. Mounting hardware for Laser mounting plates
Results	All Varian-provided mounting plates and brackets are installed. Posts are configured to meet the height requirements.
Acceptance	Inspected by Varian Project Manager, Pre-Installation checklist

4.6 DELIVERY AND RIG

Sub Project No.	**4**	This document's primary purpose is to provide an overview of the roles and responsibilities of Varian and the Customers appointed contractors during the installation. It should be read in conjunction with the PPG-HT. If you have any doubts, then ask the Varian PM for clarification.		
Task Name	RIG			
Task Overview	Installation of the Machine and Peripherals			
Prerequisites	• Sub-projects 1 – 3 completed • System cables pulled in the conduits • Storage locations for spares and accessories • Power cable (customer supplied) in modulator pull box • Electrical supply available, lockout tag of electrical supply. • Network point available			
Responsibilities	**Task**		**Varian**	**Customer**
	Schedule delivery date for the system		**X**	**X**
	Risk assessments and method statements		**X**	
	City Permits (street closures), if required			**X**
	Crane, if required			**X**
	Designated area for the delivery truck			**X**
	Ensure the RIG path is structurally suitable			**X**
	Lay floor protection internally		**X**	**X**
	Unload/Unpack system and move into the room		**X**	
	Install machine		**X**	
	Connect power			**X**
	Connect cooling			**X**
	Commissioning supplied peripherals		**X**	
	Return transportation metalwork		**X**	
Duration	5 Days			
Customer Supplied Resources & Materials	Access to the site for out of hours working Contractors to connect power and water			
Results	Machine delivered and installed			
Acceptance	Inspected by RIG Contractor and PM – RIG-HT			

4.7 RADIATION AND SAFETY

Sub Project No.	**5**	This document's primary purpose is to provide an overview of the roles and responsibilities of Varian and the Customers appointed contractors during the installation. It should be read in conjunction with the PPG-HT. If you have any doubts, then ask the Varian PM for clarification.		
Task Name	Radiation and Safety Surveys			
Task Overview	Completion of Radiation and Safety Forms			
Prerequisites	• All facility services are fully operational • Machine installed • Room clinically ready			
Responsibilities	**Task**		**Varian**	**Customer**
	Arrange date for IPA		**X**	**X**
	Perform IPA		**X**	**X**
	Critical Exam (safety interlocks etc. Europe).		**X**	
	Failure correction			**X**
	Radiation survey (Room shielding)			**X**
Duration	2 Days			
Customer Supplied Resources & Materials	RPA or physicist availability Radiation meter Neutron meter Water tank and CC13 chambers or equivalent Dosimetry equipment and chambers			
Results	Passed IPA - passed Radiation Survey and Critical Exam.			
Acceptance	Performed by Installer and Customer – IPA-HT			

APPENDIX A SHIPPING AND RIGGING INFORMATION

1 CRATE WEIGHTS AND SIZES

Description	Metric		Imperial	
	Weight (kg)	H x W x D (cm)	Weight (lb)	H x W x D (in)
Gantry	4990	295 x 157 x 224	11001	116 x 62 x 88
Stand	1890	165 x 150 x 224	4167	65 x 59 x 88
Counterweight	2710	117 x 114 x 163	5975	46 x 45 x 64
Modulator	1090	150 x 109 x 224	2403	59 x 43 x 88
Mold Kit	60	71 x 71 x 56	132	28 x 28 x 22
2 in 1 Console Cabinet	470	124 x 107 x 185	1036	49 x 42 x 73
Box Generator	140	119 x 69 x 74	309	47 x 27 x 29
Covers – 1/3	250	196 x 119 x 185	550	77 x 47 x 73
Covers – 2/3	130	127 x 112 x 152	287	50 x 44 x 60
Covers – 3/3	260	259 x 86 x 145	573	102 x 34 x 57
Box AA	230	122 x 122 x 114	507	48 x 48 x 45
Box BB, BML1, DD	240	135 x 94 x 81	529	53 x 37 x 32
Box B	120	135 x 94 x 81	265	53 x 37 x 32
Box CC	80	135 x 94 x 81	176	53 x 37 x 32
Box D	116	145 x 102 x 66	256	57 x 40 x 26
Box E	48	81 x 81 x 66	106	32 x 32 x 26
Box EE, BML2	30	109 x 28 x 48	66	43 x 11 x 19

2 RIGGING INFORMATION

NOTICE

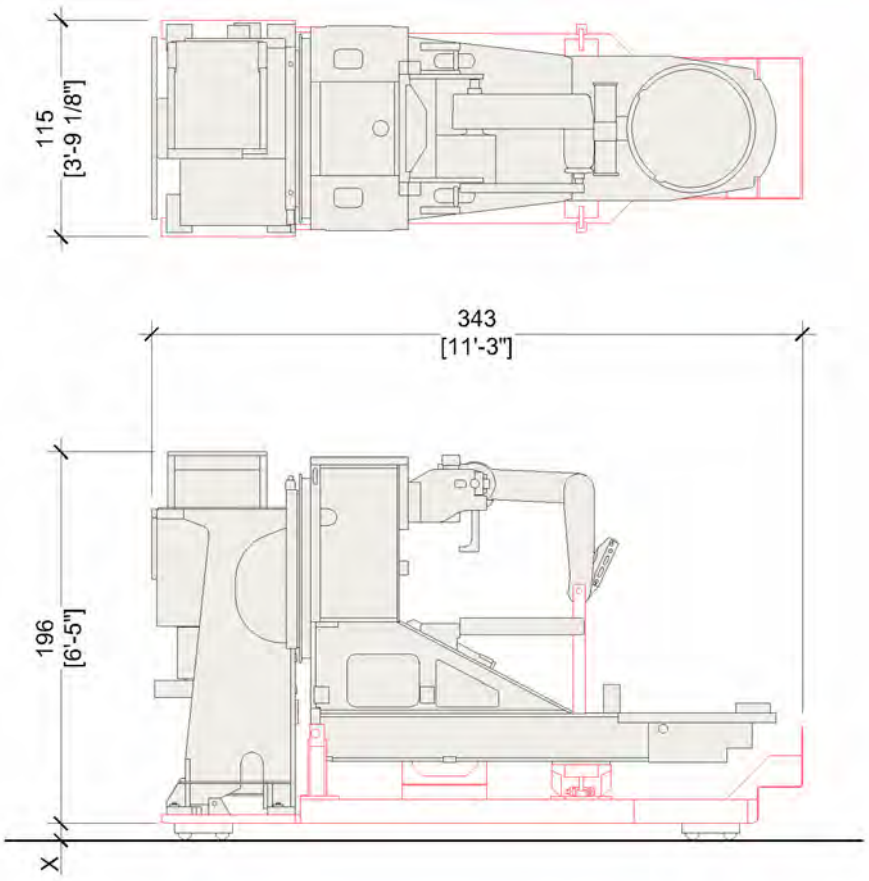
In 2-1 Standard Configuration and 2-3 Optional "Factory Break" Configuration the dimension for "X" is variable, dependent on the rigging equipment (skates or dollies).

The recommended door clearance height is 213cm [7'-0"].

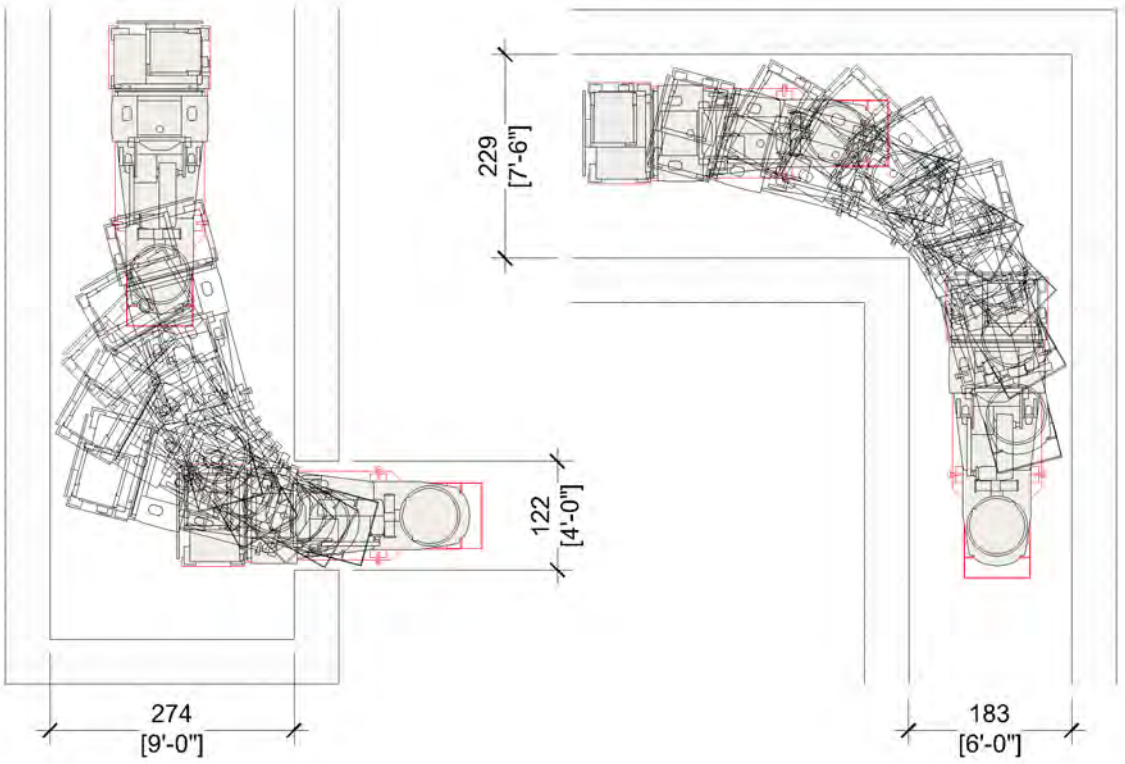
2.1 STANDARD CONFIGURATION

Connected Stand and Gantry (uncrated) with shipping red iron.

- Weight 6123 kg [13,500 lb]



2-1 Standard Configuration

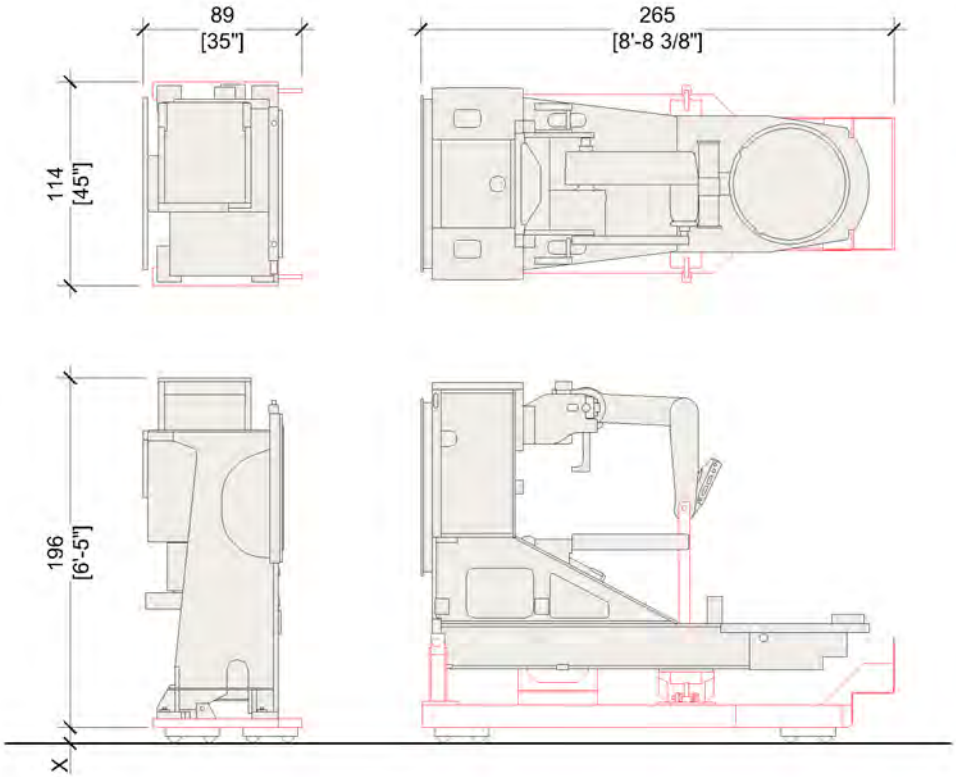


2-2 Standard Configuration Tracking Route

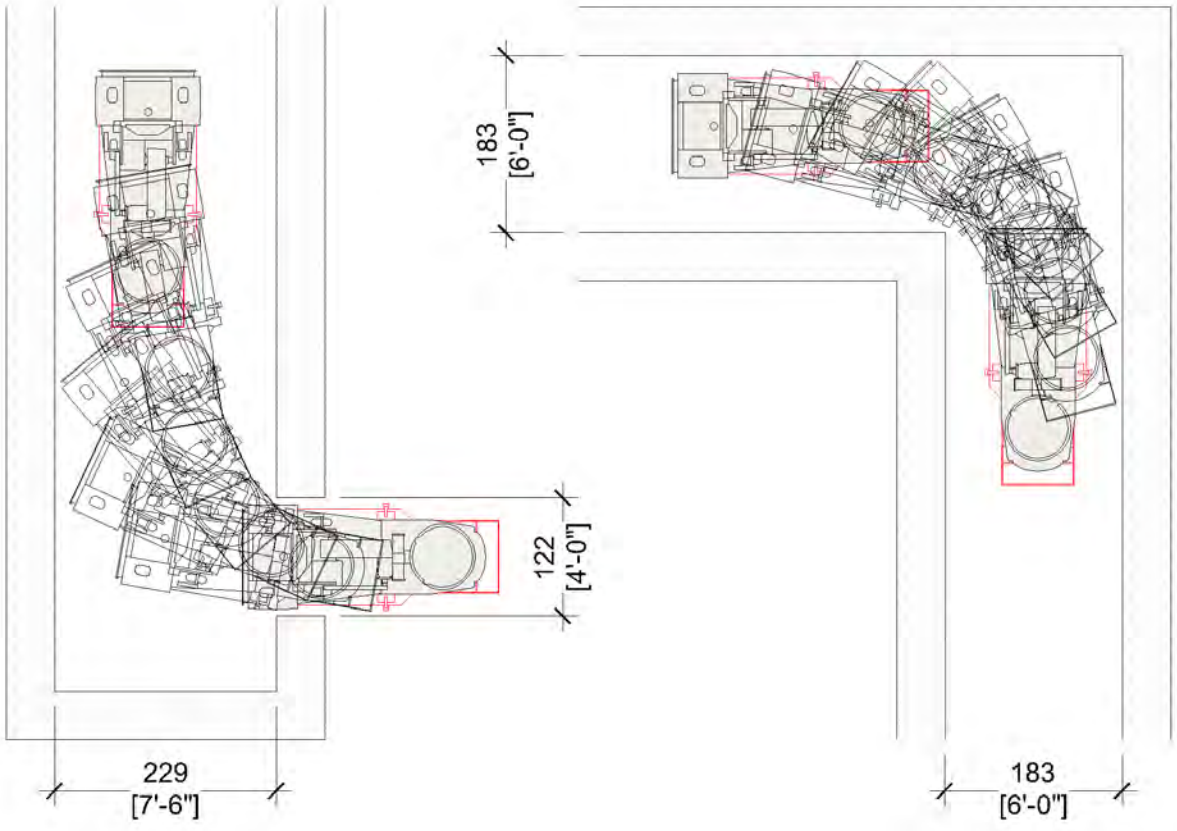
2.2 “FACTORY BREAK” CONFIGURATION

Separated Stand and Gantry (uncrated) with shipping red iron.

- Gantry Rigging Weight 4658 kg [10,270 lb]
- Stand Rigging Weight 1465 kg [3,230 lb]



2-3 Optional "Factory Break” Configuration



2-4 Tracking Route for "Factory Beak” Configuration

Base-Frame Delivery Criteria

Once the Varian base-frame delivery and installation are scheduled, please alert your security personnel of this event. Parking and access to the site should be reserved prior to our arrival.

The following requirements must be met before Varian installs the base-frame:
Clear access for delivery must be provided to accommodate a full-size tractor-trailer, a forklift, and a rigger support truck.
Clear access must be provided for rig-in. Rig-in requires:
A level, paved (or equivalent) area for forklift access to the entrance of the rig-path
A clear rig-path for moving base-frame on its side to the pit (Crate dimensions: approximately 12 ft x 6 ft x 2 ft. Weight: 2 ton)
A 4-ft to 5-ft clear area around the pit for moving the base-frame into position
Cooperation from all on-site personnel
The base-frame recess (pit) must be the proper size and depth, per the Varian Installation Data Package.
The recess and surrounding area must clean, dry, and free of all debris.
The treatment room must be watertight. If water were to enter the base-frame, the entire turntable would have to be replaced.
The isocenter must be clearly marked on all four sides of the pit, at the finished level of the concrete floor.
Adequate lighting must be provided to rig and install the base-frame.
Service power (110-120 Vac) and extension cord must reach around the circumference of the pit.
A dumpster must be available for the crate and packing materials delivered with the base-frame.
The contractor responsible for grouting around the base-frame should be on site to review the grout placement.

Protecting the mechanical assembly

When the base-frame is in place, the circular turntable mechanical assembly for the treatment couch must be protected. Do not stack or store any items (drywall, supplies, tools) on this circular area. Do not roll heavy equipment across it. Make certain no water enters the circular area. Place a protective cover over the grout-free areas to protect personnel and machine components. Damage to the turntable mechanical assembly area and the underlying machine parts are expensive to repair and may delay the project. Clinac installation cannot begin if this vital assembly is damaged.

Protecting the interconnect cable

After the base-frame is properly grouted, an interconnect cable will be exposed at the rear of the base-frame. Place the free end of the cable inside the base-frame opening to protect it from accidental damage. Advise personnel in the work area to be cautious of this cable and not to move it.

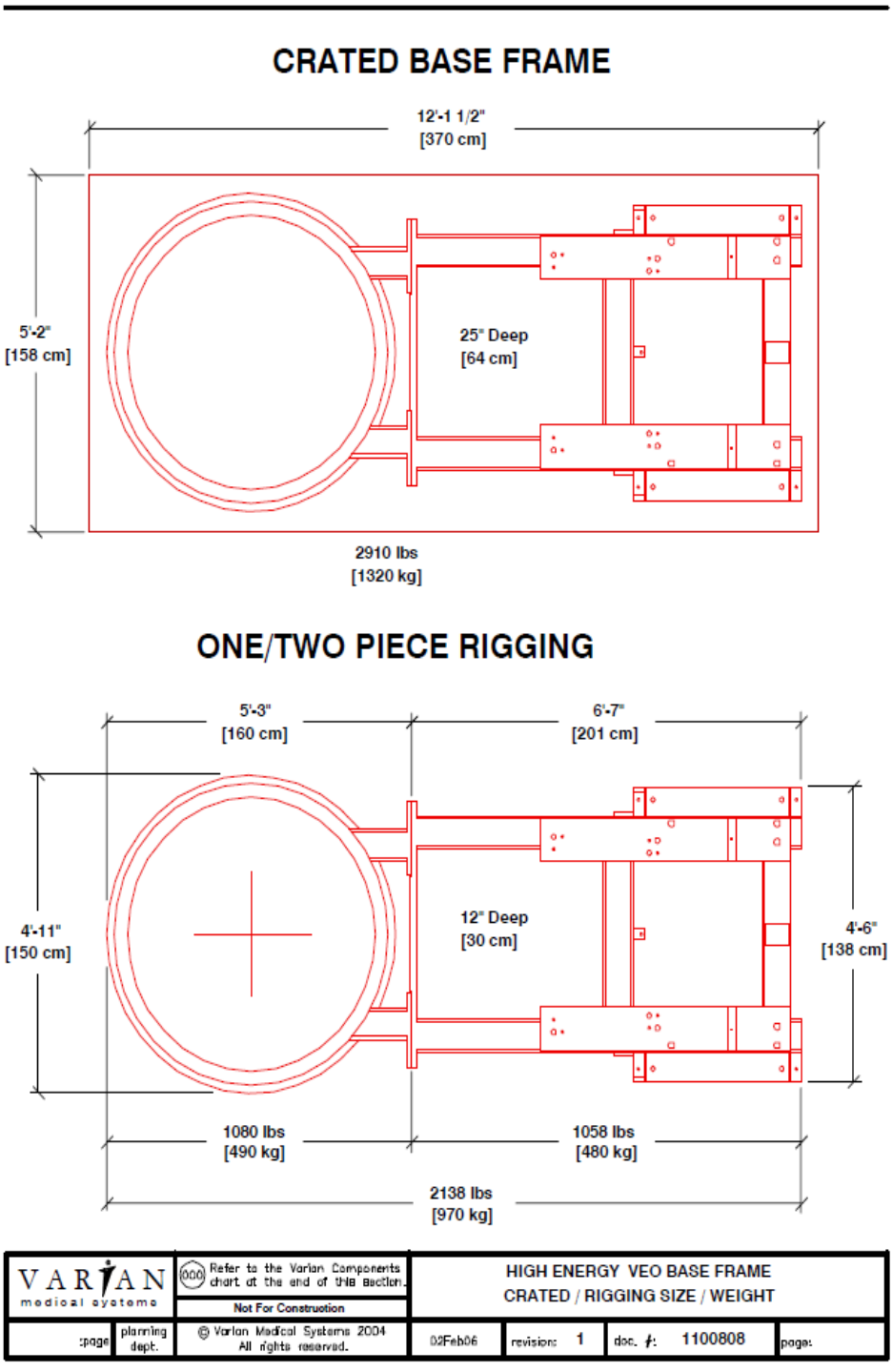
Clearing the conduit

Clear all subterranean conduits of rainwater accumulation or other debris. Please advise the contractor to have this step performed as early as possible so that water has time to evaporate, or to be otherwise removed, before Clinac delivery. Electrical conduits must be clean and dry at delivery and remain so permanently.

Measuring the conduits

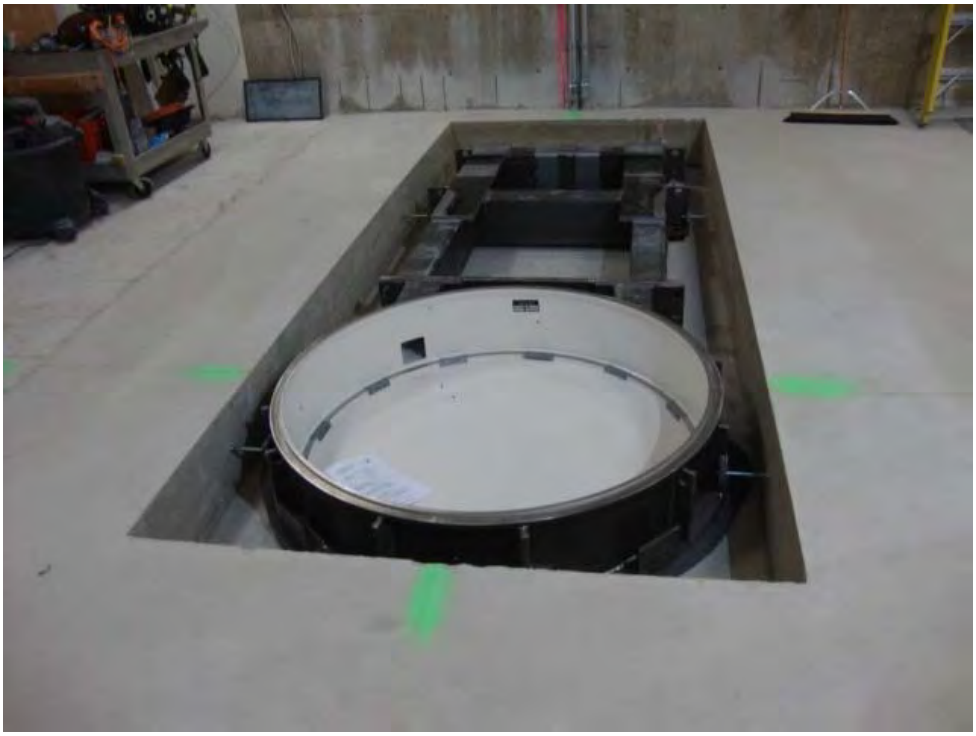
At this time, measure the conduit lengths, using the worksheet provided, and report the information to your Varian Installation Project Manager so the Varian cables can be ordered. Cable orders require four weeks lead time.

