

# varian

## TRUEBEAM / VITALBEAM PRODUCT PLANNING GUIDE

P/N: P1026768-04



# 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  $\pm 5\%$  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	<ul style="list-style-type: none"> <li>• Updated cover page</li> <li>• Removed Project Planning paragraphs from page 3, duplicated in Section 4</li> <li>• Updated the Typical Lead-times and Durations on page 3</li> <li>• Moved Note from page 9 to Section 3.1.2</li> <li>• Removed 1.3 Glossary and Abbreviations</li> <li>• Revised metric dimensions in Figure 2-1</li> <li>• Moved Turntable weight from Table 2-2 to Table 2-1</li> <li>• Added new Note on monitors to 2.5</li> <li>• Revised 2.6.1 MCB description text and removed duplicate information</li> <li>• Removed Note from 2.6.2, duplicate information</li> <li>• Updated Figure 2-8, added hinges</li> <li>• Moved Notice from 2.7.2 to 3.2.4</li> <li>• Moved bullet points from 2.7.3 to Notice in 3.1.4.2</li> <li>• Moved Note to 2.7.4 descriptive text</li> <li>• Moved bullet points from 2.7.4 to Notice in 3.1.4.1</li> <li>• Moved Notice 2.7.4 to 3.1.4.1</li> <li>• Moved bullet points from 2.7.5 to Notice in 3.1.4.3</li> <li>• Removed bullet on another set of IRMs, duplicate</li> <li>• Revised the Warning from 213 [7'-0"] to 203 [6'-8"] in 2.7.5</li> <li>• Added Support Document reference to Notice in 3.1</li> <li>• Section 3.1.1               <ul style="list-style-type: none"> <li>• Corrected detail metric dimension from 305cm to 30.5cm</li> <li>• Added bullet on pit depth variation</li> <li>• Added bullet for cooling line reference</li> </ul> </li> <li>• Revised the shaded area required for minimum floor clearances</li> <li>• Separated recommended and minimum ISO to rear wall dimensions</li> <li>• Revised the Caution in 3.1.2.1, moved text to create a new Note on obstruction consideration</li> <li>• Updated Figure 3-5, front clearance, added Console Cabinet outline</li> <li>• Updated Figure 3-6, flipped LV camera to reflect sample layout</li> <li>• Moved bullet points from 3.1.4 to 3.1.4.1</li> <li>• Moved bullet points from 3.1.4 to 3.1.4.2</li> <li>• Revised Table 3-1, removed LV camera lens column, revised Front Wall to Sagittal Wall</li> <li>• Added new Section 3.1.4.1 CCTV Cameras</li> <li>• Added new Section 3.1.4.2 Laser Mounting Plates</li> <li>• Moved IRM wall mount bullet to 2.7.5</li> <li>• Revised 3.2.2, removed duplicate specifications, removed isolation transformer Note</li> <li>• Section 3.2.3               <ul style="list-style-type: none"> <li>• Removed Conduit Access and Labeling, 3.2.3</li> <li>• Added wiring and cable key</li> </ul> </li> <li>• Updated Table 3-3 and Figure 3-9</li> <li>• Moved Note for 1-phase for accessories to 3.2.5.1</li> <li>• Added Note for customer wiring from MCB to Modulator.</li> <li>• Removed Conduit Access, 3.2.4</li> <li>• Added new Section 3.2.4.1 RJB Customer Connections</li> </ul>	DKU



		<ul style="list-style-type: none"> <li>• Moved Dedicating Grounding Section in front of Cable Containment</li> <li>• Revised 3.2.6 description, moved text to Caution, removed duplicate text</li> <li>• Updated Figure 3-12, added Laser Plates and RJB</li> <li>• Revised 3.2.7 bullets <ul style="list-style-type: none"> <li>• Removed place components shortest path</li> <li>• Removed verify room penetrations</li> <li>• Moved “conduit must be shorter than cable” to new Note</li> </ul> </li> <li>• Added maximum run length to Table 3-4</li> <li>• Added new Section 3.2.8 Cable Access</li> <li>• Moved room lighting to Section 3.2.9, moved power requirement Note to Figure 3-10</li> <li>• Moved 3.2.10.1 warning light requirements to bullet points</li> <li>• Revised 3.2.10.1 aural indicator Note to a Notice</li> <li>• Revised 3.2.10.3 EMO Switch to EMO Button</li> <li>• Moved 3.2.10.3 EMO Button requirement to a bullet point</li> <li>• Added new Section 3.2.10.4 for Emergency Disconnect Button</li> <li>• Removed Table on Safety Devices, moved options to bullet points, 3.2.10.5</li> <li>• Moved treatment room Wi-Fi bullet to a Note, Section 3.2.11</li> <li>• Added maximum input pressure to Table 3-8</li> <li>• Updated Figure 3-16, added Varian hose kit and stand entry point</li> <li>• Added do not locate floor drains in Notice, Section 3.3.1</li> <li>• Added new Section 3.3.2 Cooling Line Access</li> <li>• Added new Section 3.3.4 Optional Plumbing Considerations</li> <li>• Moved 3.4.1 Ventilation requirements to bullet points, removed duplicate Note</li> <li>• Revised the 3.7.1 Flooring requirement, changed from “static dissipative” to “Anti-Static”, removed the resistance range.</li> <li>• Added new Figure 3-18, for flooring voids</li> <li>• Removed text from Section 3.7.2, duplicated requirement in 3.1.2.2</li> <li>• Revised 4.1 Responsibilities description</li> <li>• Revised 4.3 BaseFrame customer materials to “S2” and to “~1.6 cu. yds.”</li> <li>• Added new Notice to Appendix A Section 2 Rigging</li> <li>• Revised 2.1 Standard rigging weight to “6123kg [13,500lb]”</li> </ul>	
D	November 2020	<ul style="list-style-type: none"> <li>• 2.5, Removed monitor risers</li> <li>• 3.1.4.3, Added optical imager reference to the longitudinal axis line</li> <li>• Table 3-2, Console Current, added neutral</li> <li>• Table 3-4, Revised AC Door Interlock to 120 VAC</li> <li>• 3.2.5, Revised from 24 VDC to 24 VAC</li> <li>• 3.2.10.5, Revised Light Curtain, controls door interlock circuits</li> <li>• 3.2.11, Added WiFi in the control area</li> <li>• 3.7.4, Revised the Fire Protection statement</li> </ul>	DKU



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# 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