Baseframe Specification



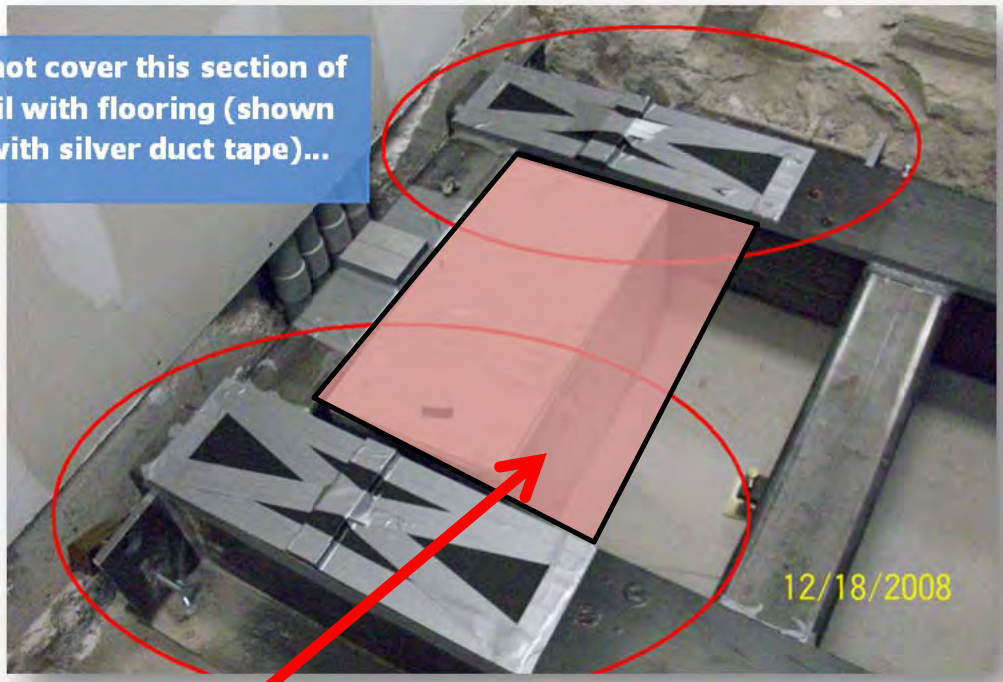
Base Frame Pit

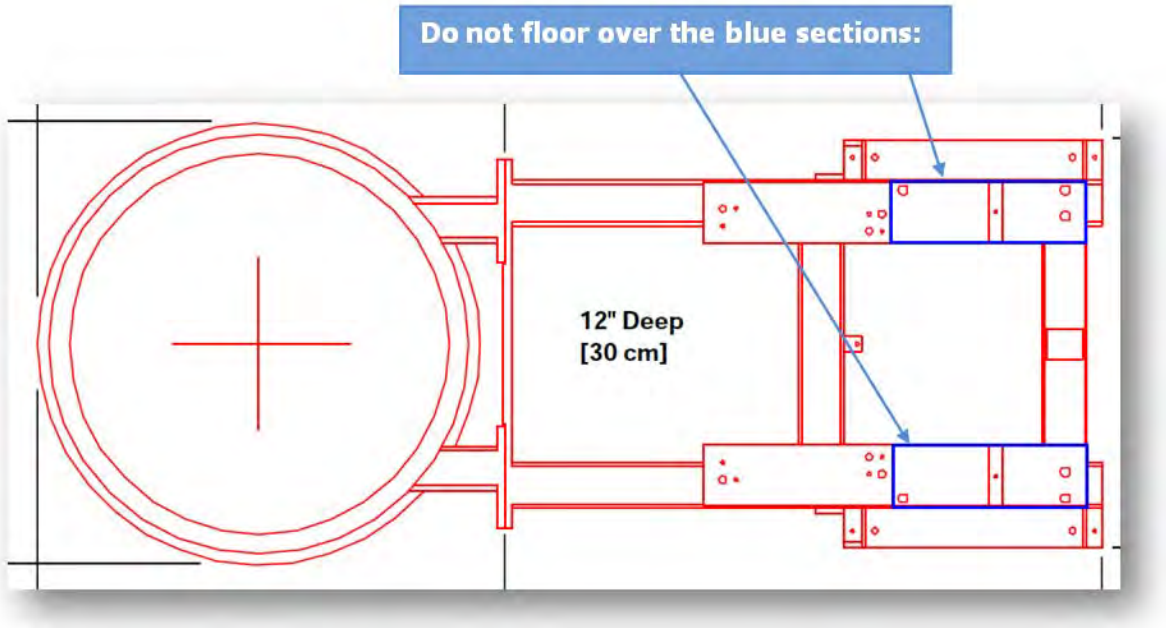
In pit



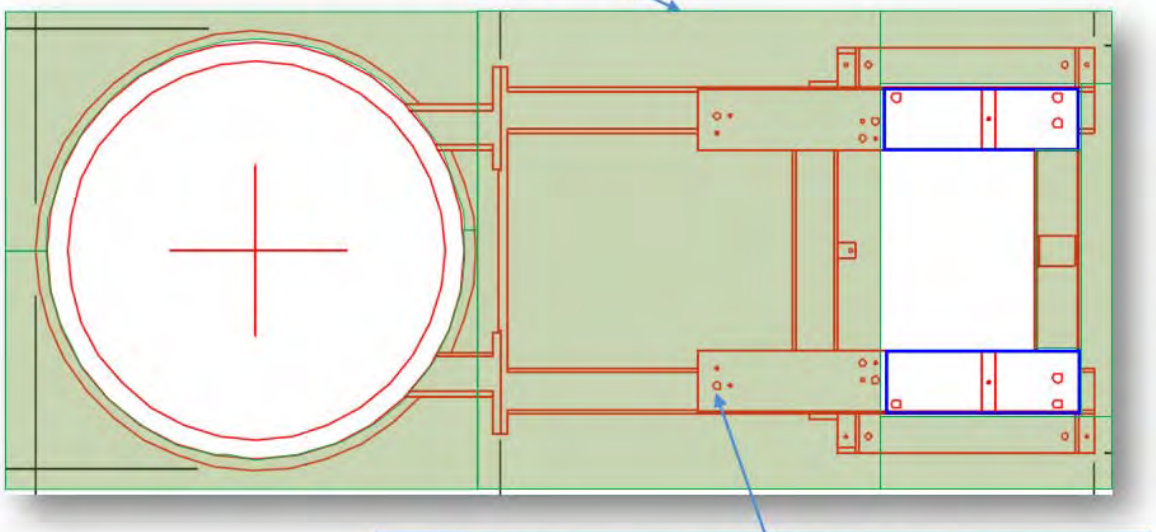
Base Frame Flooring Tips

High Energy Clinac Installations – Flooring Tips


...Do not cover this section of the rail with flooring (shown here with silver duct tape)...
12/18/2008
Frame out this section to prevent grout from entering the Baseframe pull-box.
...The rest of the rail is covered with flooring.


Do not floor over the blue sections:
12" Deep
[30 cm]

The flooring covers the rest, shown here in green:



It is OK to cover the holes in the green section above; they are used for a low energy machine. This machine is a high energy machine; everything in green is covered with flooring. The flooring terminates at the trim ring around the turn table.

Base Frame Floor Leveling

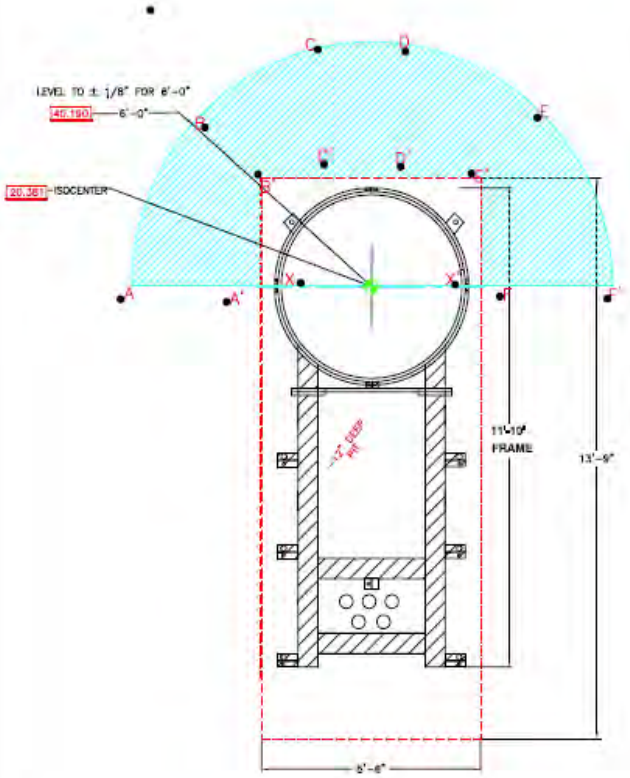
CUSTOMER _____ DATE _____

ADDRESS _____

_____

PROJECT MANAGER _____

RIGGING CO REP _____



Δ=High Point Elev. : _____
MEASURMENT INCH (CM)

Point Elevation – Floor

A _____ INCH (CM)	A' _____ INCH (CM)
B _____ INCH (CM)	B' _____ INCH (CM)
C _____ INCH (CM)	C' _____ INCH (CM)
D _____ INCH (CM)	D' _____ INCH (CM)
E _____ INCH (CM)	E' _____ INCH (CM)
F _____ INCH (CM)	F' _____ INCH (CM)

VARIAN REPRESENTIVE _____

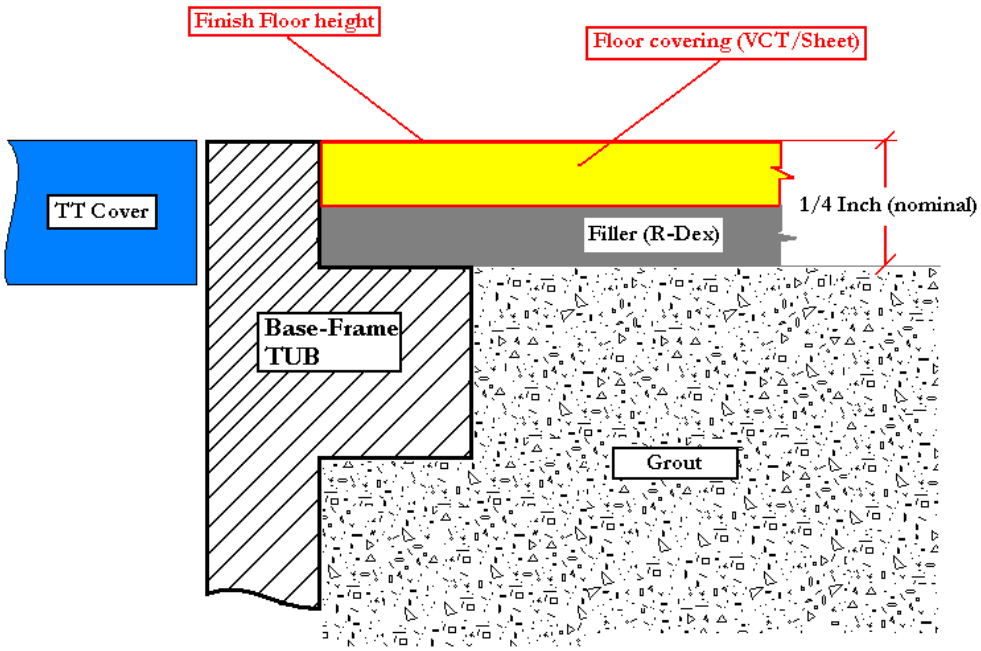
CUSTOMER REPRESENTIVE _____

Following the Grouting, Finished flooring material can be applied.

In order to achieve a smooth finish floor surface, apply suitable “filler” material along the “cold seam” at the pit line between the Grout and the poured floor.

Surrounding the line of the Base-Frame Tub, fill the gap between the rough concrete floor elevation and the finish floor elevation with the same “filler” material used to smooth the “cold seam”. See sketch 2 for more detail.

Sketch 2



Cross Section of Base-Frame Tub

DASH NO	TYPE OR MODEL	NEXT ASSEMBLY
–	HET	100050749

QTY	PART NUMBER	DESCRIPTION OR MATERIAL	ITEM
		3M 9472, TYPE 300, 5 MILS THK, LINER COLOR TAN, LINER TYPE 60# DENSIFIED KRAFT LINER, LINER PRINT "HI STRENGTH ADHESIVE", LINER CALIPER 6 MILS ON HARD COATED POLYESTER, VELVET TEXTURED.	1
			2
REF	100014004–02	LOGO, VARIAN	3

NOTES: UNLESS OTHERWISE SPECIFIED.

1. MANUFACTURE PER M7–8000.

[2] FILES REQUIRED TO CREATE ARTWORK SUPPLIED BY VARIAN PER ARTMASTER TABLE ZIP FILE.

4. COLOR AND TEXT SPECIFICATIONS PER ISO 3864–1, 3864–2.

5. ALL TEXT TO BE 10PT HELVETICA BOLD, BLACK.

6. COLOR AND TEXT TO BE SUB–SURFACE PRINTED BACKED WITH WHITE FOR OPACITY.

7. ARTWORK TO BE PROVIDED BY SUPPLIER.

[8] IDENTIFY WITH PART NUMBER 7.2PT HELVETICA BOLD, BLACK. LOCATED IN APPROXIMATE AREA SHOWN.

9. POINT SIZE EQUAL TO UNIT OF MEASURE. SAME SIZE FOR UPPERCASE AND LOWERCASE CHARACTERS. SEE SAMPLE.

SAMPLE1234 PT SIZE

sample1234 PT SIZE

[2] ARTMASTER TABLE

100051128–A.ZIP

DO NOT SCALE DRAWING

	DESCRIPTION OF CHANGE	ENGINEERING RELEASE		
APVD	DISC –01, ADD –02. NOTE 2 POLYESTER WAS POLOYESTER, SEPERATE PROCURE TO NOTE 3, INCREASE BY 1 ALL NOTES CORRECT WAS 1 INCORRECT REF SPELLING, GAUGE WAS GUAGE SHT 2 ZNB4, SEPARATE WAS SEPERATE SHT 2 ZND5, ADD TERM NUMBERS TO RELAY SHT2 ZNF5, NOTE 8 WAS 7 SHT2.	T.CHIA	T. CHIA	–
ECO	MOVE MATERIAL TO BOM AREA, ADD ARTMASTER P/N. NEW NOTE 2, ADD .ZIP FILE.			
DFT		G.ROSE	G.ROSE	G.ROSE
CHK		M.AGATE	–	–
DATE		2/2/11	6/3/11	–
REV		1	2	A

–02	SHOWN
–01	DISCONTINUED
DASH	DESCRIPTION

VARIAN medical systems — ONCOLOGY SYSTEMS

DRAWN	DATE	APPROVED	DATE	SCALE
G.ROSE	11/15/10	TOM CHIA	2/2/11	2/1
CHECKED	DATE	APPROVED	DATE	SHEET
–	–	–	–	1 OF 2

LABEL, WIRING DIAGRAM, CUSTOMER CONNECTIONS

UNLESS OTHERWISE SPEC:
ANG±= FIN ✓
.X±= .XX±= .XXX±=

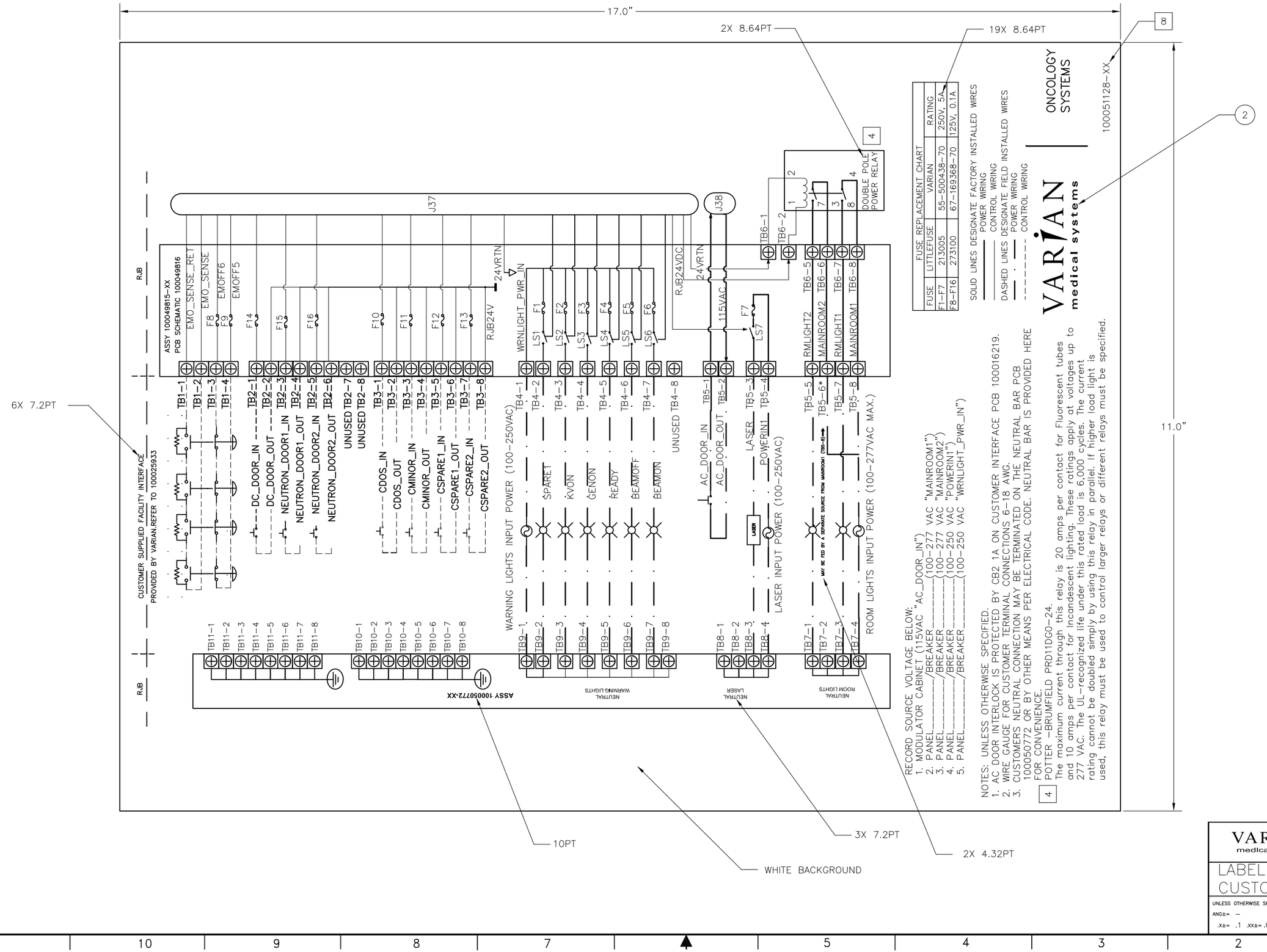
SIZE	DRAWING NUMBER	REV
D	100051128	A

SIMILAR TO: NONE

2

ACAD=60.

D 100051128



FUSE REPLACEMENT CHART		
FUSE	LITTLEFUSE	VARIAN	RATING
F1-F7	213005	55-500438-70	250V, 5A
F8-F16	273100	67-169368-70	125V, 0.1A

SOLID LINES DESIGNATE FACTORY INSTALLED WIRES
POWER WIRING
CONTROL WIRING
DASHED LINES DESIGNATE FIELD INSTALLED WIRES
POWER WIRING
CONTROL WIRING

ONCOLOGY SYSTEMS

VARIAN medical systems

RECORD SOURCE VOLTAGE BELOW:
1. MODULATOR CABINET (115VAC "AC_DOOR_IN")
2. PANEL_____/BREAKER_____(100-277 VAC "MAINROOM1")
3. PANEL_____/BREAKER_____(100-277 VAC "MAINROOM2")
4. PANEL_____/BREAKER_____(100-250 VAC "POWERIN1")
5. PANEL_____/BREAKER_____(100-250 VAC "WRNLIGHT_PWR_IN")

NOTES: UNLESS OTHERWISE SPECIFIED.
1. AC DOOR INTERLOCK IS PROTECTED BY CB2 1A ON CUSTOMER INTERFACE PCB 100016219.
2. WIRE GAUGE FOR CUSTOMER TERMINAL CONNECTIONS 6-18 AWG.
3. CUSTOMERS NEUTRAL CONNECTION MAY BE TERMINATED ON THE NEUTRAL BAR IS PROVIDED HERE 100050772 OR BY OTHER MEANS PER ELECTRICAL CODE. NEUTRAL BAR IS PROVIDED FOR CONVENIENCE.

4 POTTER -BRUMFIELD PRD11DG0-24.
The maximum current through this relay is 20 amps per contact for Fluorescent tubes and 10 amps per contact for Incandescent lighting. These ratings apply at voltages up to 277 VAC. The UL-recognized life under this rated load is 6,000 cycles. The current rating cannot be doubled simply by using this relay in parallel. If higher load ratings must be used, this relay must be used to control larger relays or different relays must be specified.

VARIAN medical systems	ONCOLOGY SYSTEMS	SCALE 2/1	
		SHEET 2 OF 2	
LABEL, WIRING DIAGRAM, CUSTOMER CONNECTIONS			
UNLESS OTHERWISE SPEC: ANG±= – .X±= .1 .XX±= .03 .XXX±= .005 FIN √	D	100051128	A
	SIZE	DRAWING NUMBER	REV

ACAD=60.

varian

Configuration for High Energy Filtrine Chiller

Filtrine Model #PCP-750G-96A includes the following:

- Cooling capacity of 85,350 BTUH @ 68˚F for High Energy System
- Air-cooled condenser, self-contained
- High ambient design up to 110˚
- Auto switch over to city water (includes low flow & high temperature interlock)
- Quick connect panel
- 208/60/3
- Start up & one-year preventative maintenance/warranty service contract
- Full freight to customer's loading dock
- Dry Contact

➢ Please Note: Filtrine suggests the High Ambient option (120°) for areas of extreme heat (i.e. Phoenix AZ / Las Vegas, NV / etc.). All other regions are covered by the standard 110° design

➢ For questions or clarifications contact:

Mark Bond
Medical Sales Engineer
Filtrine Mfg Co.
800-930-3367 ext 513
mbond@filtrine.com

Complete the following information and email to OVI_purchasing@varian.com . The factory cannot start order production until the information is provided.

varian

Configuration for High Energy Filtrine Chiller

Specify the following options required below:

AR Design: Split System (AR) (Chiller is indoors/condenser is outdoors)	YES ☐	NO ☐
460/60/3 Power	YES ☐	NO ☐
High Ambient Design to 120°F	YES ☐	NO ☐
Outdoor, Weather-Resistant Design (A-WP)	YES ☐	NO ☐
Low Profile (LP) Cabinet (Rooftop Mounting)	YES ☐	NO ☐
Space Saver Cabinet Design (SSD) (not available for outdoor)	YES ☐	NO ☐
Water Cooled Condenser (W) (Indoor only – city or tower water)	YES ☐	NO ☐

Site Name

Address 1:

Address 2:

City / State / ZIP:

Contact Name at Job Site:

Telephone Number:

Contractor Name:

Address 1:

Address 2:

City / State / ZIP:

Contact Name at Job Site:

Telephone Number:

Required on Site:

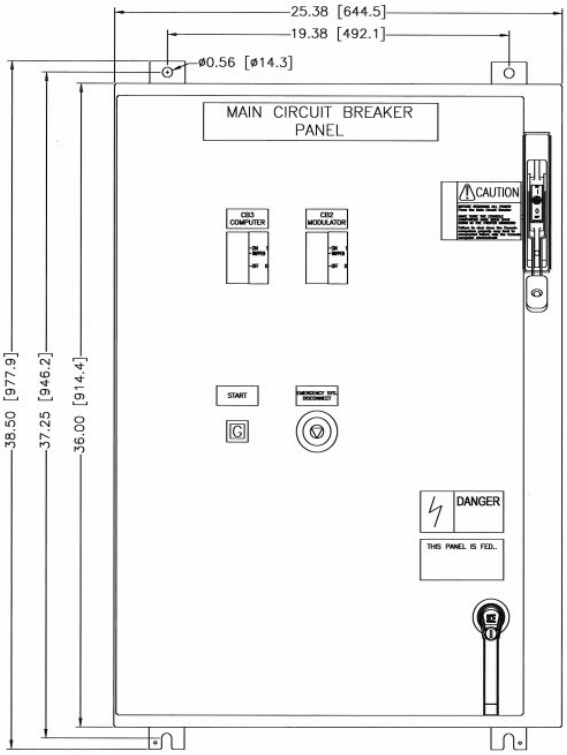
Form Completed By:

Date Completed:

TrueBeam Main Disconnect Panel – VWB Series

Application

The VWB Series of Main Disconnect Panels are custom panels that serve as the main power disconnect between the Varian TrueBeam system and the facility power source. These panels provide overcurrent protection and a panel mounted Emergency System Disconnect push-button providing immediate shut down of the entire system, complying with the NEC disconnect requirements. The standardized designs provide the customer, specifier, and installer several advantages by combining a variety of individual components into a single, pre-engineered, factory tested panel. Each panel is UL, and cUL Listed for compliance with approvals required by the NEC Articles 100 and 110-3. All panels are also CE marked for the many countries that require CE marking. The VWB panel may be surface or semi-flush mounted.

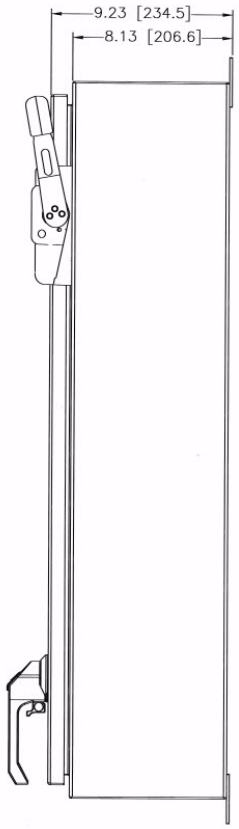


Designed for use with the following Varian Medical Systems:

- TrueBeam.

Physical Specifications

- Height: 36 inches (914.4 mm).
- Width: 25.38 inches (644.5 mm).
- Depth: 9 in. (approximately) (152.4 mm).
- Weight: 155 pounds (70.3 kg).



- Main lug wires #3/0 max.

8" of enclosure may be recessed in wall for semi-flush installations.

- **Mounting:** Via keyhole slots: width is 19.38 inches (492.3mm) on centers. Height is 37.25 inches (946.2 mm) on centers (see diagram).
- **Conduit Access:** Conduits may enter or exit from top, bottom, or sides. Preferred location is incoming near top and outgoing at the bottom. Rear conduits not possible. Exact location must be field verified.

There are several configurations of the VWB panel to accommodate domestic and international power requirements.