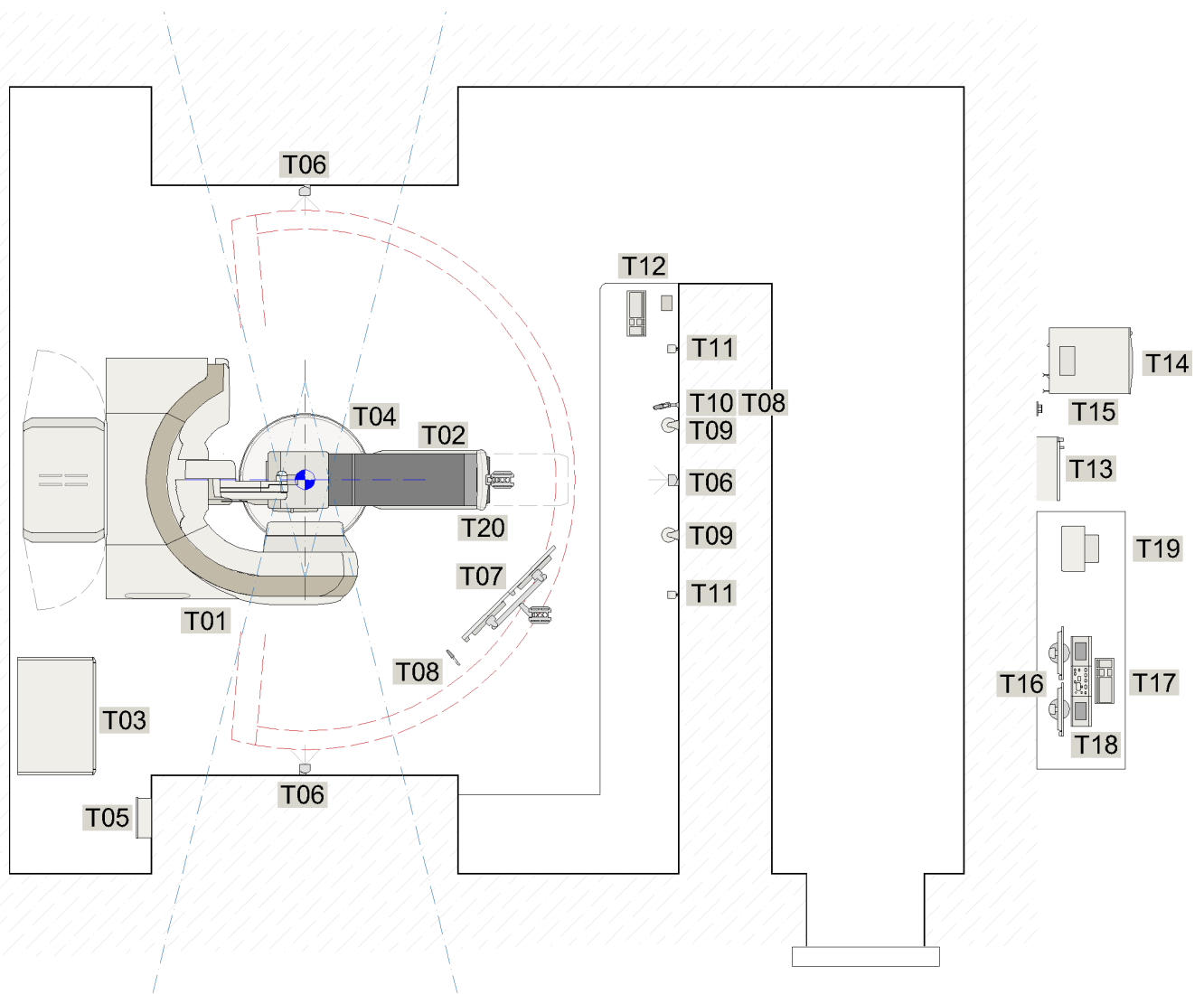


Figure 1-2 TrueBeam/VitalBeam System Components (sample layout)

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

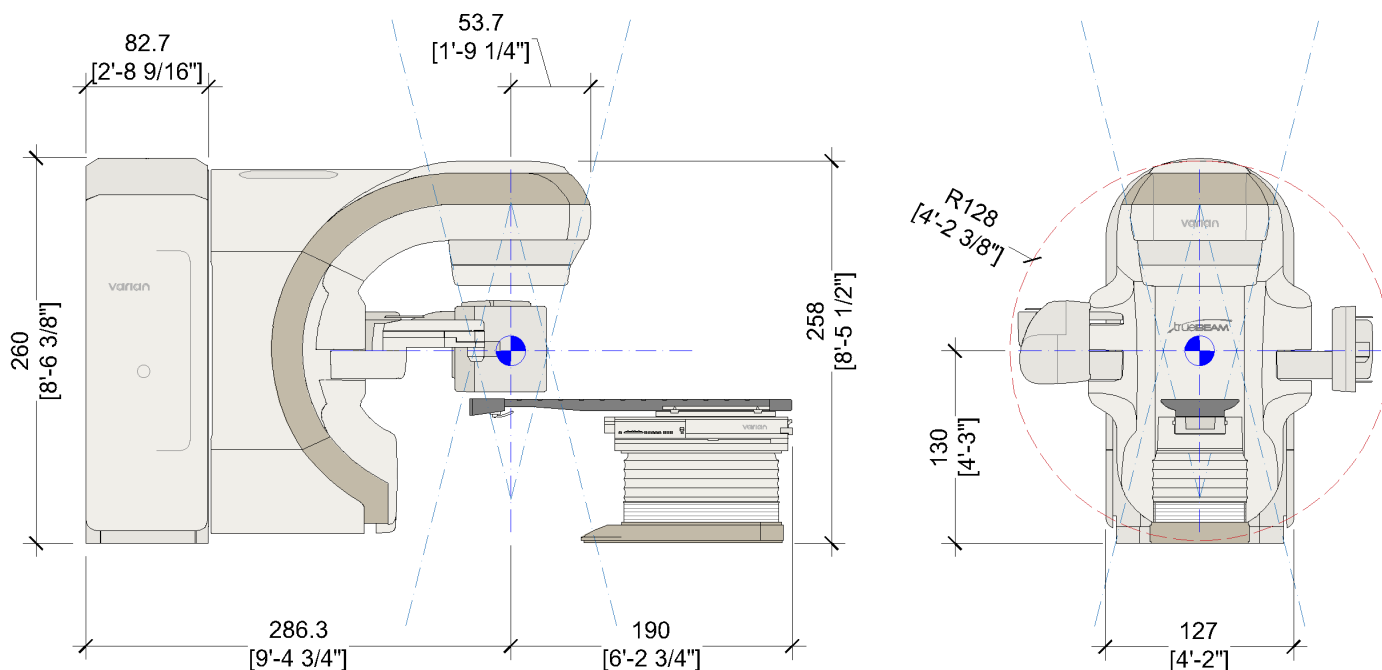


Figure 2-1 TrueBeam/VitalBeam Stand, Gantry, and Couch (Side and Front View)