Catalog Number	Ampere Rating	Voltage Rating	Short Circuit Current Rating
VWB175A208V	175 Amps	200/208Y	25,000 Amps RMS
VWB150A240V	150 Amps	240VAC	25,000 Amps RMS
VWB100A400V	100 Amps	380V/400Y	25,000 Amps RMS
VWB90A415V	90 Amps	415VAC	25,000 Amps RMS
VWB80A480V	80 Amps	480VAC	25,000 Amps RMS

Features

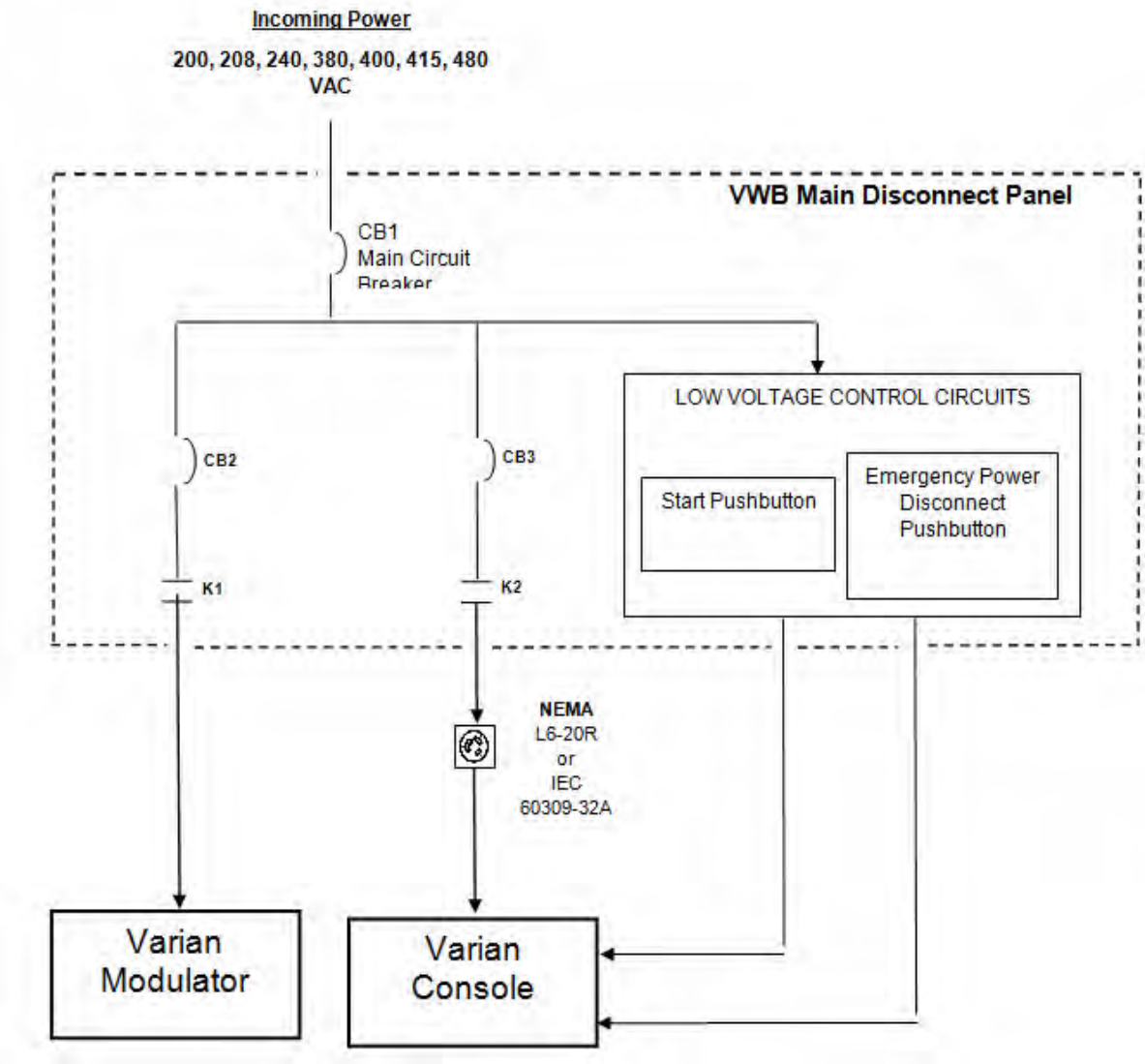
- Single Incoming Power Source with Main Circuit Breaker/Disconnect.
- Configurable Auto Restart Feature.
- Pre-Terminated Interface Cables.
- Surge suppression for each relay coil.
- Single panel completely assembled and tested.
- Custom tailored for Varian Systems.

Benefits

- Provides local Lock Out/Tag Out capability. Coordinated with Modulator and Console, and control circuits.
- If enabled, re-applies power to the Modulator after a power outage. If disabled, pressing the START push-button is required to start the Modulator.
- Facilitates system installation and troubleshooting.
- Provides protection for the sensitive electronic equipment.
- A pre-engineered panel with a permanent wiring diagram.
- Standardized design and testing assures high product quality and reliability.

General Features

- Developed specifically for Varian Medical Systems.
- Off white exterior paint finish.
- May be surface or semi-flush mounted.
- UL and cUL Listed &. CE marked.



Ordering Information

Available from GEXPRO, Indianapolis, Indiana **1-800-200-9760 ext. 3876** or 1-317-554-3876. 8:00 a.m. to 5:00 p.m. U.S. Eastern Time.

Varian Accelerator Pre-Installation Checklist

In accordance with current Varian "Standard Terms and Conditions of Sale" RAD 1652 the following are minimum facility requirements to be accomplished before the machine can be released for shipment. Requests for any exceptions should be referred to your Varian Installation Project Manager. The Customer is responsible for meeting these minimum requirements prior to the scheduled day of this inspection. If delays in facility completion postpone Varian's installation, the Customer shall reimburse Varian, at Varian's standard service rates, for any extra time and /or travel by Varian made necessary by the delay. I have explained these requirements to the Customer on this date along with the specific requirements listed below.

Varian Representative _____ Date _____ Customer Representative _____ Date _____

Site Name ☐ Address same as Sales Order "Ship To". Serial Number

Address 1:

Address 2:

City, State, Postal Code:

NOTE: The Customer is responsible to confirm, provide, and/or demonstrate to the Varian Project Manager the following items meet or exceed minimum requirements set forth in Varian's Designer Desk Reference (DDR) 10 to 14 days before the equipment is to be delivered. The Varian work area is defined as the treatment room, control room, and ancillary areas wherein Varian equipment will be installed.

Y N NA These 10 items have to be completed before the final inspection from Varian can be performed and the equipment released for delivery. Varian's installation timeline is based off these items being completed at the final inspection.

☐☐ 1. Varian work area is secure and dust free, no trades should be in this area. This area has to be isolated from the general construction area with a solid barrier. This area has to be sealed to ensure that construction dust particles from those adjoining areas do not enter the Varian work area through any means.

☐☐ 2. Network live and in-place. Record and Verify system available.

☐☐ 3. MICAP survey has been completed and submitted.

☐☐ 4. High speed internet access installed/operational and login information provided for installation personnel. Please provide login credentials or IT contact name/number: _____

☐☐ 5. Permanent power live and in-place. Electrical requirements completed including, conduits, wiring, circuit breakers and power conditioners.

☐☐ 6. Tested Chiller or Water supply at the accelerator.

☐☐ 7. HVAC system is operational in the vault and control area.

☐☐ 8. Walls, lighting, and ceilings are complete and operational. (Check for soffit clearances and laser obstructions).

☐☐ 9. Casework is complete, if not located in the rig path.

☐☐ 10. Flooring has been completed or prepared as previously agreed. **Note:** Mark "Y" if existing floor is to be used.

Y N NA GENERAL REQUIREMENTS:

☐☐☐ 11. A&E Drawings reviewed by Varian Planning Department and a copy of the drawing review on file.

☐☐☐ 12. Customer has applied for or obtained all approvals or licenses, as required.

☐☐ 13. Debris removal arranged for approximately 30 cu. yds. on day of delivery.

☐☐ 14. Customer confirms arrangements have been made for initial and ongoing debris removal by others.

☐☐ 15. Varian personnel have access to the building for all purposes related to equipment installation. This access is seven days a week and the hours can run from 7AM to 7PM. (Hours could be longer for some installs)

☐☐ 16. For safety purposes, demonstrate a working telephone in the control room area, number: _____

☐☐ 17. Acceptable clearances to install and operate equipment.

☐☐ 18. A clear rig path exists – measure all clearances from the unloading/staging area to the vault. Remove all construction materials and other obstacles from the rig path on the day of delivery and sweep the rig path clean.

☐☐ 19. Restroom facilities and sink with running water available for installation personnel throughout the duration of the installation.

☐☐ 20. Customer representative who will sign for the accelerator delivery, name/number: _____

☐☐ 21. Electrician will be available to pull Varian interconnect cables, and/or assist under direction, before or at rig-in. Qualified personnel available to connect utilities to Varian equipment as required. *Name(s) and contact information:* _____

Y N NA TREATMENT ROOM (VAULT):

☐☐☐ 22. Treatment room door operational. Door should be hung only if it does not interfere with machine rigging.

☐☐ 23. Clear 4'-0" x 7'-0" (1225mm x 2125mm) opening at vault entry.

☐☐ 24. Varian base-frame installed and grouted, correct levelness and height confirmed.

☐☐ 25. Correct number and size of conduits. All conduits must be clean and dry. Pull stings needed in all conduits.

☐☐ 26. Primary power wiring and ground conductors meet Varian minimum requirements.

- 480V/80A or 208V/175A, 3-phase + Ground (parity with power conductors, but no smaller than #6 GA)

Note: *Neutral not required for either power input.*

☐☐ 27. Relay junction box installed and tested. Conduit/route connected to:

☐ Base-frame pull-box for TrueBeam, LE Clinac and Silhouette Clinac

☐ Modulator pull-box for High Energy Clinac

Note: *If GE RJB Model VRJB-C3 Please Check* ☐

☐☐ 28. Main room lights connected to the relay junction box.

☐☐ 29. Two independent door interlock switches installed, tested, and connected to the relay junction box.

☐☐ 30. Facility emergency-off switches installed, tested, and connected to the relay junction box. TrueBeam uses Sensing resistors installed per A&E Drawings.

☐☐ 31. Warning lights installed, tested, and connected to the relay junction box.

☐☐ 32. Laser light wiring, receptacles, and mounting plates installed. Verify location, heights, and recess size.

☐☐ 33. Cooling water supply system is complete and available in service pit, valved below finished surface, pressure tested, flushed clean, and terminated with threaded body, 1" NPT, female, shut-off valves. Qualified personnel available to connect utilities to Varian equipment as required. *Name(s) and contact information:* _____

Varian Accelerator Pre-Installation Checklist

Y N NA CONTROL ROOM:

☐☐ 34. Main disconnect breakers are complete, wired, and ready for service.
Note: *If none GE VWB Please Check* ☐

☐☐ 35. Verify grounded electrical power receptacles available for control equipment components, per DDR requirements.

☐☐ 36. Casework is complete and ready. Cable routing access provided with 3" (72.6mm) grommets.

☐☐ 37. Ventilation sufficient for removal of heat from console equipment.

Y N NA OTHER:

☐☐☐ 38. Power Conditioning Unit installed and ready for service, if applicable.

☐☐☐ 39. Varian installation cables on site. Cables must be ordered 6 weeks before accelerator delivery. If not on-site, provide due date: _____

☐☐ 40. Customer confirms they will supply 2 boxes of localization X-Ray film and wet processor or radio chromic dry film for the Varian installation.

☐☐ 41. Secure, environmentally controlled, storage area (located near Varian work area) available for approximately 400 sq. feet (37 sq meters) of material. Varian installation personnel will require continuous access.
Please indicate location/room number: _____

☐☐ 42. Preliminary radiation survey form and survey instruction documents (L9330, L9330A, L9205 and L9206, whichever is applicable) have been provided to the customer. Customer has agreed to have a qualified physicist available for the survey approximately 5 days after the start of the installation. This includes photon measurements; if >8MV, also neutron measurements. [note possible neutron measurement exception in L9330A] Record physicist's name and number. _____

☐☐ 43. Qualified physicist and dosimeter calibration equipment available for acceptance testing. Coordinate timing with installation personnel and record physicist's name and number: _____

☐☐ 44. Are any Vendor Credentialing or special requirements needed for Varian's representative to access the building? _____

☐☐☐ 45. RPM Gating Pre-install checklist complete for Clinac or CT scanner.

☐☐☐ 46. OSMS Pre-installation checklist complete.

☐☐☐ 47. Calypso Pre-installation checklist complete.

Y N TrueBeam only:

☐☐ 48. Console power receptacle (IEC 60309) is complete, wired, and ready for service. Location is not more than 24 inches from Control Cabinet and not directly behind the cabinet.

☐☐ 49. Dual In-room Monitors and directional microphone - mount(s) installed, power ready, and data cable conduit/box installed.
☐ Ceiling mount OR
☐ Wall mounts - T-rail mount for microphone required.

☐☐ 50. Optical Camera location - ceiling mount and data cable conduit/box installed.

☐☐ 51. Closed Circuit TV camera locations, power ready, and data cable conduit/box installed.

☐☐ 52. Live View Camera and directional microphone - data cable conduit/box installed.

☐☐ 53. Data conduit/box installed at PAVS wireless keyboard and mouse location. Power outlet installed near data outlet.

☐☐ 54. Data conduit/box installed at each audio speaker location.

☐☐ 55. Accessory pull-box installed and connected to in-room device locations.

☐☐ 56. Control cabinets location verified:

☐☐ 57. Arrangements have been made to have the cabinet positioning bracket(s) installed at time of rig.

Y N NA High Energy and Low Enery Clinac only:

☐☐ 58. In-room monitor (if ordered) – verify location, mounting, power, and data cable conduits.

☐☐☐ 59. CCTV power, data outlets, and conduit ready for installation.

☐☐☐ 60. Intercom power, data outlets, and conduit ready for installation.

☐☐ 61. Compressed air in pit (Instrument quality)
Note: *Only required for HE Clinac.*

☐☐☐ 62. OBI breaker panel – wiring pulled and tested (3 phase & ground. HE Clinac Only ***Note:*** *If none GE VWB Please Check* ☐

☐☐☐ 63. OBI warning lights installed and wiring pulled. HE Clinac Only

☐☐☐ 64. If HE Clinac Silhouette configuration, ensure that the customer has selected their panel design preference by visiting the Varian public website.

Y N NA Halcyon:

☐☐ 65. Console power receptacle (IEC 60309) is complete, wired, and ready for service. Location is not more than 610mm (24") from Control Cabinet and not directly behind the cabinet.

☐☐ 66. Treatment room floor pit is of the correct size, location has chamfered edges and is sealed or painted.

☐☐ 67. The treatment room floor including the area behind the treatment room floor pit must be level within +/- 3mm (1/8")

☐☐ 68. The console to floor conduit run is 23 meters (75') or less. If not, 46 meters cable is required PN P1010873004.

☐☐ 69. The MDP is 100% complete and ready service. The ground conductor sized to parity with power conductor but not less than AWG-6.

☐☐ 70. The G/PE ground conductors are installed at the MDP and pulled to the control room pull box and treatment room floor pit with approximately 5M (16') of excess to allow connection after machine delivery.

☐☐ 71. Console cabinet positioning bracket installed.

☐☐ 72. A compatible treatment R&V and or Oncology information system (OSI) is operational and accessible from the Varian work area. List OSI type and version here _____

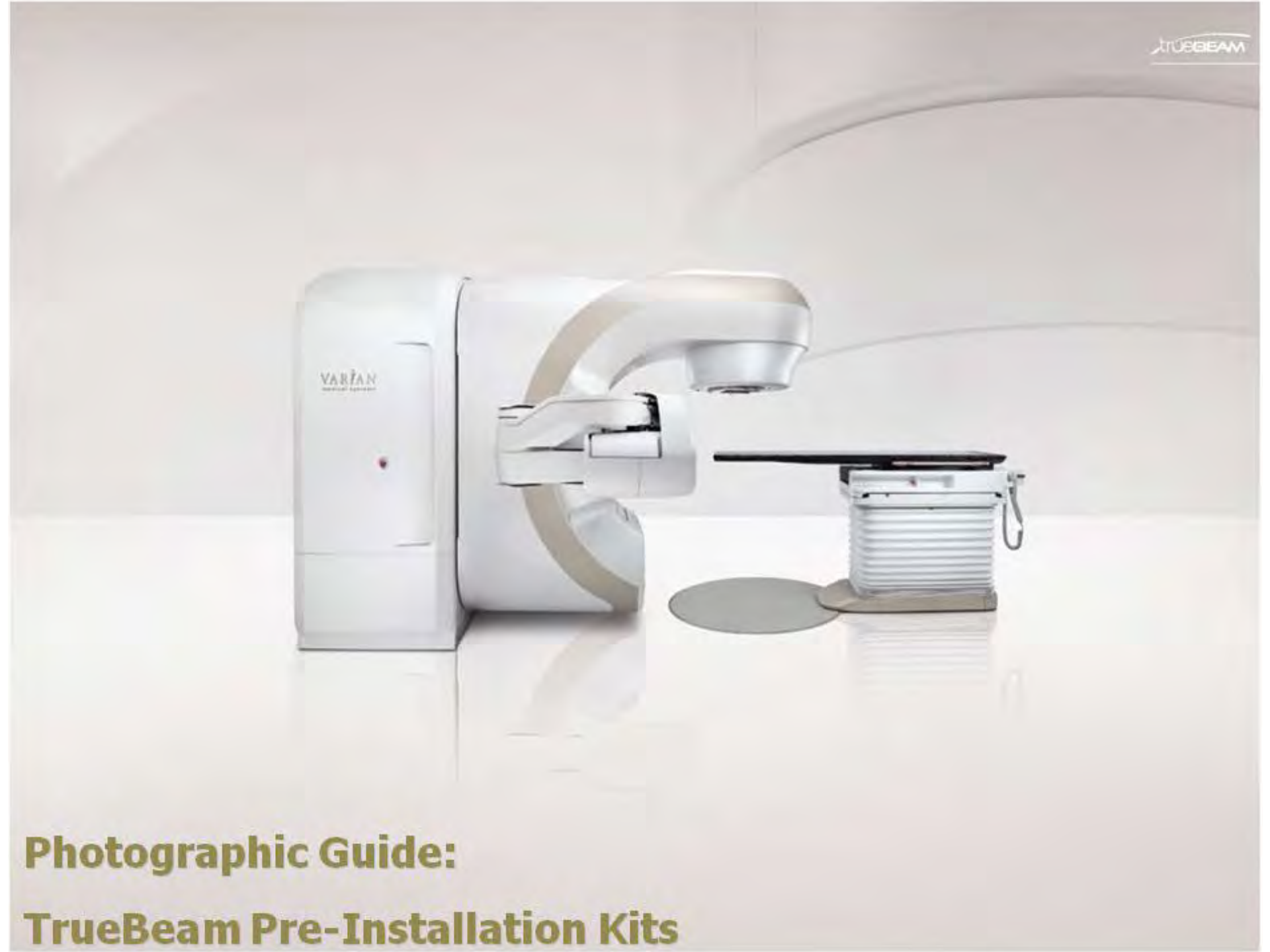
☐☐ 73. Must have Eclipse v15 or higher available at the beginning of the installation.

In the box below, precede all notes with the respective item number from the list above.

Please use the box below for general comments

Varian Representative	Customer Representative	Date

Varian Representative	Customer Representative	Date



Photographic Guide:

TrueBeam Pre-Installation Kits

varian

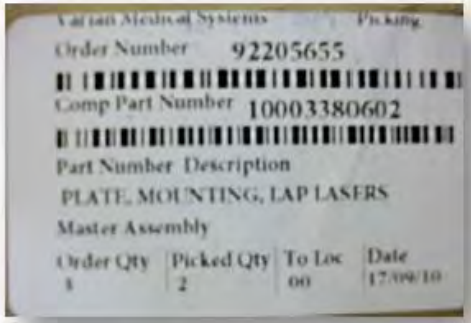
Table of Contents

1. Control Area

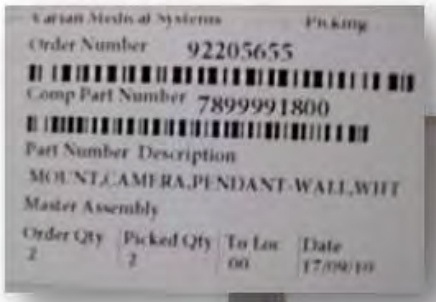
1.1 Cabinet Positioning Brackets (Qty 2, 4 pieces) & Pins (Qty 4)

2. Treatment Room

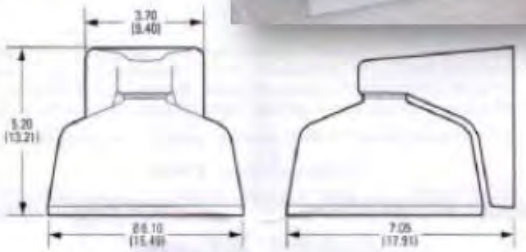
2.1 Laser Mounting Plates (Qty 4)



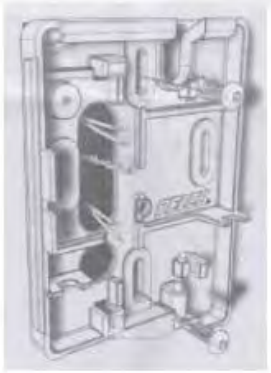
2.2 PTZ CCTV Mounts (Qty 2)

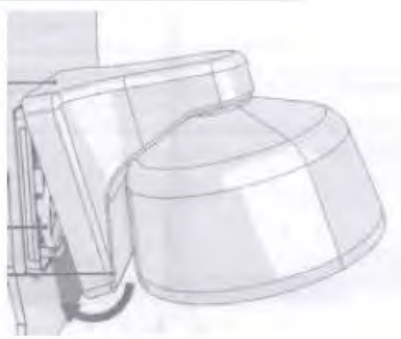


Construction		
	Mount	ABS plastic
	Adapter Plate	Aluminum
Finish		White
Weight		0.72lb (0.33 kg)



NOTE: VALUES IN PARENTHESES ARE CENTIMETERS, ALL OTHERS ARE INCHES

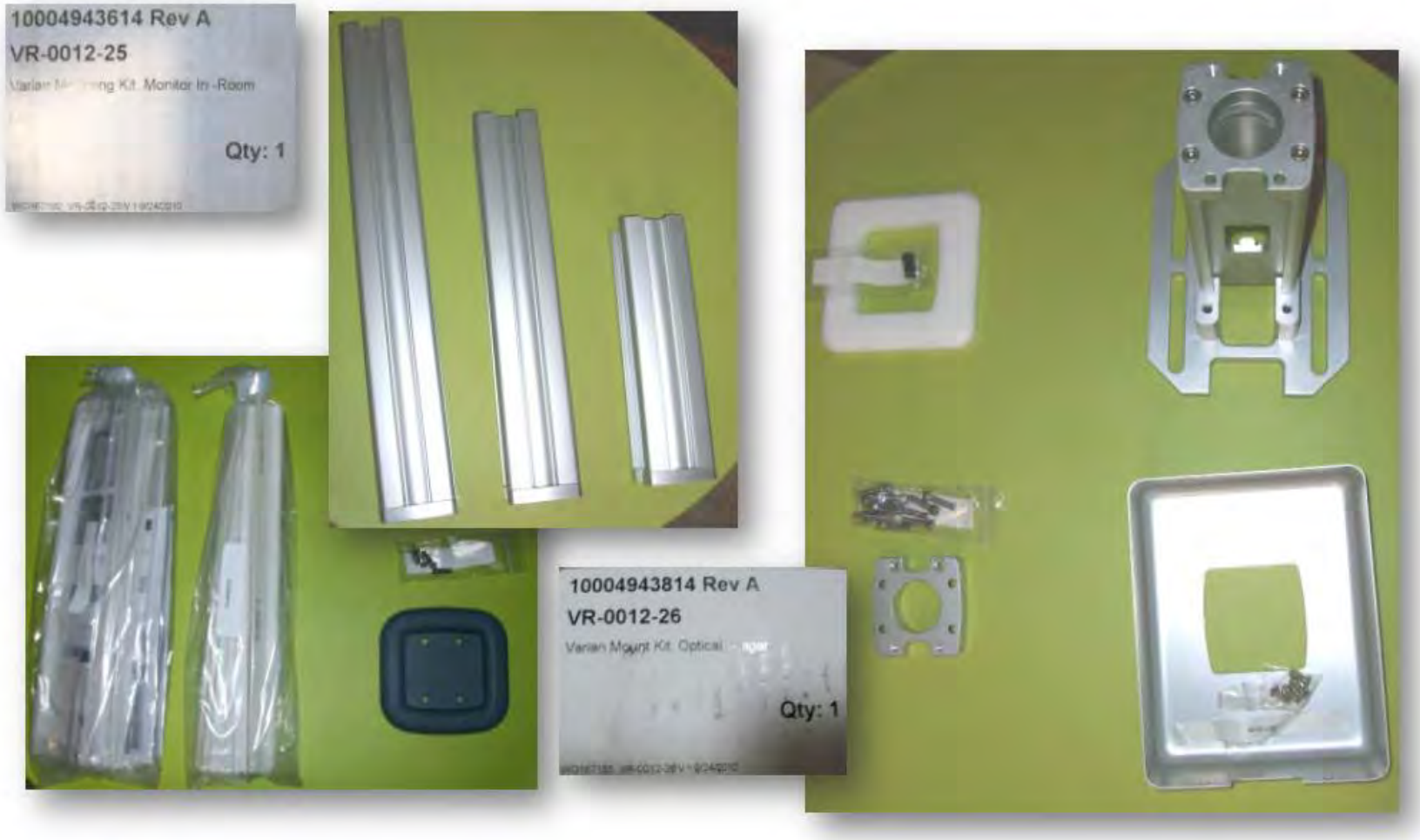




2.2 PTZ CCTV Mounts (Ceiling)

varian

2.3 In-Room Monitor & Optical Imager Ceiling Mounted Posts (Qty 1 each)



2.4 In-Room Monitor & Optical Imager Ceiling Mounted Posts: Partially Assembled Examples

2.4.1 Partially Assembled Example 1

Add extension to 10" primary	Actual Total (with connectors, without plastic piece)
12"	22.75"
18"	28.75"
24"	34.75"
12" + 18"	42"
12" + 24"	48"
18" + 24"	54"

*Floor to bottom of post: min 84" (max 88" for optical imager)

IMPORTANT: 2.5.1 and 2.5.2 only mount to the sides of the post with cable grommets, this side faces the TrueBeam.

2.4.2 Partially Assembled Example 2: Cover for flush mounting

2.4.3 Partially Assembled Example 3: Trim ring for ceiling

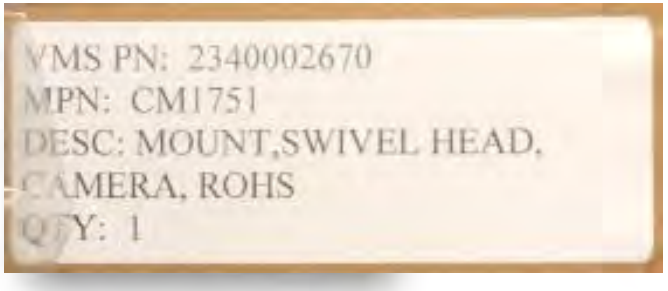
2.5 Brackets for Assembly to Posts (see 2.4.1)

2.5.1 In-Room Monitors

2.5.2 Optical Imager

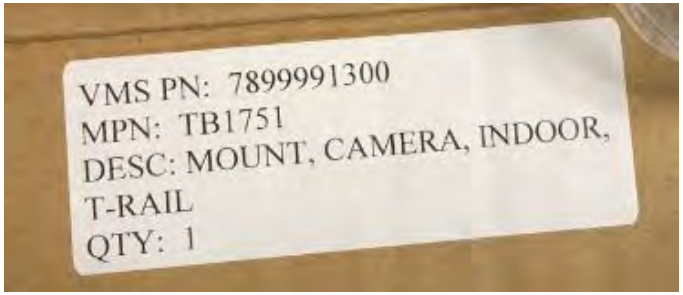
2.6 Live View Camera Mounts

2.6.1 Flush Mounting (Wall Mounting Recommended)



Wall Mounting: The bracket should be mounted so that the swiveling end can be turned 90 degrees from the bracket, pointing to the ceiling (as shown here).

2.6.2 False Ceiling Mounting

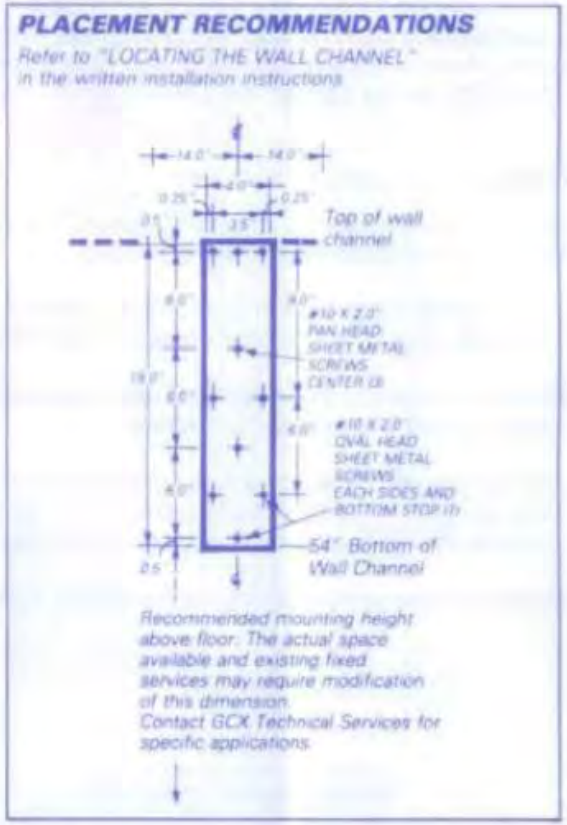


2.7 Speakers (Qty 2) & Speaker Mounts

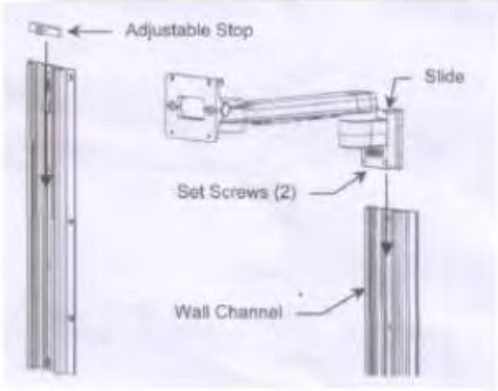
VARIAN P/N	MANUF P/N	DESCRIPTION	QTY	UOM
10004732802	10004732802	SPEAKER, IN-ROOM AUDIO	2	EA

2.8 Relay Junction Box (Qty 1) & Resistors (Qty 4)

2.9 Optional Wall Mounts for In-Room Monitors* (Qty 2)



*This item is not included with the standard kit.



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TrueBeam Kickoff Meeting

VASSAR BROTHERS HOSPITAL

45 READE PL POUGHKEEPSIE, NY 12601

Brian Schonfeld
Project Manager

Agenda

1. Varian Roles and Responsibilities
2. Order Review / System Deliverables
3. Network Requirements
4. Site Specific Components
5. Site Readiness / Installation
6. Scheduling / Timeline
7. Contacts
8. Open Discussion
9. Site Walk-Through

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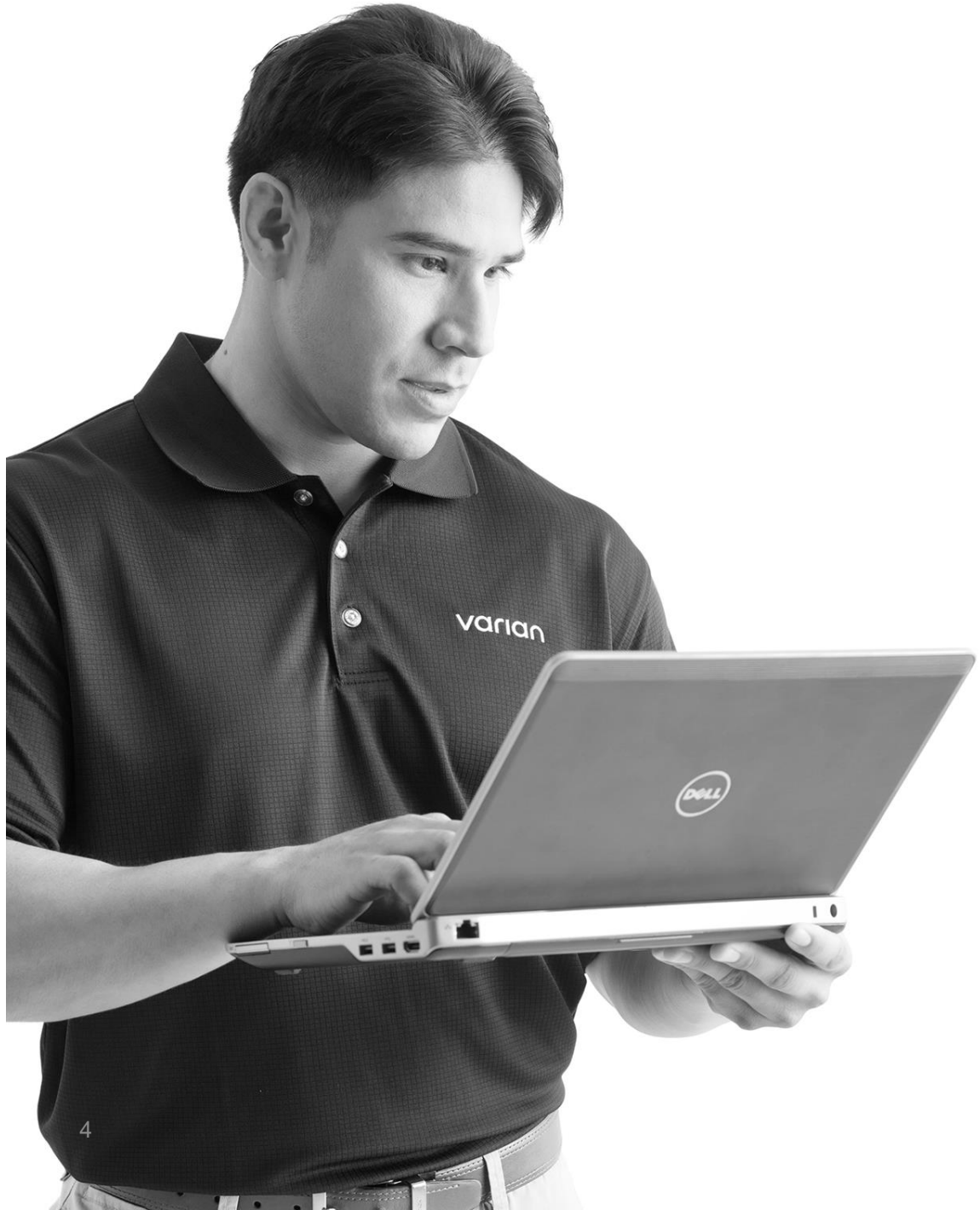
Varian Roles and Responsibilities

Project Management

- Management
  - Manage Planning, Support Construction, TrueBeam Delivery, TrueBeam Installation, TrueBeam Training
- Confirmation
  - Site Readiness per the Varian Pre-Installation Checklist no later than 10 days prior to TrueBeam delivery.
- Acceptance
  - Customer acceptance of the project deliverables according to Varian provided customer acceptance procedures.

Planning

- Drawing Reviews – Site Design
  - TBD, Regional Planner



PM Site Visits

Kick-off Meeting

Mid-Construction Review

- Conduit review

Pre-Installation Walk-Through

- 10-14 days prior to machine delivery. Site must be 100% completed per Varian Pre-Installation Checklist to insure an on-time schedule.

Any items not completed at time of final inspection can result in delay of delivering the TrueBeam and/or extended installation

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TrueBeam Order Deliverables

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TrueBeam Hardware Deliverables

120 MLC / Version 2.7

Below system configuration from:

Below system configuration from:
Quote: 2020-256889
Sales Order: 321976476
Delivery Date: 05/03/2021

Energies

- 6/6 MV (BJR 11/17)
- 10/10 MV (BJR 11/17)
- 15/16 MV (BJR 11/17)
- 6X High Intensity Mode
- 6 MeV (0-1000 MU/min)
- 9 MeV (0-1000 MU/min)
- 12 MeV (0-1000 MU/min)
- 16 MeV (0-1000 MU/min)
- 20 MeV (0-1000 MU/min)
- 6 MeV HDTSE, 0-2500 MU/min
- 9 MeV HDTSE, 0-2500 MU/min

Deliverables

- KV Imaging
- Triggered Imaging
- 4D CBCT Imaging Package
- Perfect Pitch 6-DoF Couch
- Qfix Stnd kVue Couch Top TrueBeam
- SRS Encompass IMB Qfix™ Couchtop
- Motion Management Interface
- Advanced Respiratory Motion Management System

Additional Deliverables

- Additional CCTV Camera Syst.
- Additional In-Room Monitors
- Main Circuit Breaker Panel
- Power Conditioner – 3ph/50KVA
- Filtrine Chiller
- LAP Apollo Blue Laser Kit
- RPC Lung Phantom Voucher Option
- Enhanced Beam Conformance
- Paid Commissioning

TrueBeam Training Deliverables

Clinical Training

Below training configuration from:
Below system configuration from:
Quote: 2020-256889
Sales Order: 321976476
Delivery Date: 05/03/2021

Applications Coordinator

- TB Platform On-site (Go Live)

TBD

- TB201 TB Platform Physicists (qty 1)
- TB101 TB Platform Operations (qty 1)
- CL222 Respiratory Gating (qty 1)

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TrueBeam Network

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Networking Requirements

Project Critical

MICAP

FRM-OS-MICAP required 2 weeks prior to Final Inspection

Database Information

Hostname for the TrueBeam (i.e. TrueBeamFW1111)

Static IP Address for the System

Netmask and Default Gateway

Fully Qualified Domain Suffix

DNS Server IP Addresses

IT Requirements

Inspected at Final Inspection

Control Console: 6 Network Drops (recommended) above counter

Operational Network & Phone

IT Rep. available at final inspection and during Varian installation

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TrueBeam Site Specific Components

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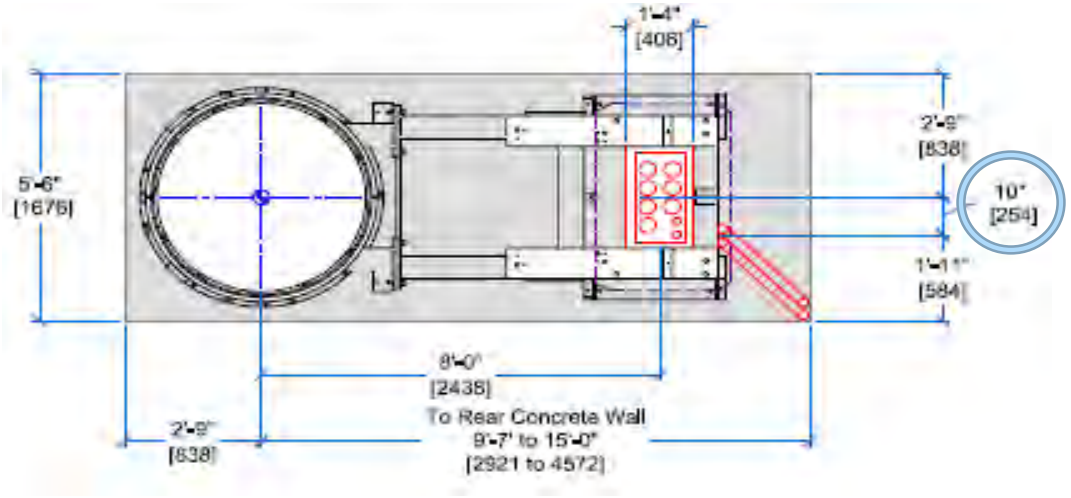


Conduits

Refer to Varian DDR – All conduits to be reviewed and confirmed on the drawings.

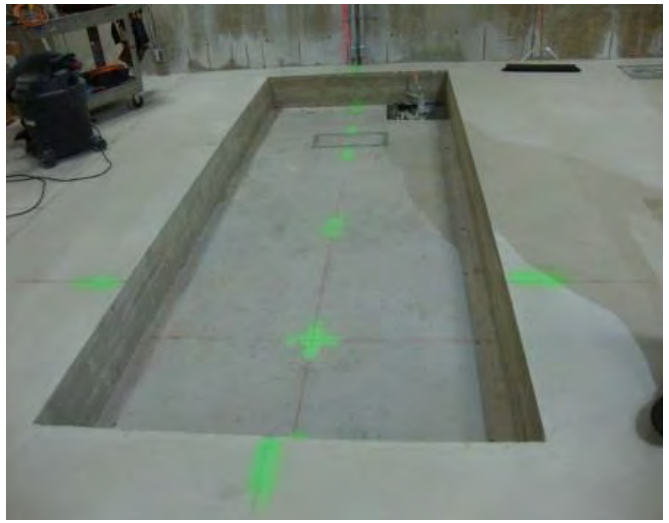
- Maximum 75’ end-to-end
  - All lengths verified during Mid-Construction Inspection. Any incorrect lengths will greatly affect installation completion.
- Maximum 270-degree bends w/o J-Box
- All conduits to be dry, clean and have pull strings (True Tapes)
  - E.C. to complete cable form prior to PM inspection.
- Contractor supply & install power cables
  - Minimum 8’ of slack in the Modulator floor box
- Cables delivered via FedEx ahead of Final Inspection

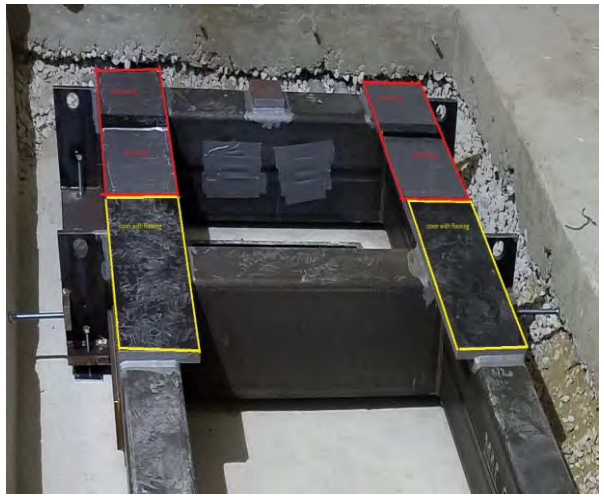
Base Frame

Best time to deliver the baseframe

- All conduits (in-slab & overhead) are installed
- Base Frame pit is formed to the correct size
- Base Frame pit is clean with no debris
- Rig path is cleared
- Isocenter is established & marked by site physicist

The Baseframe is the main structural element of the treatment machine. Any modification or alteration to an installed frame is strictly forbidden and will result in the frame having to be replaced with all the associated cost being reclaimed."





Grout in-place as soon as possible to ensure Base Frame levelness
Refer to Varian DDR for additional Base Frame information

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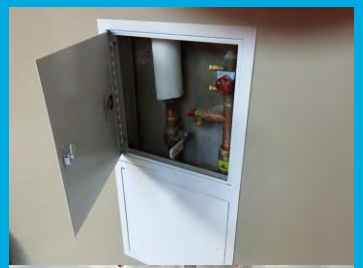
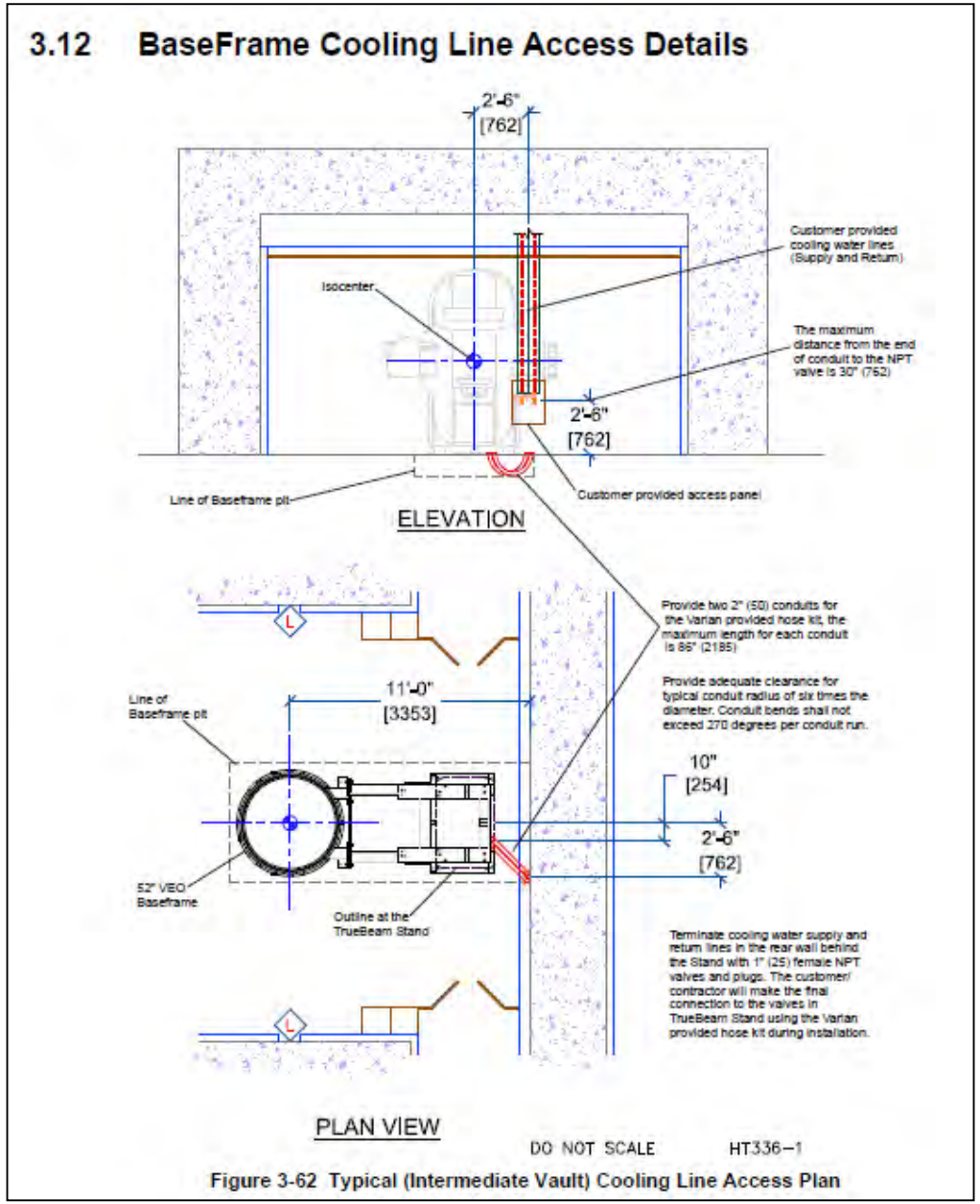
Chilled Water Lines

- **Chilled Water Lines run through 2” conduits from the rear wall of the vault to the back of the baseframe.**
  - Terminate water lines in wall with 1” female NPT valves & plugs.
  - Conduits cut down to finished floor level after the grout has cured.





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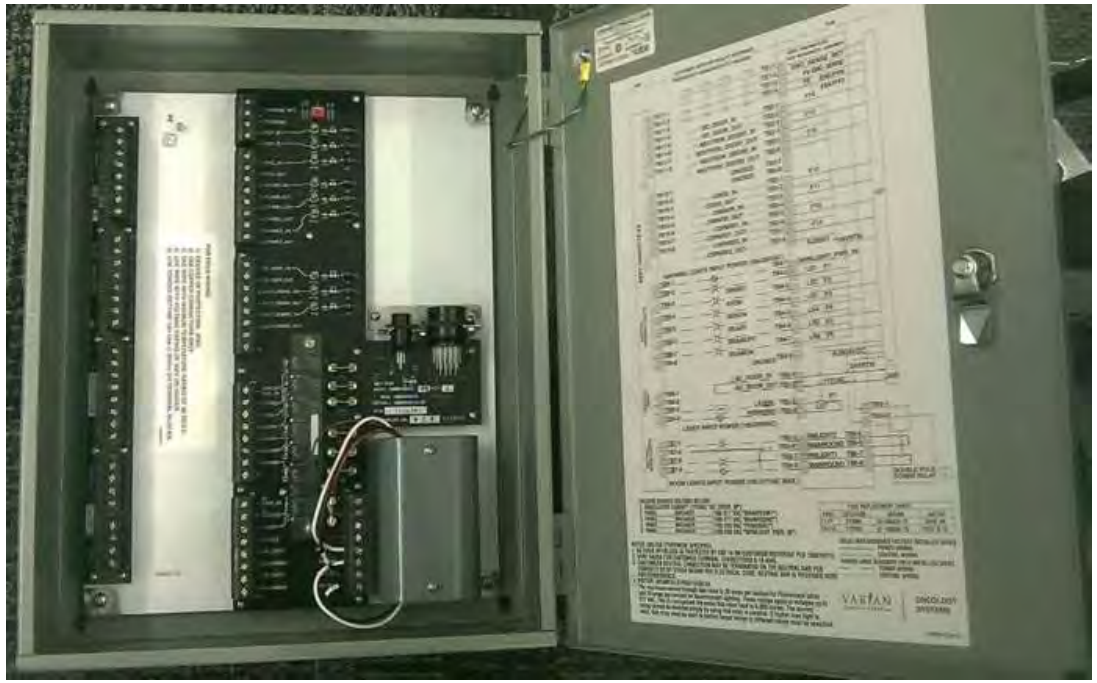
Relay Junction Box

RJB



- Back of vault location.
  - Backwall opposite of the maze entry. Out of beam path.
- Mount upright for easy access for installation and servicing
- Mount at eye-level. Not above ceiling.
- Passive so pre-wiring is possible without the LINAC connected.

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Main Circuit Breaker

MCB

- Varian provided – Contractor installed
- Must be within 10’ of Console equipment
- 480V / 150Amp / 3 Phase output
- Feeds from PCU
- Leave 8’ of slack in the Modulator floor box
- IEC60309 receptacle

Neutral inside MCB. From MCB to Modulator floor box is 3 Phase + 1 Ground

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Power Conditioner Unit
PCU

- Varian provided – Contractor installed
- 3 Phase / 50 KVA
- Input power to be determined by electrical contractor
- 480V out to the LINAC

Transector
10701 Airport Drive – Hayden, ID 83835
Rick Ribbeck – Sales Manager
rick.ribbeck@smithmicrowave.com
T: 208.762.6112
C: 208.755.2072

Chiller

- Varian provided – Contractor installed
  - Order request form
  - Quick Connect Panel (QCP) is indoor installation only
  - 10-12 weeks lead time
- Installation and Service Support
  - Pass-thru item, Varian does not service
  - Mark Bond: 800.930.3367 x 513
  - Manufacturer's warranty

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Pre Installation Kit

- **Varian furnishes and Contractor Installs**
  - **2 weeks Lead Time**

- **Cabinet Positioning Brackets & Pins**
- **Laser Mounting plates**
- **PTZ CCTV**
- **Speakers**
- **In-room Monitor Ceiling Mounted Post**
- **Optical Imager Ceiling Mounted Post**
- **Live View Camera (Wall or Ceiling) Mounts**
- **Relay Junction Box**

Lasers, Door Interlocks, E-Stops

Lasers

- Mounting plates provided by Varian. Installed by contractor
- 120V receptacle inside the recessed opening at each laser

Door Interlocks

- Two switches -120 VAC & 12 VDC

E-Stops

- Two poles with manual push/pull reset (not momentary)
  - Allen-Bradley 800T-FX6AV
- Install Varian-provided resistors
  - Normally open contacts
  - Install in series, allows for 4 EMOs

  EM01 R1 – 42.2Ω EM02 R2 – 84.5Ω
  EM03 R3 – 169Ω EM04 R4 – 340Ω

- Do not place in primary beam path

Lights, CCTV / Intercom

Room Lights

- Main room lights wired to the Relay Junction Box
- Set-up lighting wired to the dimmer wall switch

Warning Lights

- Wire to the Relay Junction Box

CCTV / Intercom

- Provide 120V power / receptacles at each location
- Located 1’ 10” from isocenter & 5’ 9” from finished floor
- All additional CCTVs mounted at customer identified location with same facilities requirements.