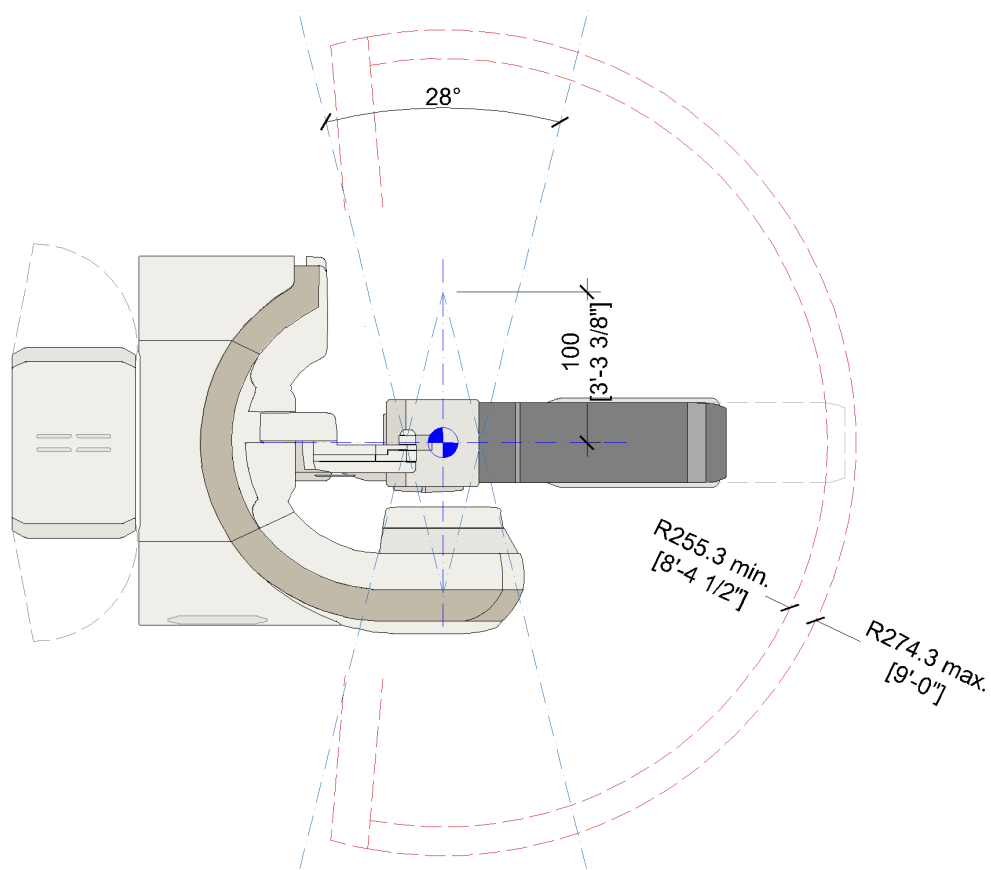


Figure 2-2 Couch Radius, Primary Beam Angle and Source to Isocenter Distance



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.

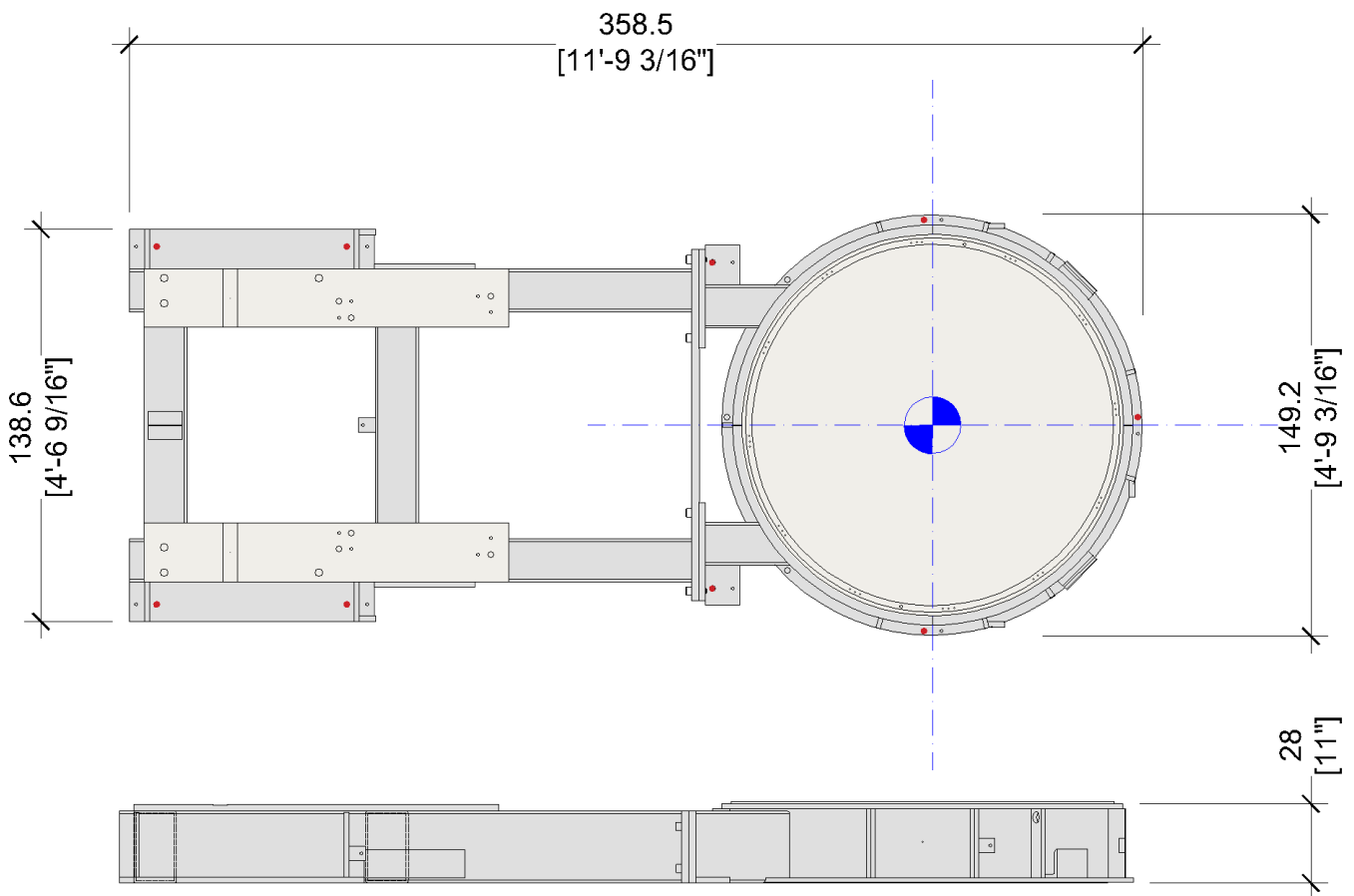


Figure 2-3 Universal BaseFrame (Plan and Side View)