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Optical Imager

- Varian provided ceiling mounted bracket & poles – contractor installed
  - Cut out facing isocenter
- Located 6’ 7” from isocenter and 7’ bottom of post to finish floor
- Maximum mounting surface from finish floor is 12’
  - If higher, uni-strut will be required to bring the mounting surface to 12’. Threaded rod will not be approved

Pre-Installation Kit comes with
12”, 18” & 24” post lengths

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In-Room Monitors

IRM

- Electrical power receptacle required at each location
- Maximum mounting surface from finish floor is 12’.
  - If higher, uni-strut will be required to bring the mounting surface to 12’.Threaded rod will not be approved
- Refer to DDR for location
  - 4’ 6” (left or right of isocenter)
  - 7’-10” from isocenter
  - 7’-0” from finish floor to bottom of post
- Additional IRM mounted at customer-identified location with same facility requirements

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Live View Microphones

- Varian provided wall mount bracket – contractor installed
  - Ceiling mounted by contractor
- Located 2’ 6” from isocenter and 7’ 2” from finish floor
- Secondary microphones typically mounted from IRM post and/or furthest away from other microphone

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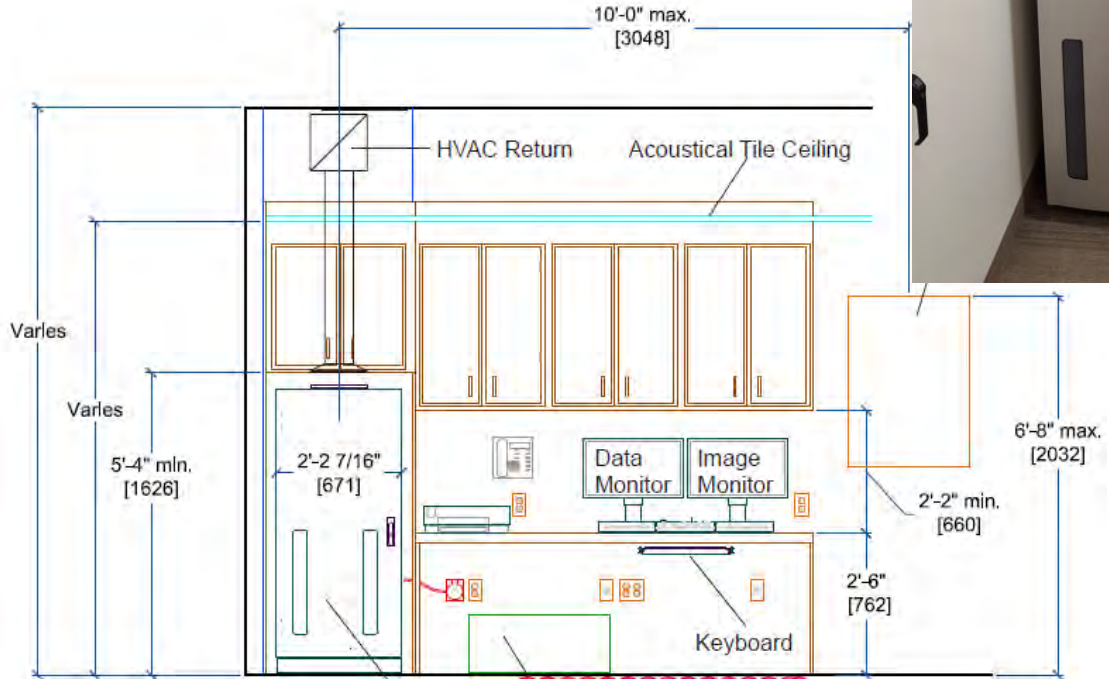
Control Room

Key Coordination Items

- Internet access for Installers required. Wifi preferred
- Dedicated circuit 120V / 20 Amps
  - (6) 4-plex power receptacles below counter - (4) duplex power receptacles & (4-5) network drops above counter
- Monitors within linear 10’ of Control Cabinet
- 3” grommet holes at counter
- 1”x2” ledge under counter at wall/other method for cable management
- IEC60309 receptacle provided by Varian, installed by E.C.
  - Within 2’ of cabinet, not directly behind. 18”-24” AFF



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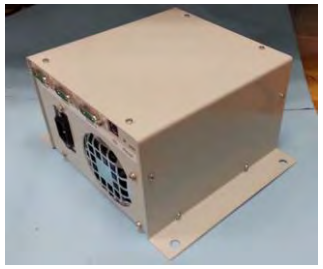
OSMS System

Planning

- Please refer to DDR
- Varian furnishes Pre-Installation Kit (Ceiling plates for cameras and power module), Power Modules, and Cables.
- Contractor installs pre-install kit.
- Power Module is ceiling mounted, 120v switched receptacle needed



Conduits

- Uses 3” conduit from control room to vault
- Uses 2” conduits inside vault

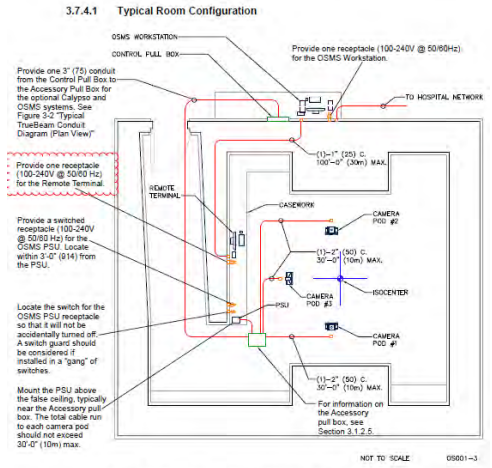
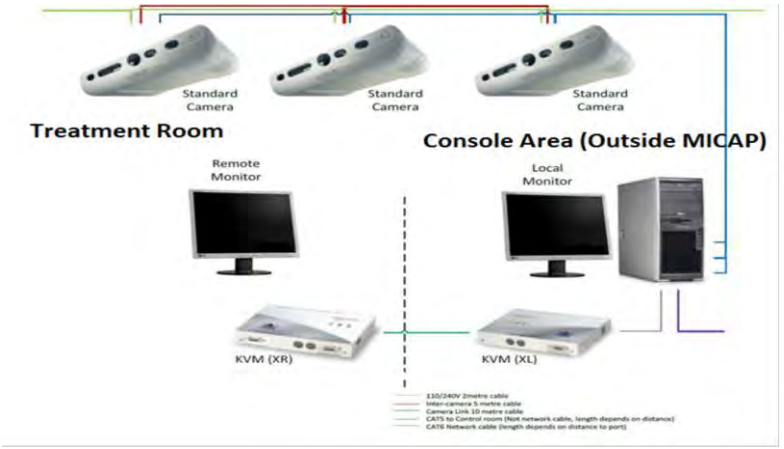


Figure 3-45 OSMS System Conduit Diagram – Typical Plan View

IT

- Requires Static IP address



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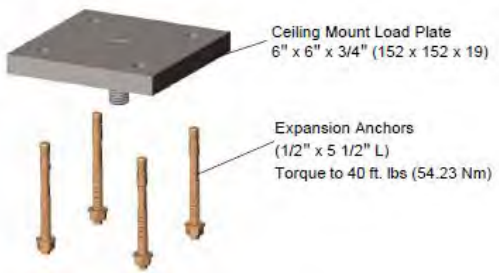
Calypso System

Planning

- Please refer to DDR Section 3.6
- Varian furnishes Pre-Installation Kit (Ceiling plates) and Cables. Contractor installs



Conduits

- Uses 3” conduit from control room to vault
- Uses 2” conduits inside vault

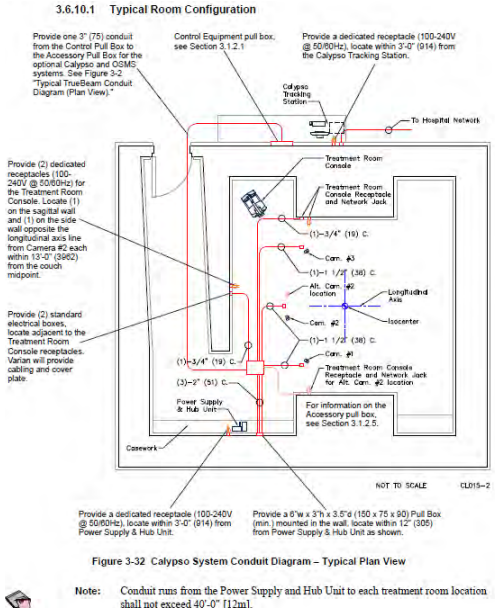


Figure 3-32 Calypso System Conduit Diagram – Typical Plan View

Note: Conduit runs from the Power Supply and Hub Unit to each treatment room location shall not exceed 40'-0" [12m].

IT

- Requires Static IP address

Site Readiness for TrueBeam Installation

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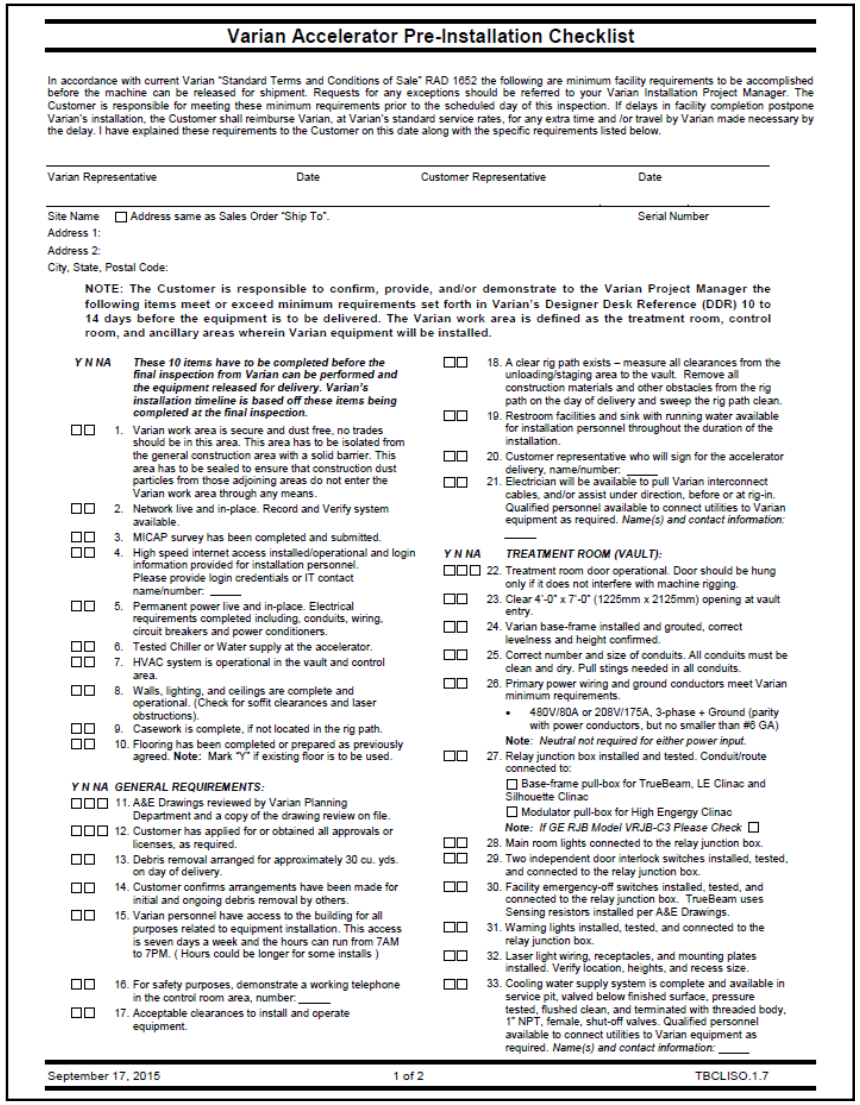
Pre-Installation Checklist

The Pre-Installation checklist will be completed at time of inspection. Any incomplete items could delay system delivery / installation.
Top 10 checklist items are critical



Varian Accelerator Pre-Installation Checklist

In accordance with current Varian "Standard Terms and Conditions of Sale" RAD 1652 the following are minimum facility requirements to be accomplished before the machine can be released for shipment. Requests for any exceptions should be referred to your Varian Installation Project Manager. The Customer is responsible for meeting these minimum requirements prior to the scheduled day of this inspection. If delays in facility completion postpone Varian's installation, the Customer shall reimburse Varian, at Varian's standard service rates, for any extra time and /or travel by Varian made necessary by the delay. I have explained these requirements to the Customer on this date along with the specific requirements listed below.

Varian Representative _____ Date _____ Customer Representative _____ Date _____

Site Name ☐ Address same as Sales Order "Ship To". Serial Number

Address 1:

Address 2:

City, State, Postal Code:

NOTE: The Customer is responsible to confirm, provide, and/or demonstrate to the Varian Project Manager the following items meet or exceed minimum requirements set forth in Varian's Designer Desk Reference (DDR) 10 to 14 days before the equipment is to be delivered. The Varian work area is defined as the treatment room, control room, and ancillary areas wherein Varian equipment will be installed.

Y N NA ***These 10 items have to be completed before the final inspection from Varian can be performed and the equipment released for delivery. Varian's installation timeline is based off these items being completed at the final inspection.***

☐☐ 1. Varian work area is secure and dust free, no trades should be in this area. This area has to be isolated from the general construction area with a solid barrier. This area has to be sealed to ensure that construction dust particles from those adjoining areas do not enter the Varian work area through any means.

☐☐ 2. Network live and in-place. Record and Verify system available.

☐☐ 3. MICAP survey has been completed and submitted.

☐☐ 4. High speed internet access installed/operational and login information provided for installation personnel. Please provide login credentials or IT contact name/number: ____

☐☐ 5. Permanent power live and in-place. Electrical requirements completed including, conduits, wiring, circuit breakers and power conditioners.

☐☐ 6. Tested Chiller or Water supply at the accelerator.

☐☐ 7. HVAC system is operational in the vault and control area.

☐☐ 8. Walls, lighting, and ceilings are complete and operational. (Check for soffit clearances and laser obstructions).

☐☐ 9. Casework is complete, if not located in the rig path.

☐☐ 10. Flooring has been completed or prepared as previously agreed. **Note:** Mark "Y" if existing floor is to be used.

Y N NA ***GENERAL REQUIREMENTS:***

☐☐☐ 11. A&E Drawings reviewed by Varian Planning Department and a copy of the drawing review on file.

☐☐☐ 12. Customer has applied for or obtained all approvals or licenses, as required.

☐☐ 13. Debris removal arranged for approximately 30 cu. yds. on day of delivery.

☐☐ 14. Customer confirms arrangements have been made for initial and ongoing debris removal by others.

☐☐ 15. Varian personnel have access to the building for all purposes related to equipment installation. This access is seven days a week and the hours can run from 7AM to 7PM. (Hours could be longer for some installs)

☐☐ 16. For safety purposes, demonstrate a working telephone in the control room area, number: ____

☐☐ 17. Acceptable clearances to install and operate equipment.

☐☐ 18. A clear rig path exists – measure all clearances from the unloading/staging area to the vault. Remove all construction materials and other obstacles from the rig path on the day of delivery and sweep the rig path clean.

☐☐ 19. Restroom facilities and sink with running water available for installation personnel throughout the duration of the installation.

☐☐ 20. Customer representative who will sign for the accelerator delivery, name/number: ____

☐☐ 21. Electrician will be available to pull Varian interconnect cables, and/or assist under direction, before or at rig-in. Qualified personnel available to connect utilities to Varian equipment as required. *Name(s) and contact information:* ____

Y N NA ***TREATMENT ROOM (VAULT):***

☐☐☐ 22. Treatment room door operational. Door should be hung only if it does not interfere with machine rigging.

☐☐ 23. Clear 4'-0" x 7'-0" (1225mm x 2125mm) opening at vault entry.

☐☐ 24. Varian base-frame installed and grouted, correct levelness and height confirmed.

☐☐ 25. Correct number and size of conduits. All conduits must be clean and dry. Pull stings needed in all conduits.

☐☐ 26. Primary power wiring and ground conductors meet Varian minimum requirements.

- 480V/80A or 208V/175A, 3-phase + Ground (parity with power conductors, but no smaller than #6 GA)

Note: *Neutral not required for either power input.*

☐☐ 27. Relay junction box installed and tested. Conduit/route connected to:

☐ Base-frame pull-box for TrueBeam, LE Clinac and Silhouette Clinac

☐ Modulator pull-box for High Engergy Clinac

Note: *If GE RJB Model VRJB-C3 Please Check* ☐

☐☐ 28. Main room lights connected to the relay junction box.

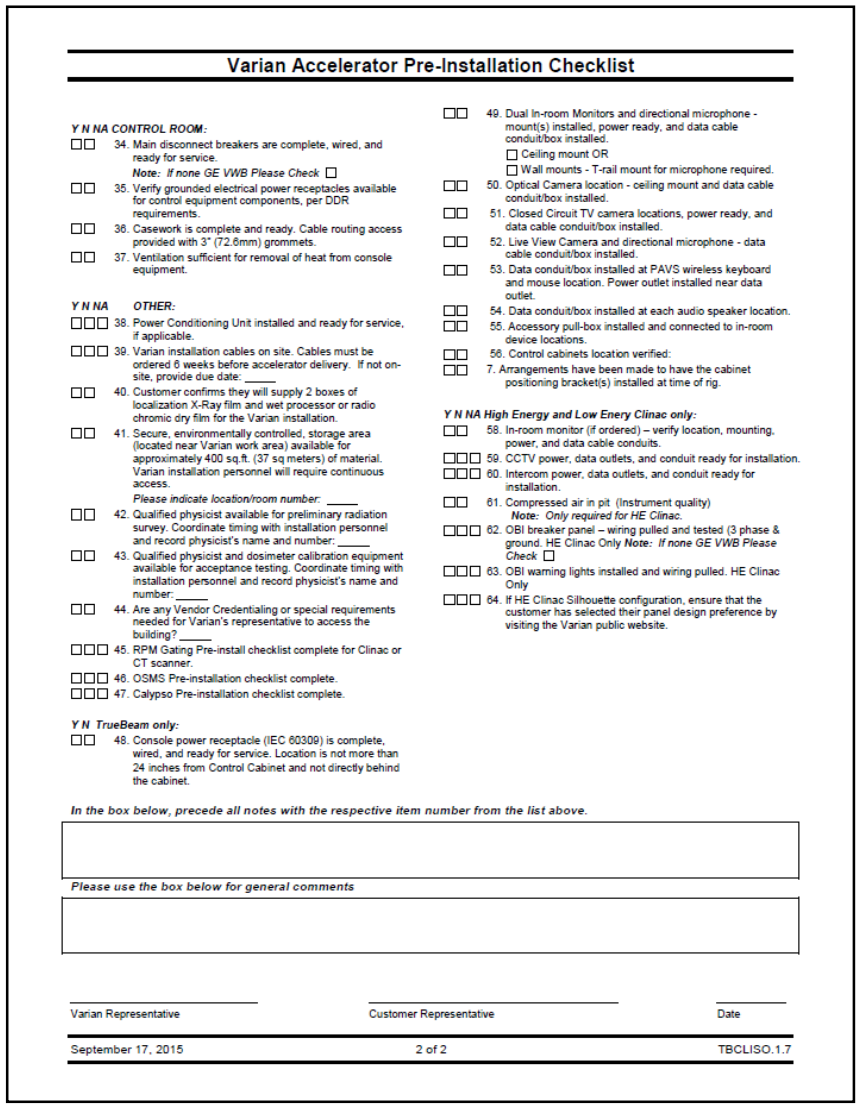
☐☐ 29. Two independent door interlock switches installed, tested, and connected to the relay junction box.

☐☐ 30. Facility emergency-off switches installed, tested, and connected to the relay junction box. TrueBeam uses Sensing resistors installed per A&E Drawings.

☐☐ 31. Warning lights installed, tested, and connected to the relay junction box.

☐☐ 32. Laser light wiring, receptacles, and mounting plates installed. Verify location, heights, and recess size.

☐☐ 33. Cooling water supply system is complete and available in service pit, valved below finished surface, pressure tested, flushed clean, and terminated with threaded body, 1" NPT, female, shut-off valves. Qualified personnel available to connect utilities to Varian equipment as required. *Name(s) and contact information:* ____



Varian Accelerator Pre-Installation Checklist

Y N NA ***CONTROL ROOM:***

☐☐ 34. Main disconnect breakers are complete, wired, and ready for service.
Note: *If none GE VWB Please Check* ☐

☐☐ 35. Verify grounded electrical power receptacles available for control equipment components, per DDR requirements.

☐☐ 36. Casework is complete and ready. Cable routing access provided with 3" (72.6mm) grommets.

☐☐ 37. Ventilation sufficient for removal of heat from console equipment.

Y N NA ***OTHER:***

☐☐☐ 38. Power Conditioning Unit installed and ready for service, if applicable.

☐☐☐ 39. Varian installation cables on site. Cables must be ordered 6 weeks before accelerator delivery. If not on-site, provide due date: ____

☐☐ 40. Customer confirms they will supply 2 boxes of localization X-Ray film and wet processor or radio chromic dry film for the Varian installation.

☐☐ 41. Secure, environmentally controlled, storage area (located near Varian work area) available for approximately 400 sq.ft. (37 sq meters) of material. Varian installation personnel will require continuous access.
Please indicate location/room number: ____

☐☐ 42. Qualified physicist available for preliminary radiation survey. Coordinate timing with installation personnel and record physicist's name and number: ____

☐☐ 43. Qualified physicist and dosimeter calibration equipment available for acceptance testing. Coordinate timing with installation personnel and record physicist's name and number: ____

☐☐ 44. Are any Vendor Credentialing or special requirements needed for Varian's representative to access the building? ____

☐☐☐ 45. RPM Gating Pre-install checklist complete for Clinac or CT scanner.

☐☐☐ 46. OSMS Pre-installation checklist complete.

☐☐☐ 47. Calypso Pre-installation checklist complete.

Y N ***TrueBeam only:***

☐☐ 48. Console power receptacle (IEC 60309) is complete, wired, and ready for service. Location is not more than 24 inches from Control Cabinet and not directly behind the cabinet.

☐☐ 49. Dual In-room Monitors and directional microphone - mount(s) installed, power ready, and data cable conduit/box installed.
☐ Ceiling mount OR
☐ Wall mounts - T-rail mount for microphone required.

☐☐ 50. Optical Camera location - ceiling mount and data cable conduit/box installed.

☐☐ 51. Closed Circuit TV camera locations, power ready, and data cable conduit/box installed.

☐☐ 52. Live View Camera and directional microphone - data cable conduit/box installed.

☐☐ 53. Data conduit/box installed at PAVS wireless keyboard and mouse location. Power outlet installed near data outlet.

☐☐ 54. Data conduit/box installed at each audio speaker location.

☐☐ 55. Accessory pull-box installed and connected to in-room device locations.

☐☐ 56. Control cabinets location verified:

☐☐ 7. Arrangements have been made to have the cabinet positioning bracket(s) installed at time of rig.

Y N NA ***High Energy and Low Enery Clinac only:***

☐☐ 58. In-room monitor (if ordered) – verify location, mounting, power, and data cable conduits.

☐☐☐ 59. CCTV power, data outlets, and conduit ready for installation.

☐☐☐ 60. Intercom power, data outlets, and conduit ready for installation.

☐☐ 61. Compressed air in pit (Instrument quality)
Note: *Only required for HE Clinac.*

☐☐☐ 62. OBI breaker panel – wiring pulled and tested (3 phase & ground. HE Clinac Only ***Note:*** *If none GE VWB Please Check* ☐

☐☐☐ 63. OBI warning lights installed and wiring pulled. HE Clinac Only

☐☐☐ 64. If HE Clinac Silhouette configuration, ensure that the customer has selected their panel design preference by visiting the Varian public website.

In the box below, precede all notes with the respective item number from the list above.

Please use the box below for general comments

Varian Representative _____ Customer Representative _____ Date _____

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Room Readiness / Final Inspection

Treatment Room

- 100% completed at final inspection
- Clean and free of dust
- Clinical clean prior to delivery

Control Room

- 100% completed at final inspection
- Console layout confirmed at final inspection
- Network drops installed & active
- Phone available & active
- Clinical Clean prior to delivery

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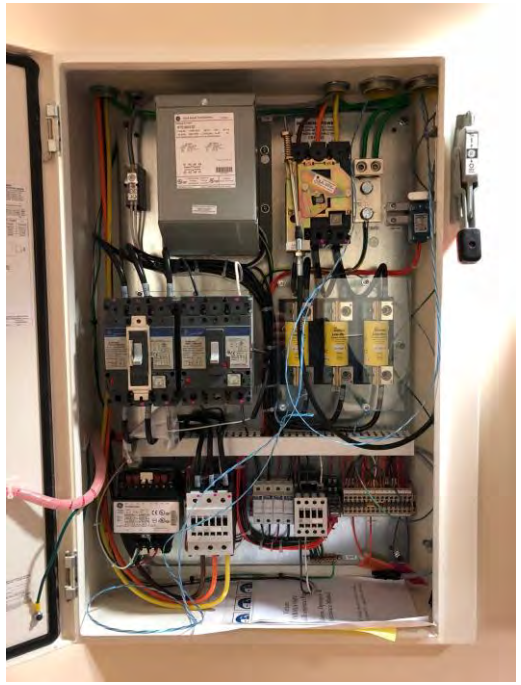
Room Readiness / Final Inspection



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Rooms Readiness

From your terms and conditions…

HARDWARE SECTION

2. Bill and Hold

This Section shall apply only to linear accelerators, simulators, and HDR BrachyTherapy afterloaders. If shipment is delayed due to unavailability of Customer facilities or any other cause, Customer may request and authorize Varian to hold the Product(s) in storage upon completion of manufacturing. Varian shall invoice Customer for, and Customer shall pay, eighty percent (80%) of the purchase price for such Product(s), which shall include any down payments or deposits. Varian will select a suitable storage facility and pay for the costs of storage and insurance for up to ninety (90) days. Title to the Product(s) shall pass when the Product(s) are placed into storage. The Product(s) shall be insured in Customer's name. If Customer has not requested shipment of the Product(s) within such ninety (90)-day period, then Varian shall ship the Product(s) to the site designated in the applicable Quotation(s). When storage is required, the provisions of this Section shall prevail over any inconsistent provisions of this Agreement.

Other options:

Rig and Wrap:

1. Extended rig and wrap: The vault and control room are prepared enough that the Linac can be fully rigged into place and cables can be pulled. The rigger-installer handoff takes place remotely.
   a. ex. Power or water or internet not complete.
2. Rig and wrap: The vault is prepared enough that the Linac may be rigged into place and the vault can be used to store the Linac and accessories until the site is completely ready and riggers return to complete the rig (at customer expense). The rigger-installer handoff takes place on site.
   a. ex. Construction work needs to be completed or wiring needs to be done.

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Installation

Key Coordination Items

- Customer's signature accepting the system shipment the day of delivery
- General Contractor to be available throughout the installation
- Local codes supersede the DDR
- 300 s.f. storage space required
- 30 yd dumpster empty day of delivery
- Working bathroom & sink available
- Chairs available at the Control Room
- Customer responsible for any rigging specialty conditions (shoring, crane, elevator)

4'x7' clear rig path openings required

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Scheduling Timelines

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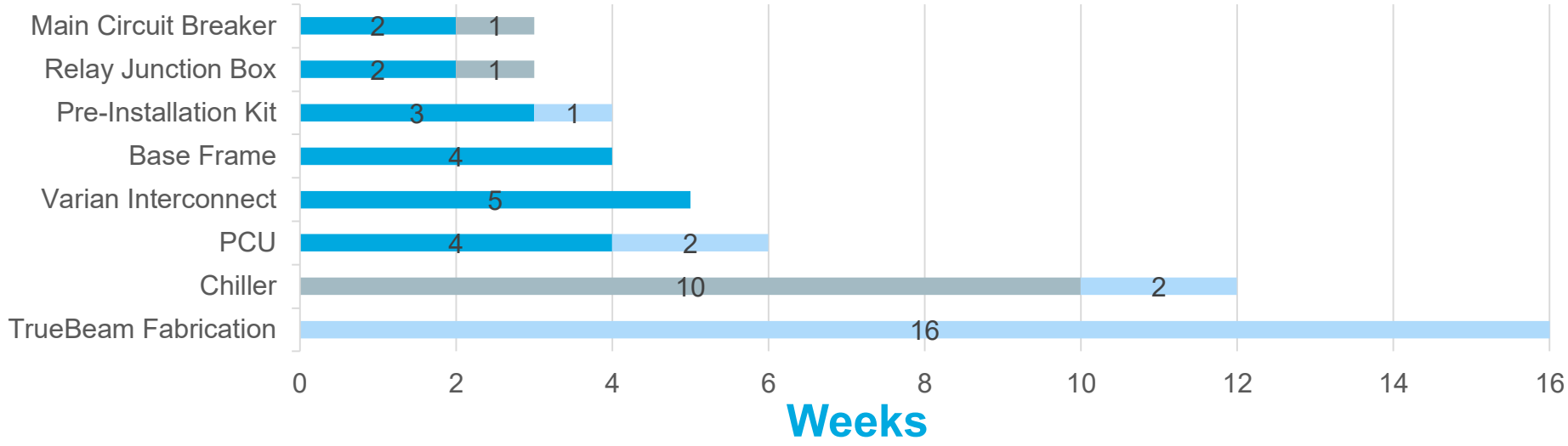
Critical Hardware Lead Times



GC to schedule the start-up and Go-live dates with the chiller manufacturer.

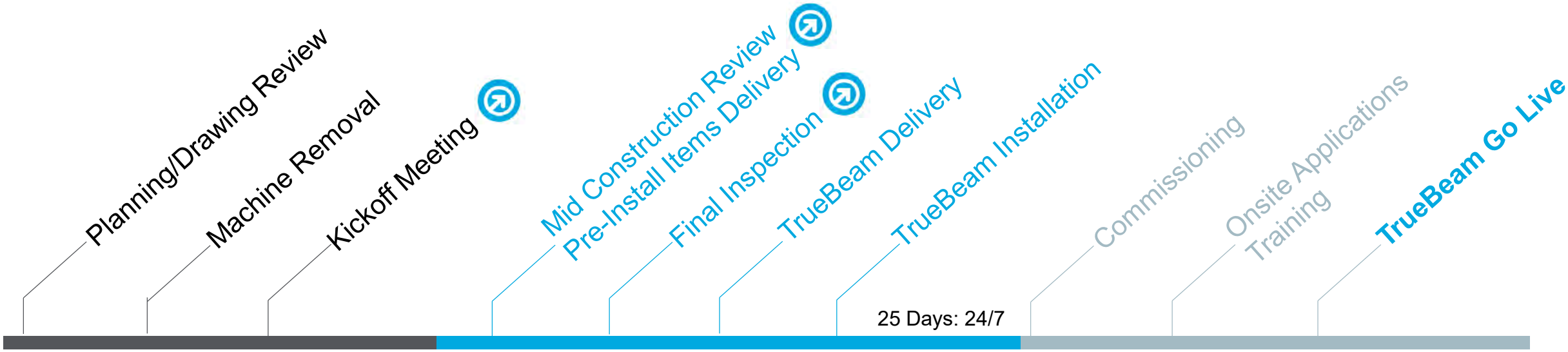
Electrician / Mechanical contractors are required to complete the start-up form.

Contractors responsible for installing Pre-Installation Kit components.

Pre-Installation Kit

- Relay Junction Box and Resistors
- CCTV Mounts (qty 4)
- Laser Plates
- Speakers
- Live View Camera Mount & Extension
- Optical Imager & In-Room Monitor Posts
- Control Console Seismic Floor Plate

Typical Implementation Timeline



Phase 1

Pre-Construction

- 30 day lead time notice for system removal

Phase 2

Construction & TrueBeam Installation

- Baseframe delivery/cable measurements
- Rigging duration: 4 days (2 days mechanical)
- Plumbing & Electrical connections: Tuesday after rig-in. Chiller startup.
- Radiation Survey: within 7 days after rig-in (typically the first Friday if rig-in on a Saturday) Neutron Scanning Gear required

Phase 3

Road to Patient Care

- Acceptance on day 25 after rig-in
- Acceptance on day 29 with OSMS
- Customer satisfaction surveys sent to physicist that signs acceptance and any others requested.

= PM Site Visit / Inspection

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Your Varian Team

Varian Project Team

Name	Title	Email	Phone
Don Lipton	District Sales Manager	Donald.Lipton@varian.com	201-470-8769
Tim MacFarlane	District Service Manager	Timothy.Macfarlane@varian.com	973-752-6740
Roger Marcotte	Installation Manager	Roger.Marcotte@varian.com	774-256-1310
Sabrina Ashford	Clinical Applications Coordinator	Sabrina.Ashford@varian.com	902-241-2287
Mitch Spiegel	Regional Planner	Mitch.Spiegel@varian.com	914-673-0642
David Mari	Manager, NE Region Project Management	David.Mari@varian.com	413-203-5950
Brian Schonfeld	Hardware Project Manager	Brian.Schonfeld@varian.com	757-647-4475

Communication is key to a successful project – Phone, Email, Conference Calls

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(Thank You)

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FILTRINE EQUIPMENT INSTALLER CHECKLIST

Your Filtrine chiller will be started up by a Factory Authorized Service Agent.
UNAUTHORIZED START UP MAY VOID THE WARRANTY!
Please complete this Installer Checklist and return it to Filtrine by fax (603-352-0330) or email (service@filtrine.com) at least 3 days prior to start up.
Thank you for your cooperation!

PROJECT NAME_____ PROJECT ADDRESS _____

CHILLER MODEL NO._____ SERIAL NO._____

PRE START-UP CHECKLIST FOR ALL MODELS

- ☐ 1] Clearances for chiller service, ventilation and access to control panel are adequate
- ☐ 2] Intake and exhaust ventilation is provided **so that ambient temperature does not exceed chiller rating** [see manual]
- ☐ 3] Electrical connections to the chiller are completed & power available is: Volts_____ Hertz _____ Phase _____
- ☐ 4] Inlet voltage is: L1-L2 _____ L1-L3 _____ L2-L3 _____
- ☐ 5] Branch circuit breaker and/or fuses rating: _____ amps
  NOTE: FLA may vary depending on options, See MCA and MOP ratings on as-built unit
- ☐ 6] Water piping to/from chiller [including QCP] is completed, including shut off valves and unions
  If not complete, a bypass arrangement has been provided.
- ☐ 7] Water piping is leak-tested @ _____ psi, **DO NOT EXCEED 80 psi** within the chiller and QCP piping
- ☐ 8] Chiller is filled with water [If propylene glycol is required by specification, see Item No.1 under weather-resistant chillers below]
- ☐ 9] Compressor lockout still in place [our assurance that no attempt has been made to start unit]
- ☐ 10] Refrigeration service valves were left closed and not tampered with
- ☐ 11] Refrigerant receiver valves were left closed [our assurance that full factory charge is intact]
- ☐ 12] Chilled water loop is properly insulated
- ☐ 13] Interlock wiring between the chiller and remote accessories such as QCP, HTX and/or remote start/stop box [where supplied] is in place

CHECKLIST FOR CHILLER WITH SPLIT SYSTEMS MODELS ARC or AR [In addition to above]

- ☐ 1] Installed refrigerant lines and service valves at indoor and outdoor section, evacuated lines holding vacuum down to 500 microns or lower.
  ARC MODEL LINE SIZES: Suction _____ inches and Liquid _____ inches – Length _____ ft.
  AR MODEL LINE SIZES: Discharge _____ inches and Return _____ inches – Length _____ ft.
- ☐ 2] Refrigerant receiver valves were left closed [our assurance that full factory charge is intact]
- ☐ 3] Installer has provided extra amount [_____ lbs] of refrigerant type [_____] for the Start-up Agent to cover capacity of the refrigerant lines between the split sections
- ☐ 4] Control wiring from indoor section to outdoor section pulled, connected and tested
- ☐ 5] Inlet voltage is: L1-L2 _____ L1-L3 _____ L2-L3 _____
- ☐ 6] Branch circuit breaker and/or fuses rating: _____ amps
  NOTE: FLA may vary depending on options. See MCA and MOP ratings on as-built unit

CHECKLIST FOR WEATHER-RESISTANT CHILLER

- ☐ 1] I have furnished and installed [_____] gallons of propylene glycol – if required by specification – to provide [____%] solution.
- ☐ 2] *For Glycol Free systems*, furnished electrical connections from 115V backup lighting system

AS INSTALLER, I UNDERSTAND THAT:

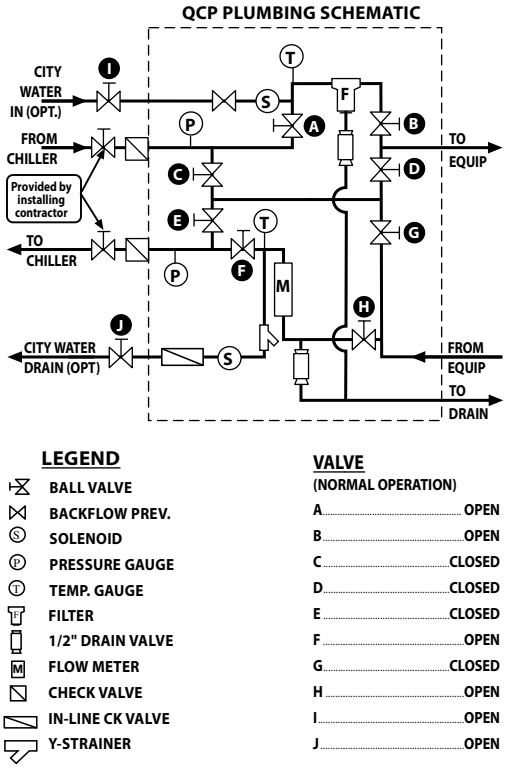
1] I should allow a minimum of [3] days after submitting checklist for start up to be scheduled.
2] When I have completed the items on the checklist, I will FAX a signed copy to Filtrine Service at 603-352-0330 or EMAIL same to service@filtrine.com.
3] Filtrine will notify us of the name of the Filtrine Authorized Start Up Agent. We may then contact them to arrange for start up during normal working hours.
4] I will be required to submit a purchase order to the Start Up Agent should they need to spend additional time at start up due to incomplete checklist items.
5] I am requesting that start up be scheduled on _____ 20____ at _____ ☐ AM ☐ PM

Installer Name _____ Title _____
Signature – Required _____ Date _____
Company _____ Tel _____ Cell _____
Fax _____ Email _____

QUICK CONNECT PANEL

USE WITH FILTRINE CHILLERS - INDOOR INSTALLATION ONLY

TYPICAL QCP



MODEL..... QCP-0.75

Especially for FILTRINE Medical Equipment Chillers

insures proper installation of these accessories

- **In-Line Filter**
- **Pressure Gauges**
- **Temperature Gauges**
- **Flow Meter**
- ***Indoor Installation Only***

A properly operating chiller is essential for the operation of your medical equipment such as MRI, CT or linear accelerators. This panel provides diagnostic information on the chiller so that you can see at glance if it is operating correctly and carry out maintenance, if required, to prevent down-time. Filtrine has selected and installed these gauges, etc., in consultation with medical equipment manufacturers so that you can be sure they are properly installed to give this vital information.

EASY HOOKUP CONNECTIONS and MONITORING

Install this compact panel between chiller and equipment for instantaneous availability of autoswitchover to city water [optional], pressure gauges, temperature gauges, flow meter and in-line filter. Panel is complete with all valves, solenoids, bypass and drains installed. Easy-to-open door on front of panel provides access to valves and filter for routine maintenance. Complete unit housed in white enameled aluminum cabinet with stainless steel top, bottom and frame.

TEMPERATURE GAUGES

For water entering and leaving equipment are dial-type, in Celsius and Fahrenheit, uses probe for maximum accuracy with no pressure drop.

PRESSURE GAUGES

Dial-type, in psi and bar and generate no pressure drop.

FLOW METER

Analog type with moving indicator in liters and gallons per minute, for minimum pressure drop.

FILTER

Bag-type, using 50 micron bag with less than 1 psi pressure drop when new. Filter located inside the panel; includes bypass piping to ensure easy filter element change.

OVERALL PRESSURE DROP

Through panel at 20 gpm flow is under 10 psi when filter is clean.

CONNECTIONS

CHILLER SIDE..... 3/4" FPT [19mm] copper pipe*
EQUIPMENT SIDE..... 3/4" FPT [19mm]
DRAIN..... 1/2" FPT [12.5mm]
* *Other sizes available*

UNIT WEIGHT .....110 lbs. [50 Kg]

OPTIONS AVAILABLE

AS **AUTOSWITCHOVER TO CITY WATER**: Cooling is already piped for easy access to backup cooling. Power supplied from chiller is 115/60/1. Switchover occurs on high temperature, low flow and power loss alarms.

HT **HIGH TEMPERATURE INTERLOCK**: Signals warning light when coolant temperature exceeds high limit.

LF **LOW FLOW INTERLOCK**: Signals warning light upon loss of coolant flow [pump failure].

UPS **BATTERY BACKUP**: Helps prevent loss of glycol due to nuisance tripping during short power failure, brownout or generator testing.

FILTRINE Mfg Co • 15 Kit St. Keene, NH 03431 USA
800-930-3367 • 603-352-5500 • FAX 603-352-0330
WEB www.filtrine.com • EMAIL cool@filtrine.com

LABOR & PARTS

FILTRINE IS ISO 9001-2008 REGISTERED
PRODUCT LINE APPROVED MARK AVAILABLE

666 QCP-0.75 [EB]
REVISED 12.17.13

READY-TO-ISSUE SPEC FOR QUICK CONNECT PANEL

GENERAL: Install [where shown on plans] a factory packaged compact panel containing temperature and pressure gauges, flow meter, and filter in piping between chiller and equipment. Panel to include all necessary valves, solenoids, bypass and drain. Panel to be Model QCP-0.75 as manufactured by Filtrine Manufacturing Company, Keene NH, USA. 03431

GAUGES: Temperature gauges for water coming into and leaving equipment to be dial-type, in Celsius and Fahrenheit scales, using a probe for maximum accuracy with no pressure drop. Pressure gauges to be dial-type, showing psi and bar and to generate no pressure drop.

FLOW METER: Flow meter to be analog type with sliding indicator calibrated in liters and gallons per minute to generate minimum pressure drop.

FILTER/VALVES: Bag type filter to use 50 micron bag with less than 1 psi pressure drop when new, to be located inside the panel, with bypass plumbing to permit easy filter change even as flow continues through loop. All valves to be full-flow type to minimize pressure drop.

PRESSURE DROP: Overall pressure drop through panel when filter is clean to be less than 10 psi.

CONNECTIONS: Connections to be 3/4" FPT [19mm] copper on chiller side, 3/4" FPT [19mm] on equipment side. Drain connection to be 1/2" FPT [12.5mm].

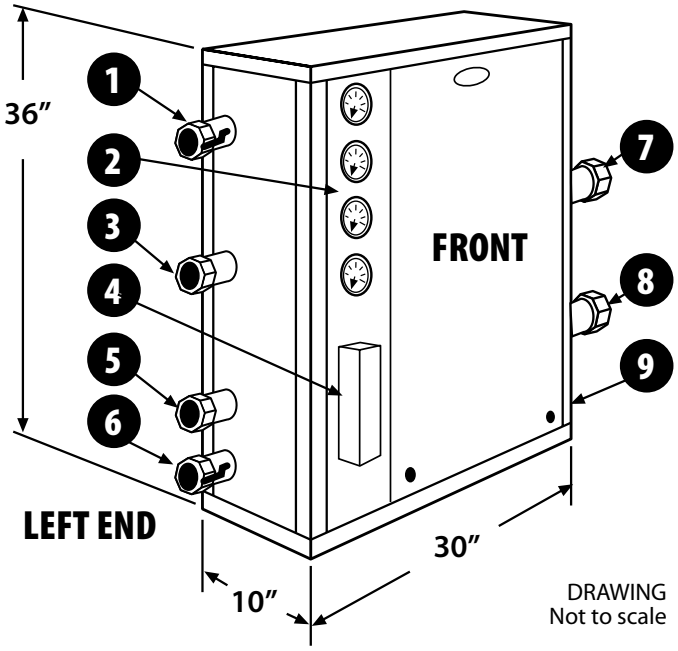
CABINET: The cabinet shall be constructed of enameled aluminum panels, with stainless steel top and sides. Panels to be removable without tools for access to valves and filter. Dimensions to be no more than 30"W x 10"D x 36"H.

AUTOMATIC SWITCHOVER TO CITY WATER *[optional]*: Water inlet with backflow preventer and drain to be included for connection to city water supply for emergency use. Solenoids to be included to automatically switch over to city water cooling in the event of water temperature above designated set point between 40°F and 90°F [4.4°C to 32.2°C], or flow of less than 1/2 GPM [1.9 LPM], or power loss. Check valves installed on piping to and from chiller.

VOLTAGE *[optional]*: 115/60/1 supplied from chiller.

APPROVAL: Manufacturer shall be ISO 9001 2008 Certified.

WARRANTY: Manufacturer shall provide warranty for parts replacement for 1 [one] year from start-up, 15 months from shipment; whichever is less.

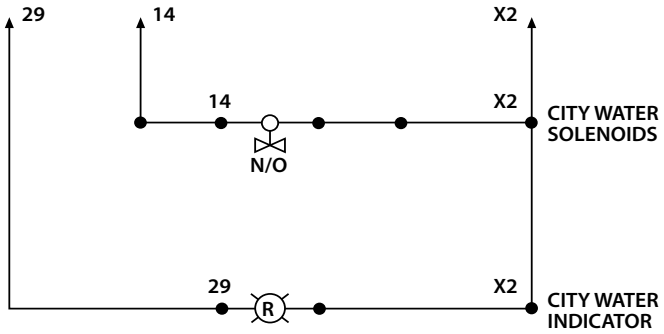


DRAWING
Not to scale

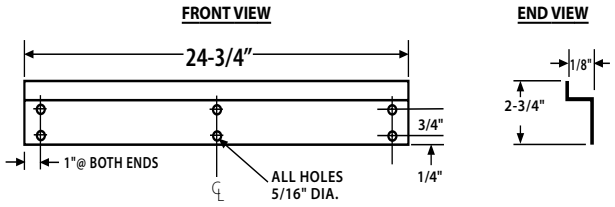
DRAWING LEGEND

1 ..... *OPTIONAL* City Water In3/4" FPT
2 ..... Press and Temp Gauges
3 ..... From Chiller 3/4" FPT
4 ..... Flow Meter
5 ..... To Chiller 3/4" FPT
6 ..... [*OPTIONAL*] City Water Drain 3/4" FPT
7 ..... To Equip 3/4" FPT
8 ..... From Equip 3/4"FPT
9 ..... Service Drain 1/2" FPT

INTERCONNECT TERMINALS TO CHILLER



MOUNTING BRACKET



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LABOR & PARTS

FILTRINE IS ISO 9001-2008 REGISTERED
PRODUCT LINE ETL APPROVED CE MARK AVAILABLE

666 QCP-0.75 [EB]
REVISED 12.17.13

PERCENT VOLUME GLYCOL CONCENTRATION REQUIRED FOR AMBIENT TEMPERATURE

TEMP °F	GLYCOL CONCENTRATION
20	20%
10	30%
0	37%
-10	42%
-20	46%

- Calculate your propylene glycol concentration using this chart.
- Determine your location's lowest possible ambient temperature.
- Find the total volume of water in the system.
  Include the volume of water in the piping and the number of gallons in the tank.
  The chiller's tank capacity is listed on the unit tag on the as-built chiller.
- Choose the appropriate percentage of glycol by volume for your area from GLYCOL CONCENTRATION column.

  NOTE: *FILTRINE RECOMMENDS THE USE OF PROPYLENE GLYCOL.*
- **DO NOT EXCEED A CONCENTRATION OF 50%**

Warranty does not cover damage to the chiller due to freezing caused by improper glycol concentrations.

Transtector Power Conditioning with Voltage Regulation

TrueBeam™, Clinac™, Acuity™ or Silhouette™

1451-055

Input 208/240/480/600 60 Hz
Output 208Y/120 or 480Y/277

Transtector's 50 KVA Conditioner

Transtector's 50 KVA Power Conditioner is engineered for the operating environment and load characteristics of Varian's TrueBeam™, Clinac™, Acuity™ and Silhouette™. The 50 KVA conditioners offer a comprehensive power quality solution, correcting voltage sags, swells and surges.

Exceptional service and superior design have led Transtector to become the most widely utilized power conditioning solution for Varian Medical Systems.

Design

Transtector's power conditioners with voltage regulation are designed to provide stable, clean power to your Varian equipment. Our proprietary technology corrects voltages five times faster than the competition. Transtector's precision engineering ensures your Varian equipment is running for you to meet your time critical treatment schedule. Transtector's configuration saves you installation and maintenance time and expense.

Service

Our technical support and service departments are available 24/7 because we understand time is critical. We stand behind our quality with a two year parts and workmanship warranty and on-site service capabilities.

Delivery

We work closely with Varian to ensure our systems are delivered at the same time. Transtector's power conditioning and voltage regulation systems can be shipped with Varian's system from Palo Alto, California. We can also drop ship directly from our factories.

TRANSTECTOR

www.transtector.com
208.772.8515
800.882.9110

Power Conditioning with Voltage Regulation

700 A/VS Series Transtector's 50 KVA Conditioner

1451-055

Voltage regulation, noise filtering, surge protection and a single point ground

- Voltage regulation of ±2.0 % for an input +10 % to -15 %, with sags and swells corrected within one cycle
- Isolation transformer establishes a clean neutral ground bond, eliminates noise, and functions as a single point ground independent of the facility's grounding system
- Transtector's proprietary surge protection responds in less than 5 nanoseconds, offering the industry's best voltage protection performance
- All connections for customer inputs and outputs are front access for ease of installation
- User friendly LED monitor panel
- Manual bypass system
- UL/cUL Listed, other certifications available upon request
- Input and output breakers provided

Specifications

For complete specifications and owners manuals visit www.transtector.com/var

Transtector Model 208 V Output 480 V Output	8BLX-50K-700A/VS 8BNX-50K-700A/VS	8CLX-50K-700A/VS 8CNX-50K-700A/VS	8DLX-50K-700A/VS 8DNX-50K-700A/VS	8ELX-50K-700A/VS 8ENX-50K-700A/VS
Input Configuration (other voltages available)	208 V +15 %/- 23% max 200 A breaker	240 V +15 %/-23 % max 175 A breaker	480 V +15 %/-23 % max 90 A breaker	600 V +15 %/-23 % max 70 A breaker
Output Configuration	175 A 208/120 VAC or 90 A 480/277 VAC (+/-2% Typical)			
Supply Frequency	60 Hz +/-3%			

Performance

Voltage Regulation	Half cycle response, one cycle correction
Rated kVA	50 kVA continuous duty
Noise Attenuation	Common mode and transverse mode
Overload Rating	200% for ten seconds, 1000% for one cycle
Surge Protection	ANSI, IEEE C62.41, UL 1449
Operating Temperature	0 to 40 ºC (32 to 104 ºF)
Heat Output	Nominal 3410 BTU/hour, 6820 BTU/hour maximum

Mechanical

Dimensions H x W x D	66.0 in x 29.0 in x 35.875 in (167.64 cm x 73.6 cm x 91.12 cm)
Weight	1,142 lbs (518 kg)

www.transtector.com
An ISO 9001: 2008 & 14001 certified company.

smiths

TRANSTECTOR

Pre-installation Customer Requirements

0001-0008 17 October 2018

CE
0086

Vision RT Ltd
Dove House
Arcadia Avenue
London N3 2JU
United Kingdom

Information in this document is subject to change without notice. Stenographical and clerical errors on the face of this document are subject to correction. By accepting and using this document, Customer agrees that Vision RT's liability for errors contained in this document or loss or damage incurred by Customer in connection with the furnishing or use of this document shall be limited to and in accordance with the warranty given to the product(s) supplied, as set out in Vision's standard terms and conditions of sale, which apply to and govern this document. Vision RT shall not be responsible for any other loss, liability or damages whatsoever. This document may contain information confidential and/or proprietary to Vision RT including, without limitation, technical or commercial know-how, specifications, inventions, processes or initiatives which are of a confidential nature. This document and its contents must therefore be kept in strict confidence by Customer in accordance with Vision RT's standard terms and conditions of sale and may only be used for the purpose for which it is intended. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, for any purpose without the express written permission of Vision RT Ltd. Nothing in this document shall constitute the granting (expressly or impliedly) of any right or license to Customer to any intellectual property contained herein.

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Quality Management Vision RT operates a Quality Management System designed to meet the requirements of BS EN ISO 13485:2003 (Europe) as well as FDA medical device good manufacturing practice regulations, 21 CFR Part 820 (USA).