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.**

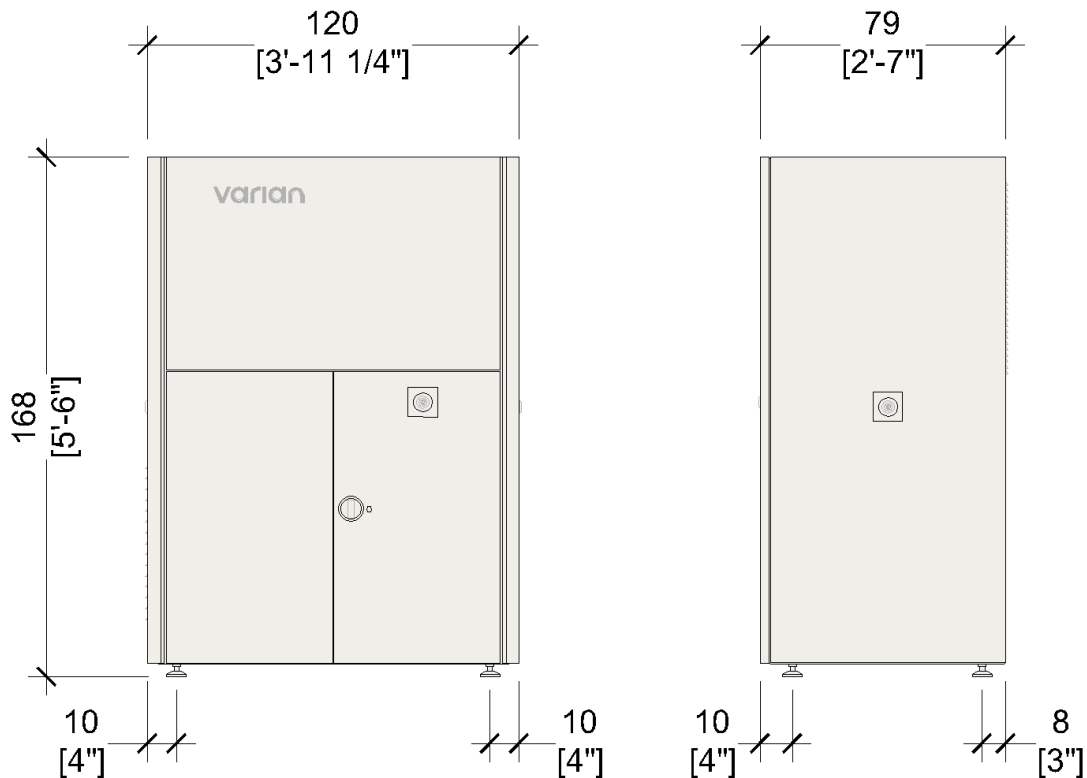


Figure 2-4 Modulator Size (Front and Side View)



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.

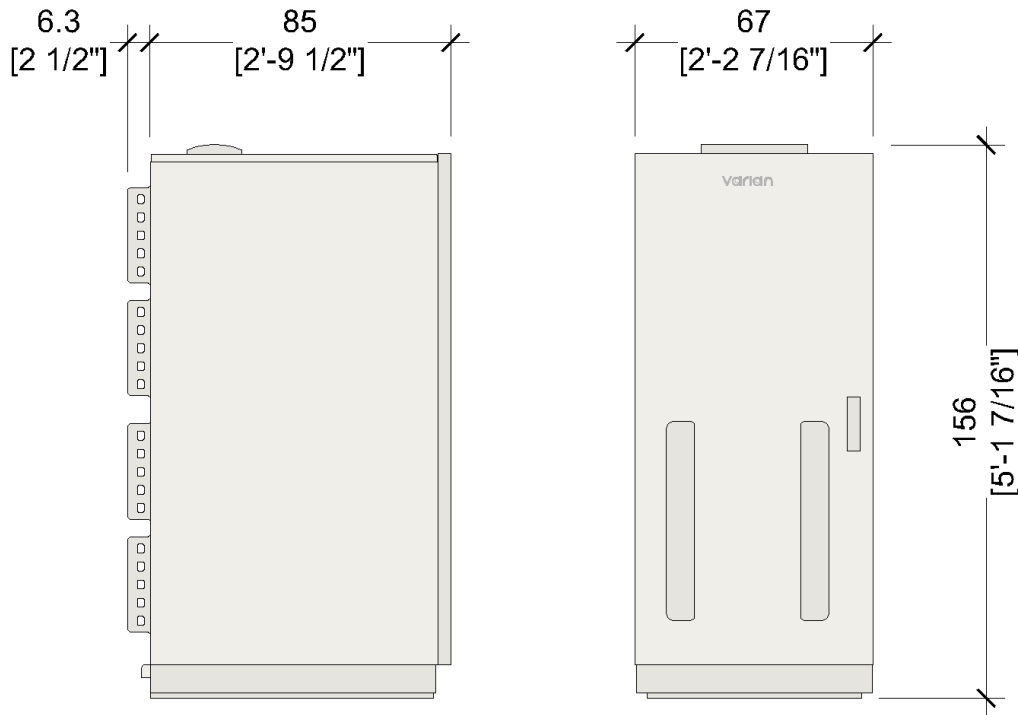


Figure 2-5 Console Cabinet Dimensions (Front and Side View)

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.