Vision RT's Quality Management System complies with the requirements of BS EN ISO 13485:2003 for the '*design manufacture installation and servicing of 3D surface imaging technology for image guided therapy*'. As certified by BSI Certificate Number MD 95049 issued on 11/07/2005 and valid until 10/07/2014. Copies of this certificate are available from the Vision RT website: *www.visionrt.com*.

Europe

Vision RT products meet the requirements of the Council Directive MDD 93/42/EEC and are CE marked.

AlignRT®, **GateCT®** and **GateRT®** are approved as class IIb medical devices.

Full Quality Assurance is certified by BSI Certificate Number CE 95048 issued on 13/07/2005 and valid until 17/06/2015. Copies of this certificate are available from the Vision RT website: *www.visionrt.com*. BSI is a Notified Body for MDD 93/42/EEC and is identified by Notified body Number 0086.

USA

AlignRT® including the new frameless SRS module, **GateCT®** and **GateRT®** all have 510(k) clearance (K123371) from the FDA (8 January 2013). A copy of the FDA 510(k) clearance letter is available from the Vision RT website: www.visionrt.com.

AlignRT®, **GateCT®** and **GateRT®** are identified as class II medical devices.

Revision History

Date	*Revision*	*Author*	*Comments*
05 Jun 09	Issue 1.4	James Turner	Reformatted to new template and revised for three camera systems.
11 Nov 2010	Issue 1.5	Mary Lau	Renamed document title from “Customer Information” to “Pre-Installation Customer Requirements". Applied new document template. Revised for three camera systems including minor edits.
16 May 2013	Issue 2.0	Gideon Hale	Document template updated, Drawings updated and AlignRT HD detail added.
10 Jul 2013	Issue 2.1	Martin Allen	Minor corrections.
23-Jan-2017	Issue 2.2	Michael Medlicott	Added 3.1.3. Updated AlignRT/GateCT HD Equipment Configuration. Confirmation form removed . Minor corrections to the content, edits & additions.
13-Jun-2018	Issue 2.3	Jon Tejevo	Updated site survey and installation task times. Added IBA Proton and Elekta as 3rd party systems
17-Oct-2018	Issue 2.4	Jon Tejevo	5A fused mains power supply specified for cameras. Minor corrections to installation task times. Siemens open I/f cable part number added.

HELP DESK SUPPORT

If you cannot find the information you require in this document, please contact us:

Telephone Support

USA telephone support	866 594 5443
International telephone support	+44 208 349 6519

Internet Support

World Wide Web	http://www.visionrt.com
Help Desk Website	http://support.visionrt.com

You can also write to us at either of these addresses:

International and Europe

Vision RT Ltd
Dove House
Arcadia Avenue
London
United Kingdom
N3 2JU

USA and Canada

Vision RT Inc
8840 Stanford Boulevard
Suite 3200
Columbia
MD 21045
USA

DOCUMENT CONVENTIONS

SYMBOLS AND WARNINGS

WARNING

Warnings are shown in yellow boxes and should be read very carefully as they may impact on the safe operating of your system.

INFORMATION

Important information can be found in blue boxes. This information could be very useful in the setup of Vision RT products.

ABBREVIATIONS

CT	Computerized Tomography
DICOM	Digital Imaging and Communications in Medicine
IT	Information Technology
Linac	Linear accelerator

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Summary

This Customer Information document describes the customer requirements for site preparation for installation of Vision RT products. Network configuration and security policy requirements are also specified which are essential for the correct operation of Vision RT products, failure to meet these could impact the customer support contract.

The purpose of the document is to aid Customers, Engineers and Contractors in their understanding of Vision RT equipment requirements and facility design issues.

1.2 Audience

This document is intended for 3rd party distributors, users purchasing Vision RT products, IT support staff and any 3rd party IT support staff and details pre-installation requirements for Vision RT products.

1.3 Responsibilities

WARNING

It is the responsibility of the customer to ensure that the requirements in this document are satisfied.

1.4 Vision RT Customer Sales Contract Specifies:

- Services supplied by Vision RT;
- Computer hardware supplied by Vision RT;
- Application Software version to be supplied by Vision RT;
- Respiratory Gating interface. A full list of these is available in our 3rd party interface statement;
- Special terms or condition of sale;
- Estimated ship date;
- Shipping address.

2 RESPONSIBILITIES

2.1 Typical Duties of the Parties

To help assure a trouble-free project, good communications between the customer and Contractor, and a clear agreement with the assignment of responsibilities are required.

The Customer shall:

- Provide supervision and temporary services/facilities;
- Provide a Project Manager;
- Assign an internal representative for acceptance verification of AlignRT;
- Schedule initial training for staff with Vision RT;
- Ensure the checklist (Form 231 provided by Vision RT) is completed and verify the contents;
- Provide equipment and material storage prior to and during construction.

The Contractor shall:

- Provide structural alterations as required;
- Provide electrical systems as required for room occupancy, including lighting and power distribution;
- Provide and connect electrical utilities required for Align RT;
- Provide periodic and final clean-up;
- Pull Interconnecting cables;
- Provide and pull network cables, where required;
- Maintain treatment room and control equipment area in a dust free condition during installation and testing.

Vision RT shall:

- Provide AlignRT equipment;
- Provide installation planning assistance;
- Perform installation, testing and acceptance;
- Provide Customer Training.

3 BEFORE INSTALLATION

Before installation, Vision RT will contact the customer to arrange a convenient time to carry out a survey of the room where the system is to be installed.

3.1 Site Survey

3.1.1 Customer Responsibilities

The customer is required to make the following arrangements for the site survey:

- Access to the room where the system is to be installed out of clinical hours. The survey will take approximately two hours for each room being surveyed.
- Access to the false and structural ceilings to determine if there are any obstructions affecting system installation.
- Provide a marked location of the Iso-center for Vision RT to use as a reference point.

3.1.2 Camera Positioning

The Vision RT representative will take measurements to determine the optimum position of the cameras to give maximum coverage given the room geometry.

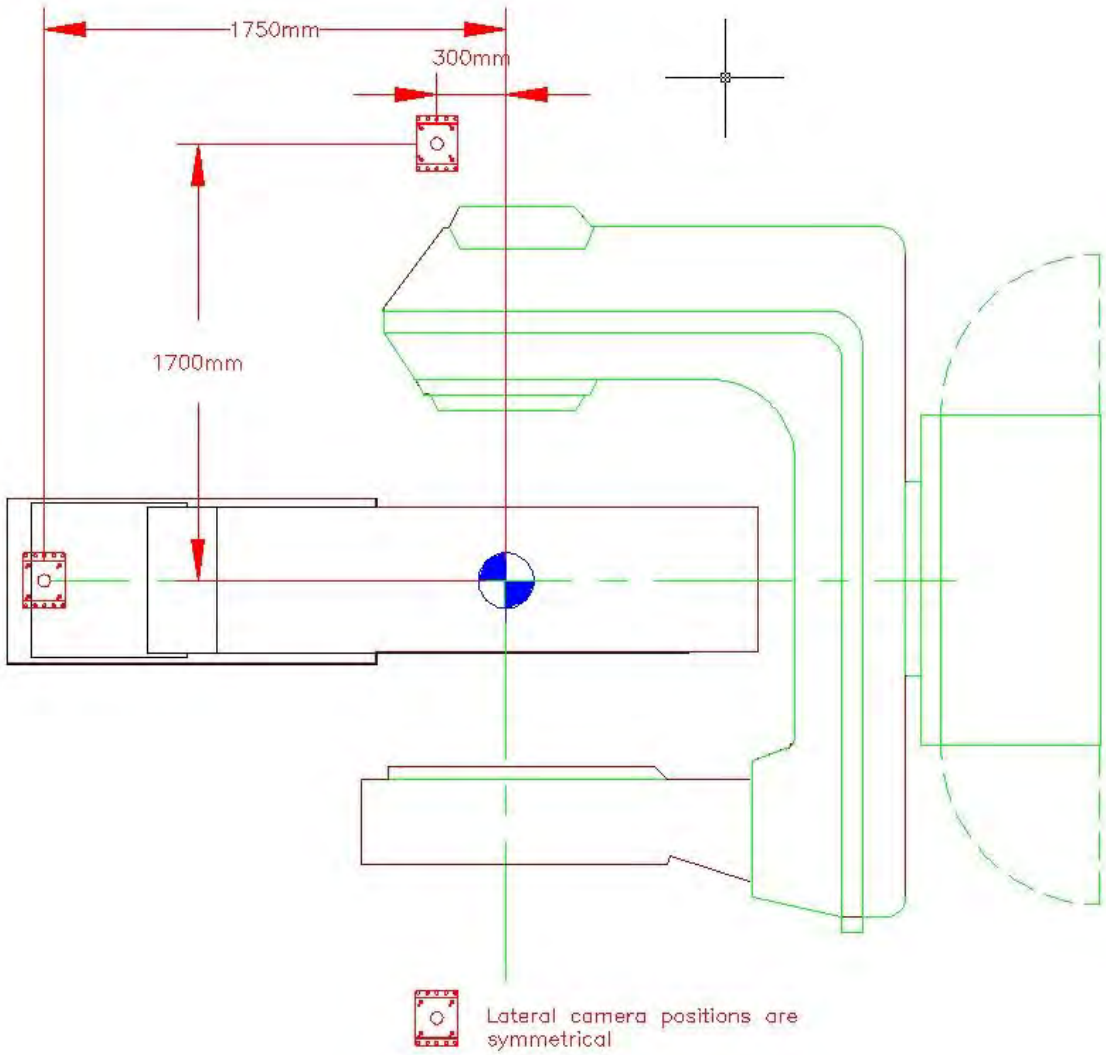
3.1.3 Treatment Room Air Vents

Every effort should be made by the customer to ensure any air conditioning/air ducts/vents are re-positioned at least one tile from the proposed camera positions. Where this is not possible, it is advised that air vent diffusers should be fitted to block the flow of air to the camera(s).

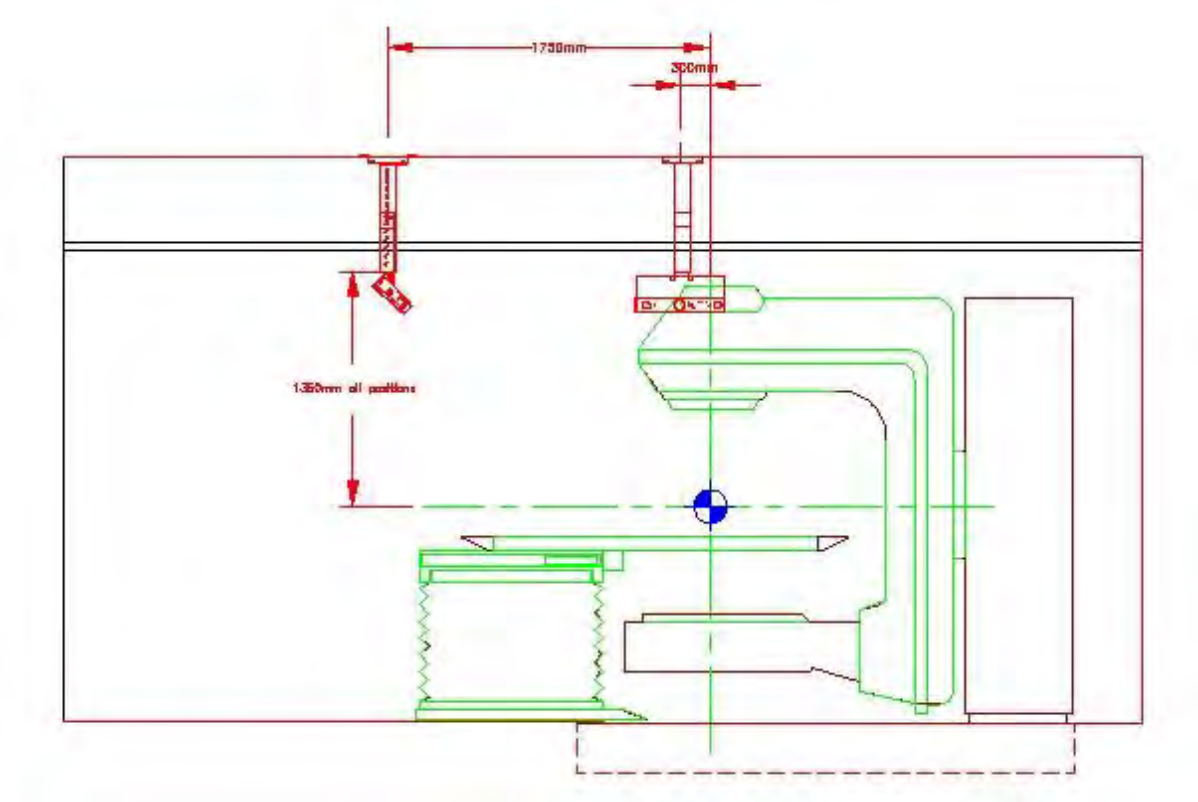
3.2 Camera Positions – Treatment Rooms

The minimum false ceiling height is 2743mm (9ft).

Linac Room Plan View



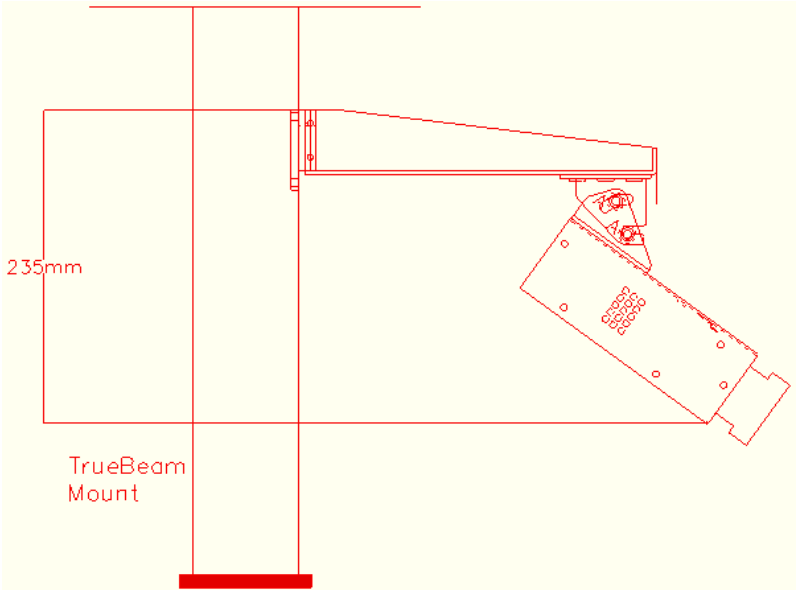
Linac Room Sectional View



3.2.1 Central Camera Position in a Varian TrueBeam Treatment Room

When AlignRT is installed in a TrueBeam treatment room, the central camera is mounted from the GCX bracket used to mount the Varian Optical Guidance camera. The Varian camera is located 183cm +/- 10cm forward of isocenter on the mid line of the couch. The AlignRT camera will be attached to the GCX mount using its own adaptor above the Varian camera as shown below. Vision RT part number for the GCX adaptor is VD0419 (supplied by Vision RT with AlignRT).

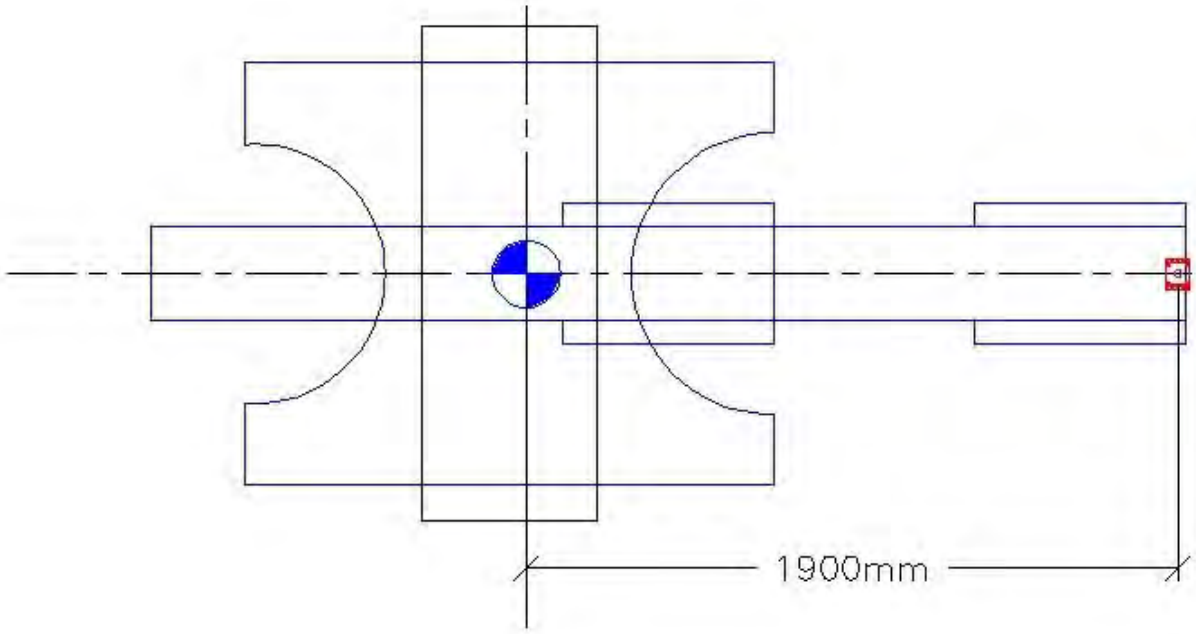
TrueBeam GCX Mount for AlignRT HD



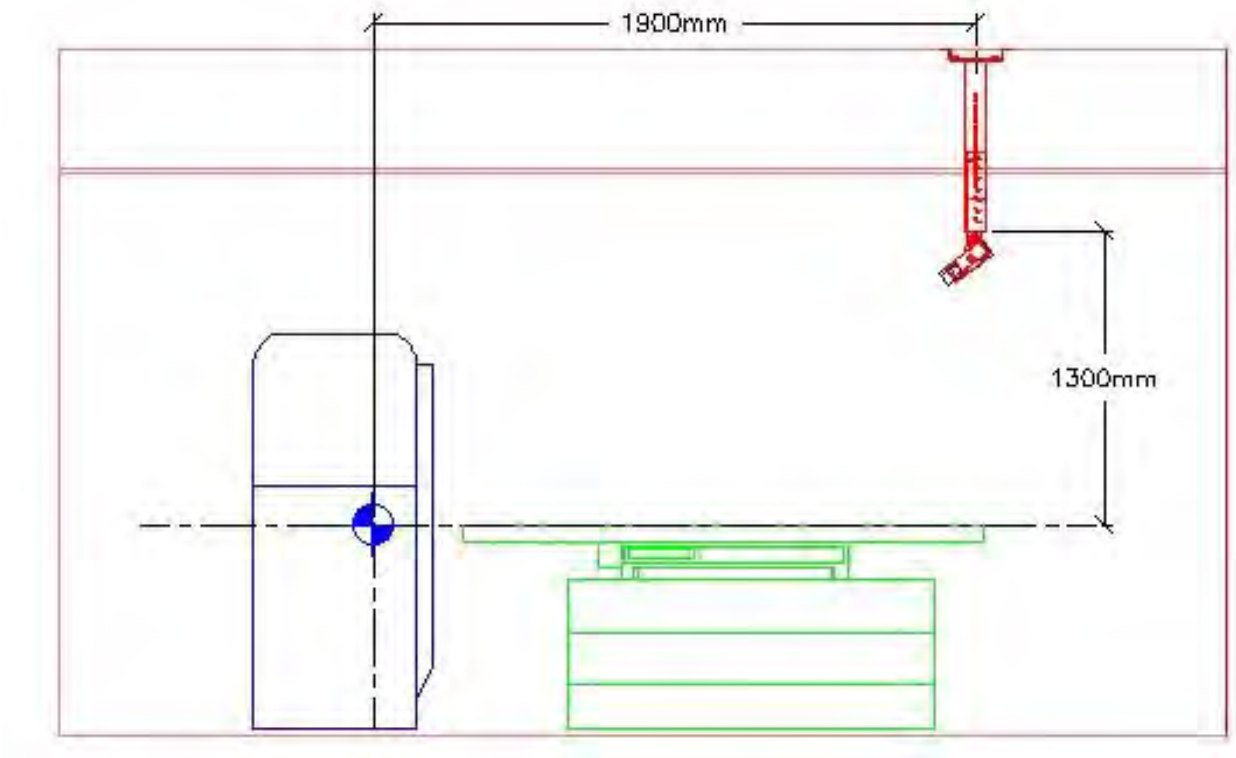
The false ceiling height recommended by Varian for TrueBeam installations is 2743mm. This should be considered as a minimum height in order to achieve a good central camera viewing angle when the Varian camera bracket is located 193cm (183cm + 10cm) forward of isocenter.

3.3 Camera Positions – CT rooms

CT Plan View



CT Sectional View



Camera mount located 1900mm forward of CT internal isocentre.

3.4 Mounting cameras

AlignRT cameras may only be mounted to the structural ceiling or Unistrut.

Vision RT shall provide all the fixings to be used in installation as part of the system shipment.

AlignRT Ceiling plates are installed to concrete using four M8 expansion bolts.

AlignRT HD Power supplies are installed using two M8 expansion bolts.

Cameras are mounted with their lenses at a height of at least 120cm above isocenter (typically 250cm or approximately 8ft above the floor).

3.5 Finishes

As with most computer components, the electronic components for this equipment are sensitive to localised static electricity. Carpeting or other flooring adjacent to the equipment in the room or at the control equipment area should not exceed a 2.0kV rating at 20% relative humidity when measured as outlined by the methods in AATCC-134. Retrofit static dissipative coatings are also available from various manufacturers. Many facilities use carpet squares that can be replaced or cleaned and allow access to floor duct if used.

Exposed grid ceilings allow for access to the power supply without the use of access doors. Service of the equipment is simplified where there are removable ceiling tiles. Coordinate the layout of ceiling tiles to ensure that ceiling support system does not interfere with the camera support and bracket.

3.6 Location of Workstation and Remote Terminal

The Vision RT representative will discuss the following during the site survey:

- The location of the workstation and remote terminal (not GateCT).
- Any specific mounting requirements required for the installation. If identified, these must be procured and installed by the customer **before** system installation.

3.7 Standard Locations for the Workstation and Local Monitor

The workstation is typically located within a 45 metre cable run from each of the camera(s).

- **AlignRT (Linac):**

  The workstation and monitor are situated in the Control room adjacent to the linac console.

- **GateCT:**

  The workstation is situated in the control room. For standard installations, the workstation should be positioned next to, or within easy reach, of the CT controls.

- **AlignRT (Proton):**

  The workstation is situated in the control room.

3.8 Standard Locations for Remote Terminals

The position of the remote terminal will be determined during the site survey.

- **AlignRT (Linac)**

  A remote monitor in the treatment room should be situated in a convenient location where the coordinates from the linac monitor can be easily read.

- **GateCT:**

> **INFORMATION**
>
> No remote terminal is required for GateCT installations.

- **AlignRT (Proton):**

  The remote terminal will be situated in the treatment room.

3.9 Power Requirements

3.9.1 Customer Responsibilities

Vision RT expects that all electrical work carried out b ythe customer is in accordance to local regulations and that the customer takes full responsibility for this.

The installation of electrical sockets detailed below must be completed by the customer before on site camera installation.

The socket requirements are detailed below:

	Maximum current consumption	
	At 100V	**At 220V**
AlignRT (3 Cameras)	2A	0.9A
AlignRT Workstation	5A	2.4A

- One socket is required for the camera power supply, which powers all cameras. This must be a 5A fused supply with a wall switch in an easily accessible location clearly labelled Vision RT cameras.
- One isolator switch is required to ensure that the electrical circuit can be completely de-energized for installation or maintenance. This must be installed in an easily accessible location;
- One socket is required near the planned workstation location (the isolation transformer will power the workstation and monitor);
- One socket is required near the remote terminal (the isolation transformer will power the monitor and KVM switch).

3.9.2 Earth integrity

The equipment must be connected to an earthed AC mains utility outlet.

3.9.3 Mains power supply

It is essential for power to all cameras to be disabled by a switch.

For *North America and Canada operation,* the System requires an earthed single-phase 120V 10A AC fused power supply.

For *Japanese operation,* the System requires an earthed single-phase 100V 10A AC fused power supply.

For *UK, European, Korean, Indian and Australian operation*, the System requires an earthed single-phase 220V – 250V AC fused power supply with power surges within national limits.

3.9.4 Power source requirements

For *North America and Canada operation*, the System must be connected to a nearby earthed power supply rated 120V, 60Hz, 10A.

For *Japan operation*, the System must be connected to a nearby earthed power supply rated 100V, 50Hz or 60Hz, 10A.

For *UK operation*, the System must be connected to a, nearby, TN or TT power supply system outlet point rated 220-240V, 50Hz, 13A, inclusive of switch.

For *European and Korean operation*, the System must be connected to a nearby earthed power supply outlet which will accommodate a standard 230V, 10A Schuko plug.

For *Swiss operation*, the System must be connected to a nearby earthed power supply outlet which will accommodate a standard 250V, 10A SEV 1011 compliant plug.

For *Indian operation*, the System must be connected to a nearby earthed power supply outlet which will accommodate a standard 250V, 5A BS 546 compliant plug.

For *Australian operation*, the System must be connected to a nearby earthed power supply outlet which will accommodate a standard 240V, 10A AS 3112 compliant plug.

3.9.5 Airflow

Provide a minimum 3” (75mm) air and cable space at sides, top and rear of all computers and monitors.

3.10 3rd Party Interfacing

3.10.1 Customer Responsibilities

The customer is responsible for ensuring that all necessary hardware and software for interfacing to the Vision RT system is purchased from 3rd party CT or Linac manufacturers in advance of the installation. Vision RT reserves the right to charge for an additional Support visit if we are unable to test with Third party equipment during installation.

Where a new 3rd party gating interface has been installed Vision RT require the customer to arrange for a 3rd party service representative to be on site to allow joint testing of the gating interface. For sites with an existing operational interface there is no such requirement.