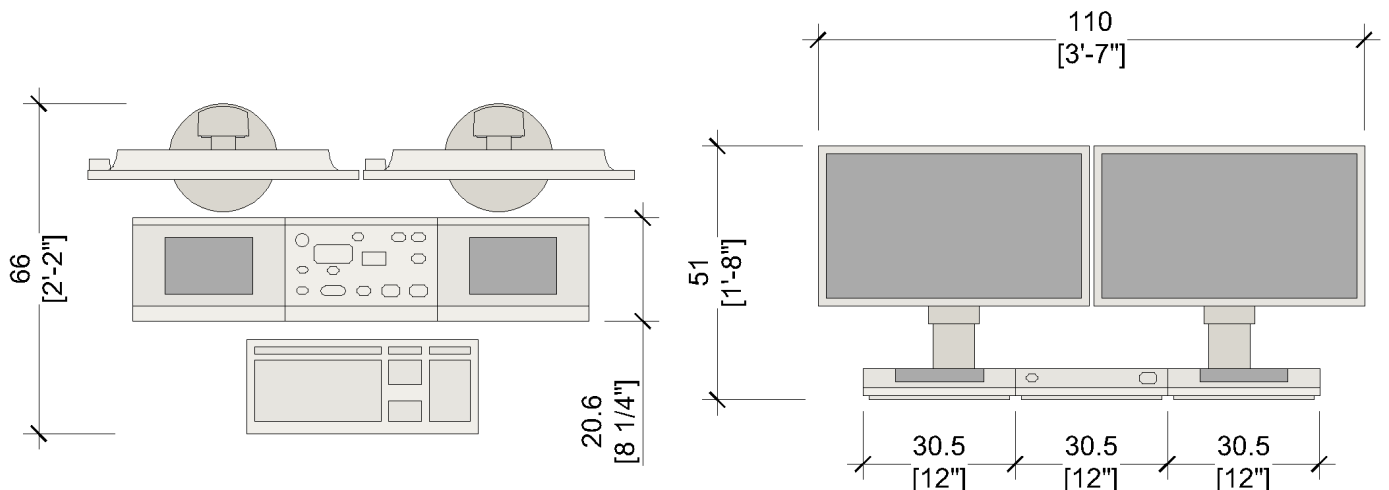


Figure 2-6 Console Desk Layout





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
<b>A</b>	30m [100']	12	<b>T01 - Stand</b>	<b>T03 - Modulator</b>
<b>B</b>	45m [150']	18		<b>T14 - Console Cabinet</b>
<b>C</b>	45m [150']	7		<b>T17 - Control Console</b>
<b>D</b>	45m [150']	1	<b>T14 - Console Cabinet</b>	<b>T20 - Optical Imaging Camera</b>
<b>E</b>	30m [100']	2 (up to x4)	<b>T14 - Console Cabinet</b>	<b>T07 - In-Room Monitor</b>
<b>F<sub>1</sub></b>	15m [50']	3		<b>T17 - Control Console</b>
<b>F<sub>2</sub></b>	15m [50']	6		<b>T16 - System Monitors</b>
<b>F<sub>3</sub></b>	15m [50']	2		<b>T18 - CCTV Monitor</b>
<b>G</b>	15m [50']	1		<b>T13 - MCB</b>
<b>H</b>	45m [150']	1	<b>T13 - MCB</b>	<b>T03 - Modulator</b>
<b>I</b>	45m [150']	2	<b>T05 - RJB</b>	<b>T01 - Stand</b>
<b>J</b>	45m [150']	2	<b>T08 - Microphone</b>	<b>T17 - Control Console</b>
<b>K</b>	38m [125']	1	<b>T14 - Console Cabinet</b>	<b>T10 - Live View Camera</b>
<b>L</b>	45m [150']	2	<b>T11 - Speaker</b>	<b>T17 - Control Console</b>
<b>M</b>	45m [150']	2 (up to x6)	<b>T09 - CCTV Camera</b>	<b>T18 - CCTV Monitor</b>
<b>N</b>	45m [150']	1	<b>T14 - Console Cabinet</b>	<b>T12 - USB Hub, Treatment Room</b>
<b>O</b>	7.5m [25']	1		<b>T19 - Printer</b>

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





## 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				
Description	Bracket Weight		Supporting Weight	
	Kg	Lb	Kg	Lb
Console Cabinet Bracket	22	49	<a href="#">See Section 2.4</a>	
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.

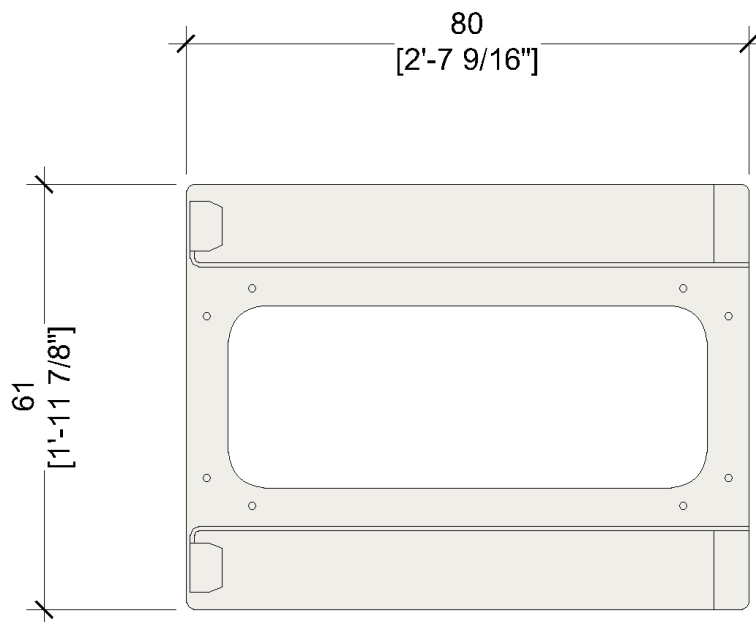


Figure 2-7 Floor Bracket for Console Cabinet

### 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.

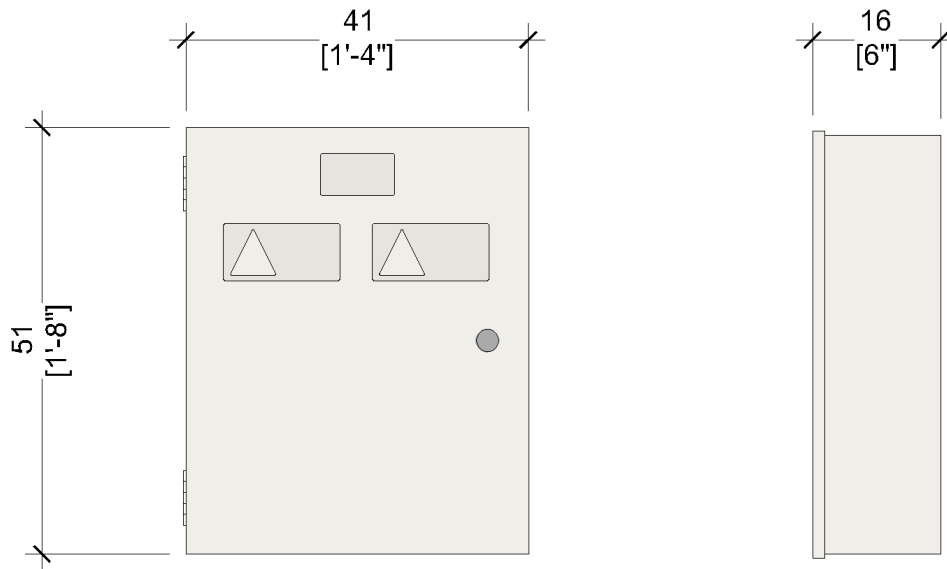


Figure 2-8 Relay Junction Box (Front and Side View)

### 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.

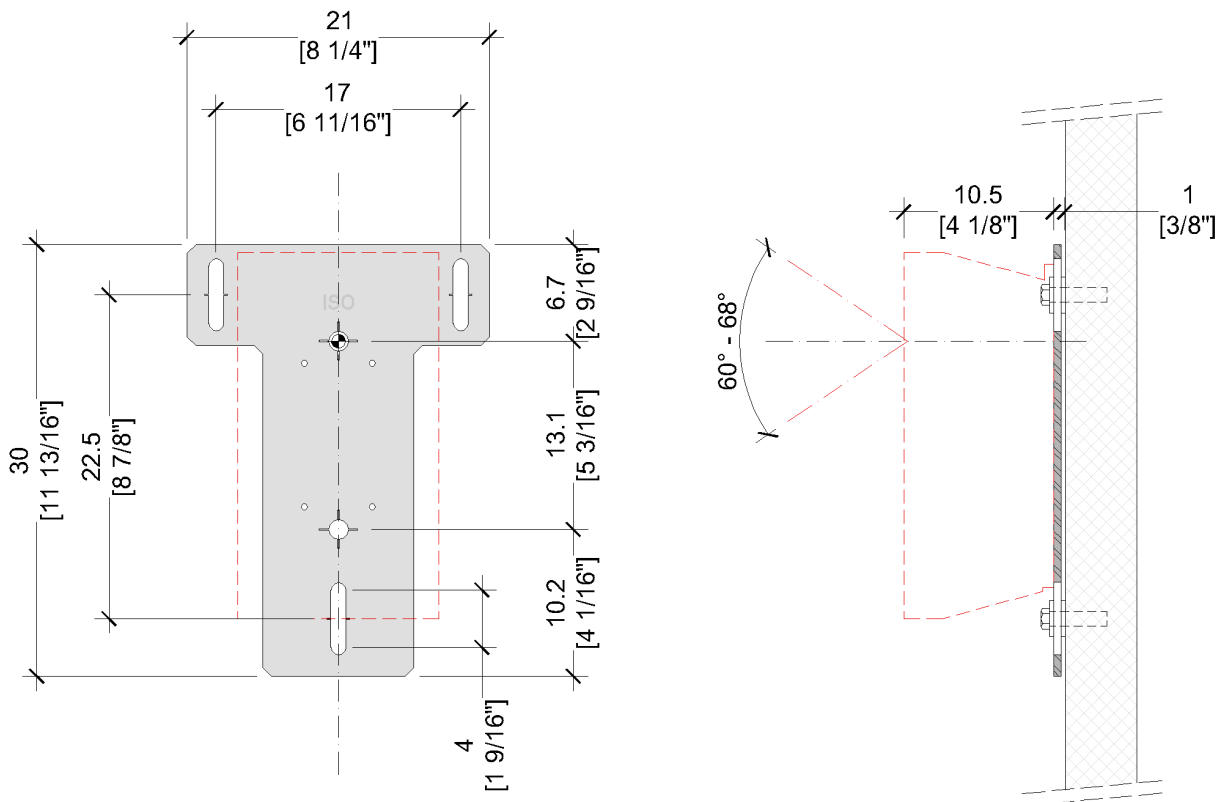


Figure 2-9 Laser Mounting Plate



## 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](#).

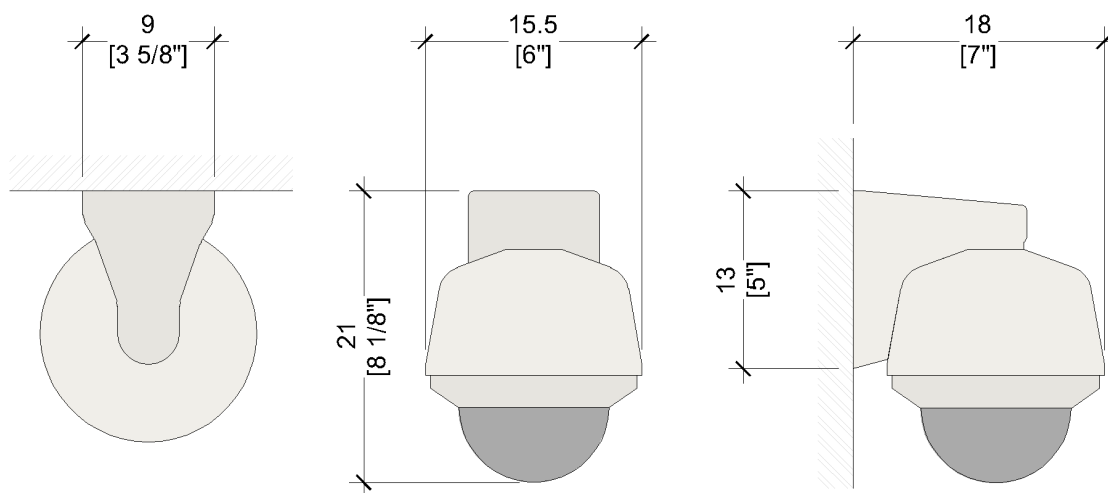


Figure 2-10 CCTV Camera Mounts (Plan, Front and Side Views)