3.11 IT Requirements

Before installation, Vision RT will provide a guidance document to describe all IT requirements to ensure the correct functioning of the Vision RT product.

Vision RT will require IT support towards the end of installation to test connectivity.

3.12 Ceiling Access

3.12.1 Customer Responsibilities

Access to the ceiling will be required to install the camera units in the optimum position.

For standard installations, if the false ceiling consists of ceiling tiles this will be a straightforward process. If access to the ceiling is limited, Vision RT Support will recommend any necessary alterations. The customer is responsible for carrying out any alterations such as installing hatches prior to installation. For example, if the site has a false dry ceiling, the customer will be responsible for creating an access area of approximately 1m² before the cameras are installed.

3.13 Cabling

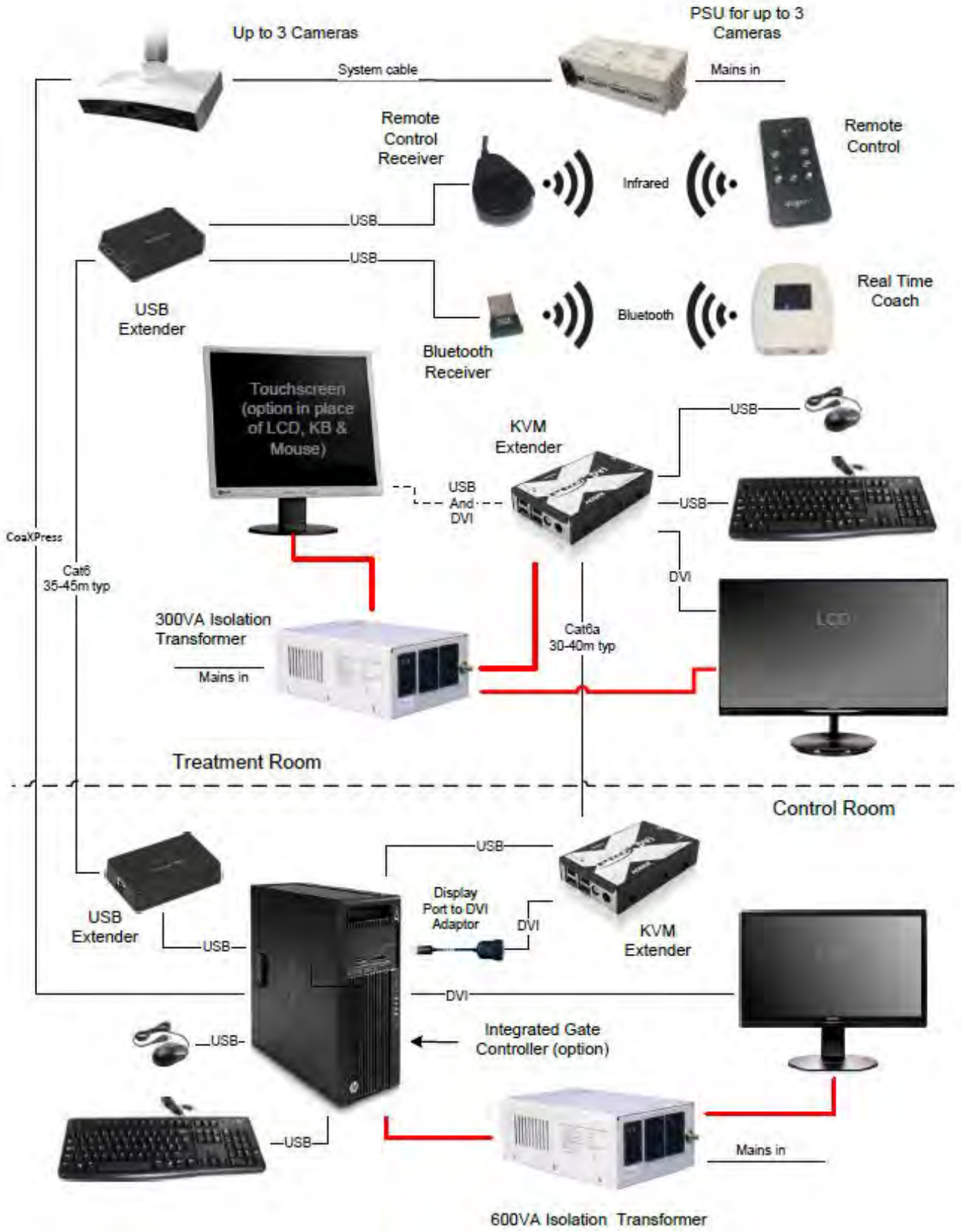
During the installation, cables will be run to:

- Connect each camera to the workstation;
- Connect each camera to the Power Supply Unit (PSU)
- Connect the workstation to the remote terminal (except GateCT installations)

All cables will be correctly managed using cable management systems, with no loose cables lying across floors or work surfaces.

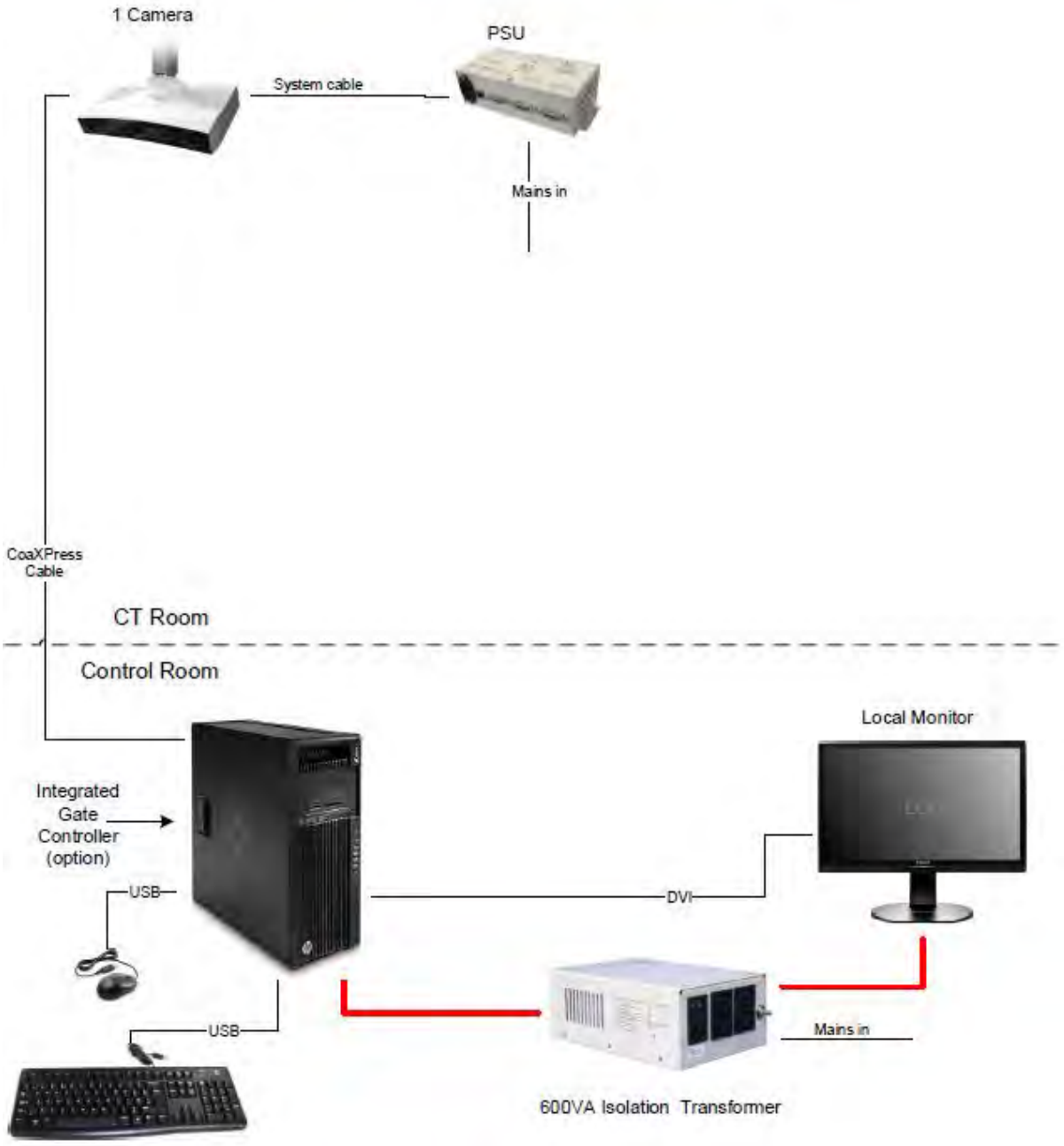
All cable connections will be held captive through appropriate fixings and/or cable management.

AlignRT HD Equipment Configuration



Note: Some of the hardware included in this diagram may not be representative of what the facility purchased from Vision RT.

GateCT HD Equipment Configuration



3.13.1 Customer Responsibilities

The customer must ensure suitable conduits are available for the cables as follows:

Conduit Information

Cable Type	Purpose	Cable Diameter (mm)	Cross-section cut-out for connector (mm) if the conduit needs to pass through a bulkhead
Mains	Camera power	7	US mains plug – 27mm x 25mm
Camera data cable	Data cable from camera to Workstation	5	16mm diameter
CAT6a to Control room	Remote KVM interface	7	14mm x 14mm

4 INSTALLATION

4.1 Before Installation

4.1.1 Confirmation of Dates

The customer will be contacted by Vision RT Support to discuss the installation dates. This may vary slightly depending on whether any custom brackets are required by Vision RT following the site survey.

4.1.2 Installation Tasks

The time required for installation and acceptance tests is dependent on the product ordered. The table below provides an approximate guide based on two people carrying out the installation:

Approximate Installation Time

Description	AlignRT	AlignRT + GateCT	GateCT
Workstation (quantity)	1	2	1
Cameras (quantity)	3	4	1
Gating interface (quantity)	1	2	1
Approximate installation time	3 days	4 days	2 days

AlignRT + GateCT systems are typically installed in two separate rooms.

4.1.3 Third Party Interfaces

Where a system has been purchased that includes third party interfaces, these should be installed and tested prior to Vision RT system installation.

4.1.3.1 GateCT

3rd Party System	Compatibility	3rd party gating cable
GE	GE *Advantage Workstation* 4.1 or later with the Advantage 4D software	GE RPM Cable
Philips	*Brilliance* 16P, *Brilliance Big Bore*, *Brilliance* 40 and *Brilliance* 64 Only the *Brilliance Big Bore* will support GateCT® as standard (includes RPM cable (required) and software).	Philips RPM Cable All other scanners require the cable, software and training to be purchased separately. The RPM cable number is 455012303742.
Siemens	*Somatom Sensation Open* CT Scanner (enabled for 4DCT) Somatom Definition Open CT Scanner	Vision RT cable type VD0194 Vision RT cable type VD0629 Siemens supplied open i/f cable part number 10186444.
Toshiba	*Aquilion Large Bore* TSX-201A/1C and TSX-201A/1F and system software version 3.35 and above.	Toshiba RPM cable

4.1.3.2 GateRT / AlignRT Advanced Surveillance with BeamHold

3rd party system	Compatibility	3rd party gating cable
Siemens	*Artiste* Linac. Siemens third party gating interface (PN: 08139474. Gated option 2nd Gen.)	Vision RT cable type VD0198 and VD0228
Varian C-series	There are certain Varian system pre-requisites for the Gating Interface to operate correctly, please contact your local Varian sales representative.	Vision RT cable type VD0328 Vision RT Breakout Box V000031 Varian EXGI cables
Varian TrueBeam	There are certain Varian system pre-requisites for the Gating Interface to operate correctly, please contact your local Varian sales representative.	Vision RT cable type VD0535
IBA Proton	IBA Particle Therapy System (PTS) Universal Beam Triggering Interface.	IBA PTS Gating Cable
Elekta	Elekta Synergy & Elekta Versa HD with Response system.	USB mini cable USB micro cable

4.2 During installation

4.2.1 Customer Responsibilities

Couch accuracy must also be determined for new installations, if the couch is not accurate to within 1mm, hospital staff will be required to recalibrate the couch before installation.

Supply and installation of monitor mounts is the responsibility of the customer.

Hospital IT support staff must also be available towards the end of the installation process or prior to Acceptance to test system connectivity.

4.2.2 Installation Procedure

During the installation, the following tasks will be completed:

- Cover equipment using dust sheets to protect machinery.
- Remove the appropriate ceiling tiles.
- Where necessary, attach the ceiling brackets and depending on the ceiling construction type this is likely to involve drilling. This task is typically undertaken by the hospital in advance of the installation visit.
- Attach the camera vertical mount brackets.
- Cut ceiling tiles to shape, replace and attach trim.
- Attach cameras.
- Run cables.
- Set up workstation.
- Set up remote terminal.
- Adjust camera optics.
- System calibration.
- Run connectivity and interface tests.
- Run acceptance tests.

5 AFTER INSTALLATION

5.1 Cleaning

5.1.1 Customer Responsibilities

The installation of Vision RT products may create some dust especially if drilling is required. Vision RT will endeavor to ensure that this is kept to a minimum and suitable dust covers will be used to protect existing equipment. It should be noted that some residual dust will be unavoidable and it is recommended that the room is thoroughly cleaned before clinical operation.

5.2 Training

A Vision RT representative will liaise with the customer regarding the details of the Vision RT training process.

5.2.1 Customer Responsibilities

Where applicable, access to a conference for classroom training and to the treatment vault (outside of clinical hours or suitable time set aside during the day) will be required for the training.

END OF DOCUMENT

Astarita Associates, Inc.

MEDICAL PHYSICS CONSULTANTS

414 Route 111, Smithtown, NY 11787
Phone (631) 265-2950
Fax (631) 265-2962

November 5, 2020

Vassar Brothers Medical Center
45 Reade Place
Poughkeepsie, NY 12601
matthew.sutton@nuvancehealth.org
Att. Matthew Sutton, Chief Medical Physicist

RE: Shielding Calculations for:
Linac #1 Vault
The Dyson Center for Cancer Care
Vassar Brothers Medical Center
45 Reade Place
Poughkeepsie, NY 12601

Dear Mr. Sutton:

Enclosed are shielding calculations for the Varian TrueBeam 6/10MV Linear Accelerator located at the above referenced facility. The following pages describe the shielding design in detail using the principles found in NCRP Report No. 151, Shielding Techniques for Radiation Oncology Facilities, by Patton H. McGinley along with the Varian site planning guide.

Page 2 of this report describes the assumptions used for the calculations. These are based upon information provided including structural drawings, estimated workloads, and unit specifications. Please ensure all assumptions are reviewed by the medical physics / clinical staff for accuracy.

Page 3 of this report describes the shielding plan in detail. Please reference the "**Install**" column for additional shielding required as well as any noted comments. Wall shielding should be installed to the ceiling/cap above. The shielding needed is based upon noted material densities. Should the building material change, please contact our office immediately to ensure shielding adequacy. Although not shown on page 3, neutron and 30^0 off primary calculations were taken into consideration in this report.

As summary of our analysis is as follows:

1. **The existing shielding is adequate for the new unit under the workload conditions specified on page 2 of this report.**
2. **Although the Linac Vault door is providing sufficient shielding to the control area, we recommend performing a survey, as well as evaluating the personnel dosimetry reports, to ensure ALARA levels are maintained. Please contact our office for door shielding recommendations should additional protection be warranted.**
3. **If the door is being replaced, a 3/8"Pb door should be installed and 3/8"Pb used to replace demolished walls in the area/wall #10.**

Should you require any further information concerning these calculations or any other matter, please do not hesitate to contact me.

Sincerely,

James Astarita, MS, DABMP

November 5, 2020

Linac #1 Vault shielding calculations for: The Dyson Center for Cancer Care

Unit: Varian TrueBeam 6/10MV

Assumptions

Head Leakage (of W@1m)

Xray	30^0 scatter
0.001	0.007

Neutron (mSv/Gy @ 1m)			
0.004%	of	10.00	MV workload

Workload (W)

	Energy (MV)	Dose cGy/pt	Workload (pts/day)	(days/wk)	IMRT %	IMRT Factor	Primary cGy/wk	Leakage cGy/wk
Weekly	6	400	34	5	40%	5	68,000	177
	10	400	6	5	0%	0	12,000	12

Maximum Exposure in any 1 hour

6 MV	2400 cGy Primary
6 MV	12 cGy Leakage
6 MV	16.8 cGy 30^0 Scatter off Primary

NCRP Occupacy Factors

Fully occupied areas:	1
Exam/treatment rooms	0.5
Corridors, patient rooms, lounges, staff rest room	0.2
Corridor doors	0.125
Public toilets, storage rooms, waiting rooms, patient holding	0.05
Outdoor areas w/ transient occ., attics, stairs, elevators, janitor closets	0.025

Radiation Protection Citeria Used

Area	Limit
Restricted	10mR/wk
Unrestricted	2mR/wk
	2mr in any 1 hr

The Dyson Center for Cancer Care: Varian TrueBeam 6/10MV Linear Accelerator

TVL's (inches)

	Primary Energy (MV)				Leakage Energy (MV)				Neutron			
Material	6	10	0	0	6	10	0	0	6	10	0	0
Concrete 147lbs/ft3	13.5	15.3			11	12						
Concrete 300lbs/ft3	6.5	7.4			5.3	5.8				6.5		
Lead 11.35g/cm3	2.2	2.2			1.8	1.8						
Concrete 250lbs/ft3	8.3	9.4			6.7	7.4				6.5		

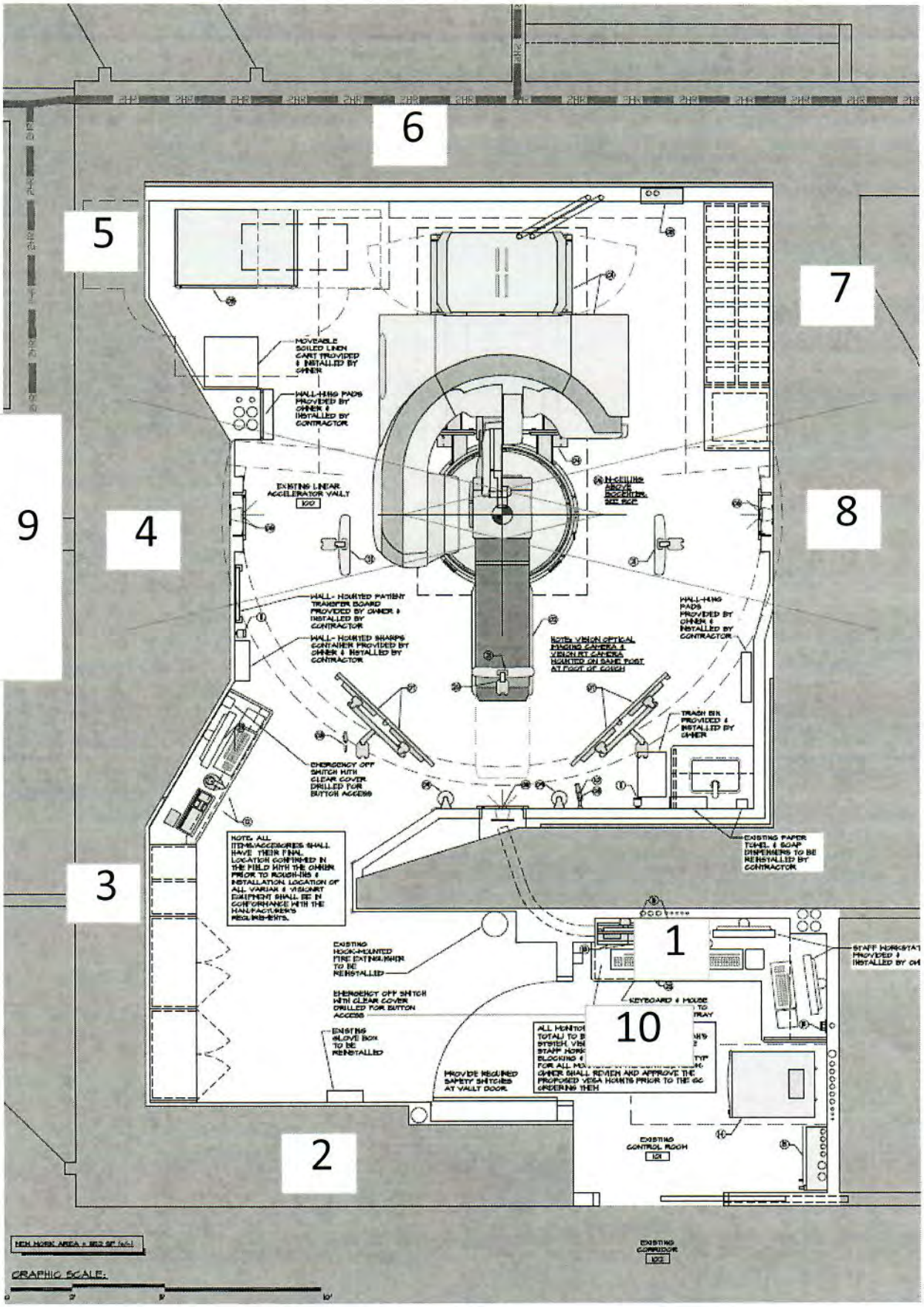
Wall Calculations

Area#	Area	D(ft)	D(m)	U	T	R/NR	Energy	P/L/S/N	P,L,S: cGy/wk N: cSv/wk	P,L,S: mR/wk N: mRem/wk	max mR in any 1hr	Desired mR/wk	Total TVL's Required	Current TVL's Existing	TVL's Needed to install	Needed Concrete 147lbs/ft3	Needed Lead 11.35g/cm3	**Install " (In.) Lead 11.35g/cm3**	Total mR/wk
1	Control	15	4.57	1.00	1.000	R	6	L	8.46	8458.04		4.5	3.27	4.06	-0.79	-8.6	-1.4	0	<5
		15	4.57	1.00			10	L	0.57	574.08		0.5	3.06	3.80	-0.74	-8.9	-1.3		
2	Hall	26	7.92	1.00	0.200	NR	6	L	0.56	563.04		1.9	2.48	3.37	-0.89	-9.8	-1.6	0	<2
		26	7.92	1.00			10	L	0.04	38.22		0.2	2.33	3.16	-0.83	-10.0	-1.5		
3	CT Sim Control	20	6.10	1.00	1.000	NR	6	L	4.76	4757.65		1.8	3.42	4.65	-1.23	-13.51	-2.2	0	<2
		20	6.10	1.00			10	L	0.32	322.92		0.2	3.21	4.27	-1.06	-12.74	-1.9		
4	CT Sim	18	5.49	0.13	0.500	NR	6	P	141.19	141193.27		1.5	4.97	7.05	-2.08	-28.0	-4.6	0	<2
		18	5.49	0.13			10	P	24.92	24916.46		0.5	4.70	6.53	-1.83	-28.0	-4.0		
5	Stairwell	20	6.10	0.13	0.025	NR	6	P	5.72	5718.33		1.2	3.68	4.44	-0.76	-10.3	-1.7	0	<2
		20	6.10	0.13			10	P	1.01	1009.12		0.8	3.10	3.92	-0.82	-12.5	-1.8		
		20	6.10	1.00			6	L	0.12	118.94		1.8	1.82	3.00	-1.18	-13.0	-2.1		
		20	6.10	1.00			10	L	0.01	8.07		0.2	1.61	2.75	-1.14	-13.7	-2.1		
6	Vestibule/Cath Lab	15	4.57	1.00	1.000	NR	6	L	8.46	8458.04		1.8	3.67	3.70	-0.03	-0.3	-0.1	0	<2
		15	4.57	1.00			10	L	0.57	574.08		0.2	3.46	3.47	-0.01	-0.1	0.0		
7	Linac	16	4.88	1.00	0.500	R	6	L	3.72	3716.91		4.5	2.92	3.09	-0.17	-1.9	-0.3	0	<5
		16	4.88	1.00			10	L	0.25	252.28		0.5	2.70	2.83	-0.13	-1.5	-0.2		
8	Linac	18	5.49	0.13	0.500	R	6	P	141.19	141193.27		3.5	4.61	5.55	-0.94	-12.7	-2.1	0	<5
		18	5.49	0.13			10	P	24.92	24916.46		1.5	4.22	4.90	-0.68	-10.4	-1.5		
9	Adjacent Building - 3rd Floor	28	8.53	1.00	1.000	NR	6	L	2.43	2427.37		1.8	3.13	4.00	-0.87	-9.6	-1.6	0	<2
		28	8.53	1.00			10	L	0.16	164.75		0.2	2.92	3.66	-0.74	-8.9	-1.3		
		26	7.92	0.13			6	P	135.35	135345.03		1.3	5.02	8.10	-3.08	-41.6	-6.8		
		26	7.92	0.13			10	P	23.88	23884.42		0.7	4.53	7.20	-2.67	-40.8	-5.9		
10	Door	15	4.57	1.00	1.000	R	6	L	8.46	8458.04		4.5	3.27	4.06	-0.79	-8.6	-1.4	0 - see calc. below	<10
		15	4.57	1.00			10	L	0.57	574.08		0.5	3.06	3.80	-0.74	-8.9	-1.3		

Door Calculations

Energy	W_L cGy/wk	W_n cSv/wk	W_p cGy/wk	T	Maze Wall " concrete	TVL	Maze Wall D(m)	$D_{iso\text{-}wall}$ d_1(m)	$D_{sc\text{-}door}$ d_2(m)	Neutron TVD (m)	Pt. Scatter factor (a)	IMRT Field F (cm^2)	Wall Area Reflected A_1(m^2)	0.5MV Pt. Scatter α	Leakage α	total mR/wk	Pb scatter TVL (in)	**Existing inches Pb**	
6	177	0	68000	1	44.6	11	4.570	5.8	4.5	1	0.00139	225	10.80	0.022	0.010	35.17	0.31	1/4	~6
10	12	0	12000	1	44.6	12	4.570	5.8	4.5	1	0.00135	225	10.80	0.022	0.010		0.31		

D - distance T - occupancy factor NR -unrestricted L - leakage S - 30^0 scatter off primary TVL - tenth value layer
U - use factor R - restricted area P - primary beam N - neutron W - workload (P,L,S,N)



Note - Area 9 is the 3rd floor of the adjacent building