## 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).

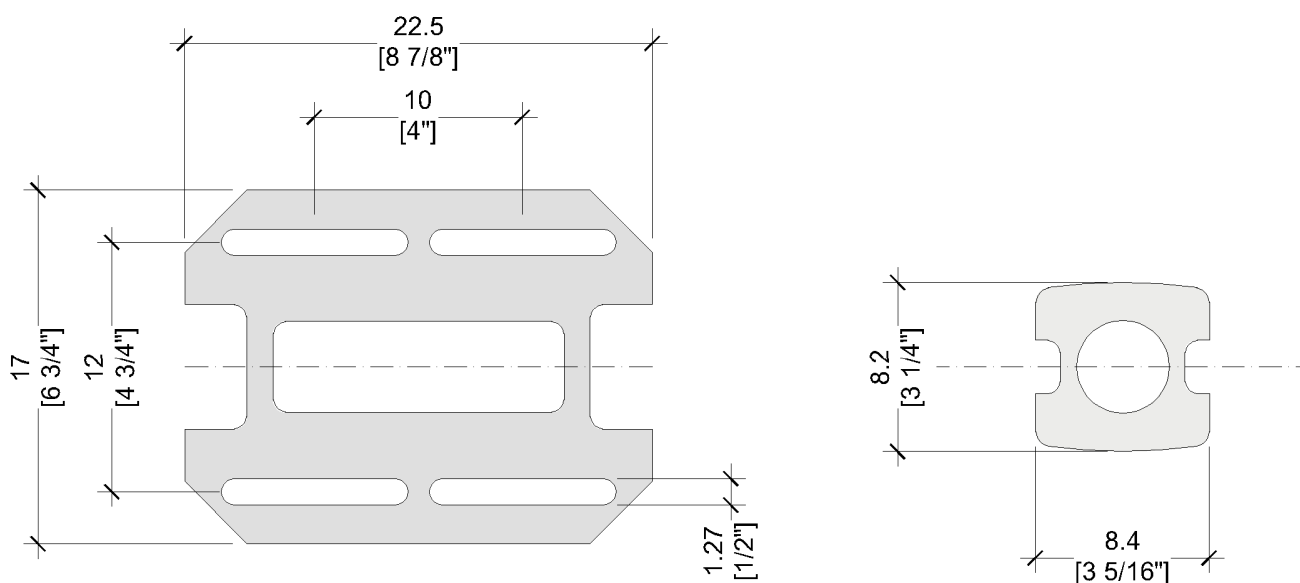


Figure 2-11 Ceiling Mounting Plate and Post Section



- 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.

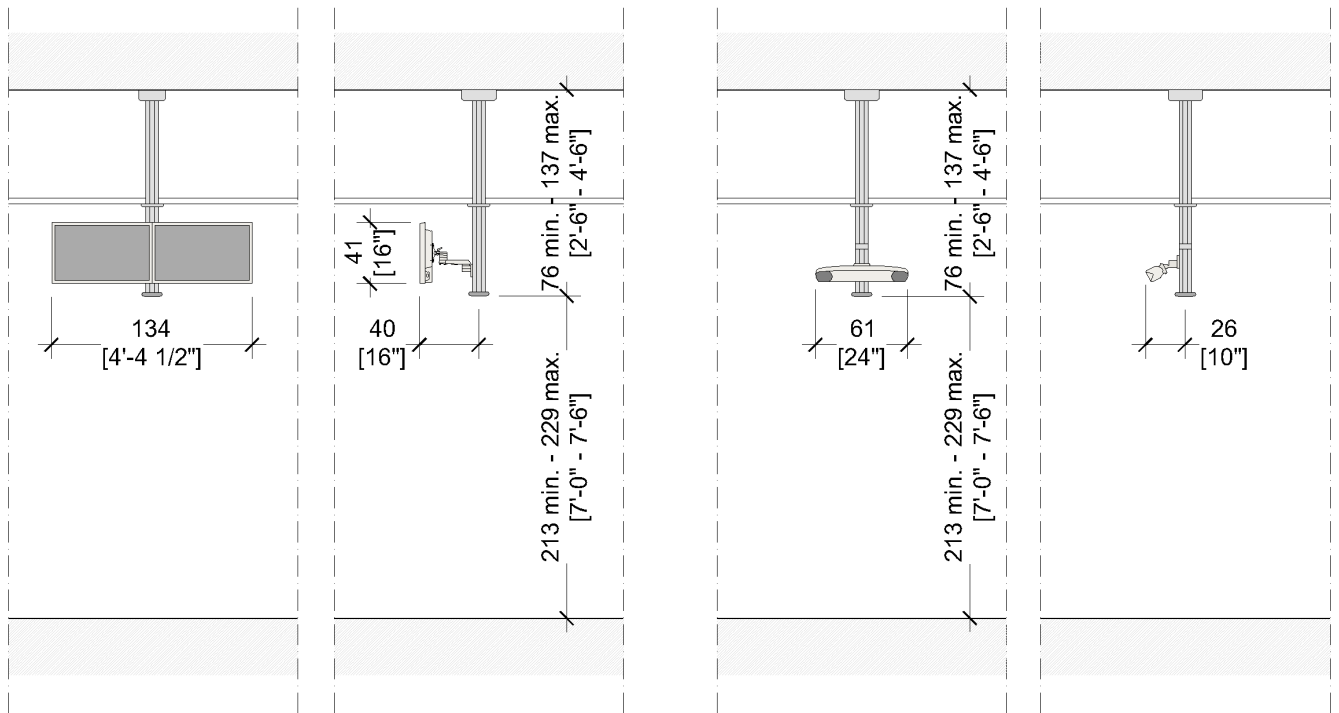


Figure 2-12 IRM and Optical Camera Mounting Heights



**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.

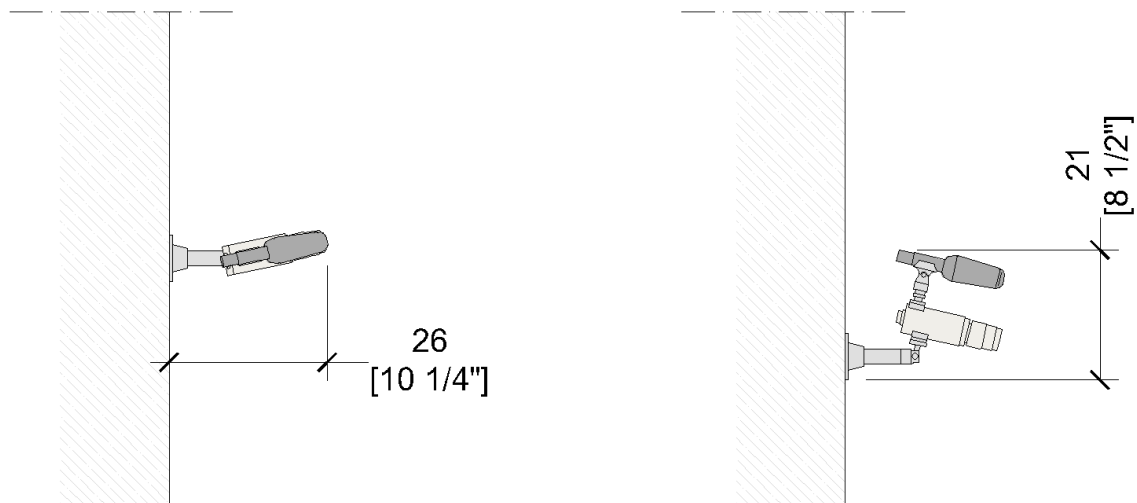


Figure 2-13 Live View Camera Wall Mount (Plan and Side View)

## 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 \(Elevation\)](#)

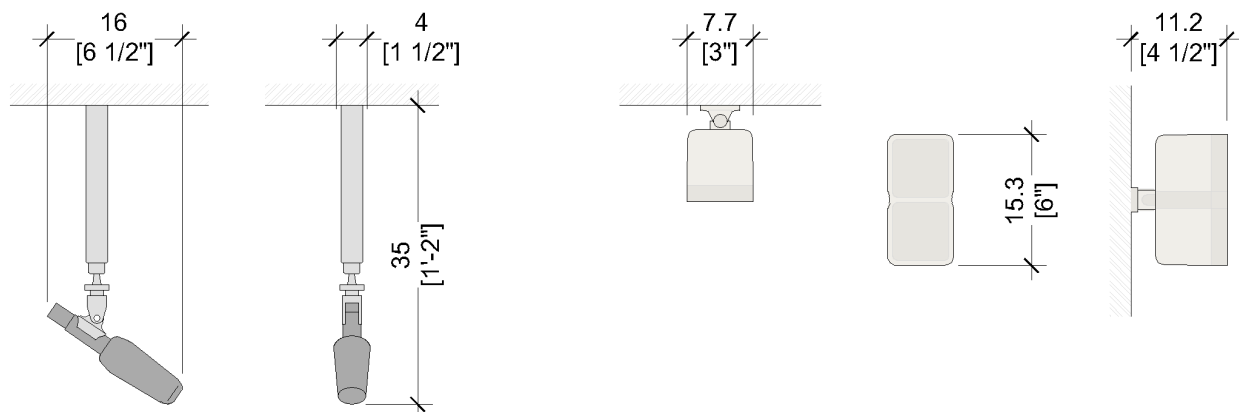


Figure 2-14 Microphone and Speaker Side and Front Elevations



### 3 CUSTOMER REQUIREMENTS

#### 3.1 SPATIAL



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



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.

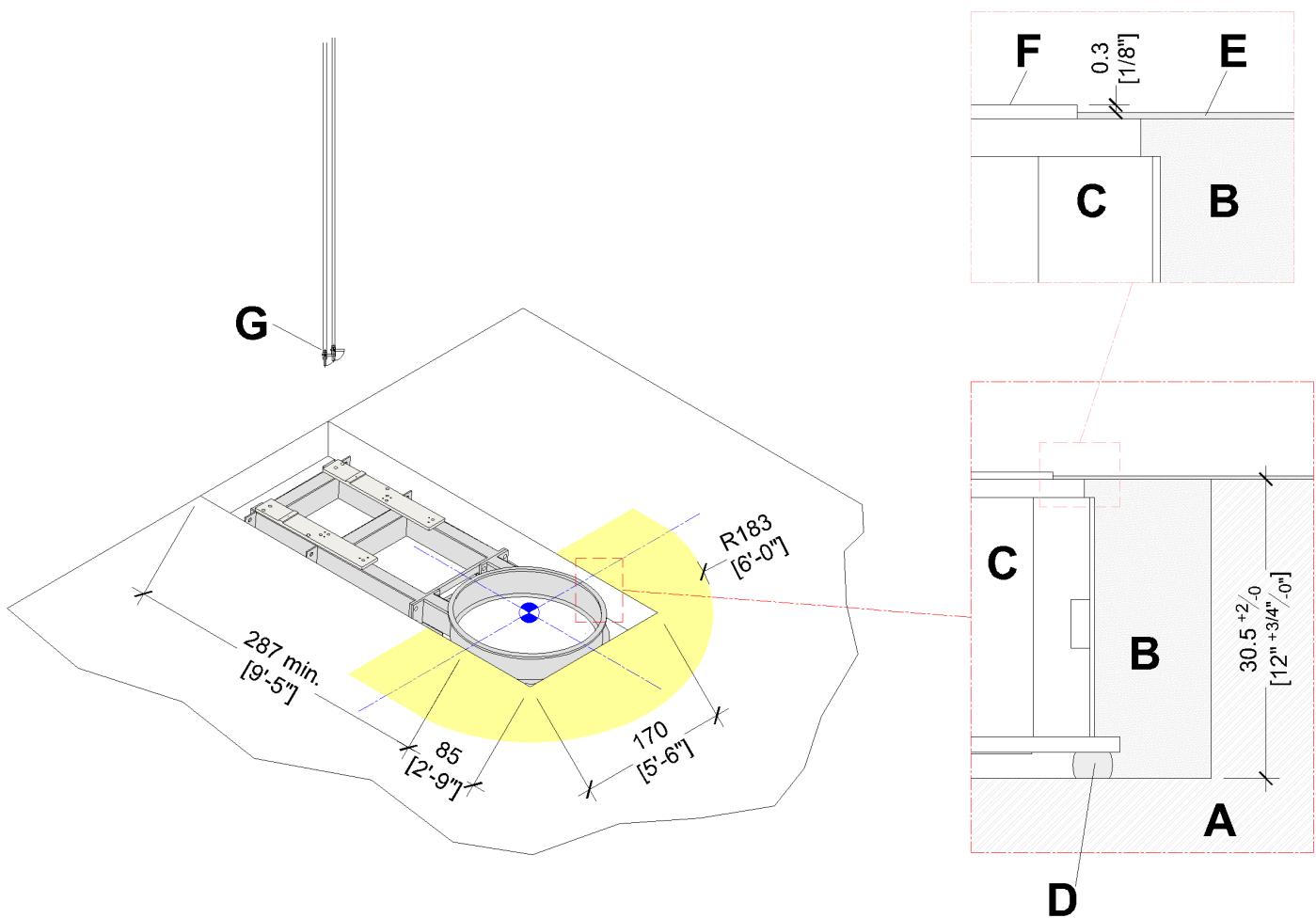


Figure 3-1 Minimum BaseFrame Pit Dimensions

<b>A</b>	Structural Concrete (by Customer)	<b>E</b>	Finished Flooring (by Customer)
<b>B</b>	Backfill Concrete (by Customer)	<b>F</b>	Turntable Trim Ring, BaseFrame
<b>C</b>	BaseFrame (by Varian)	<b>G</b>	Chilled Water Supply and Return Isolation Valves (by Customer)
<b>D</b>	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  $\pm 3\text{mm}$  [ $\pm 1/8"$ ] 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.

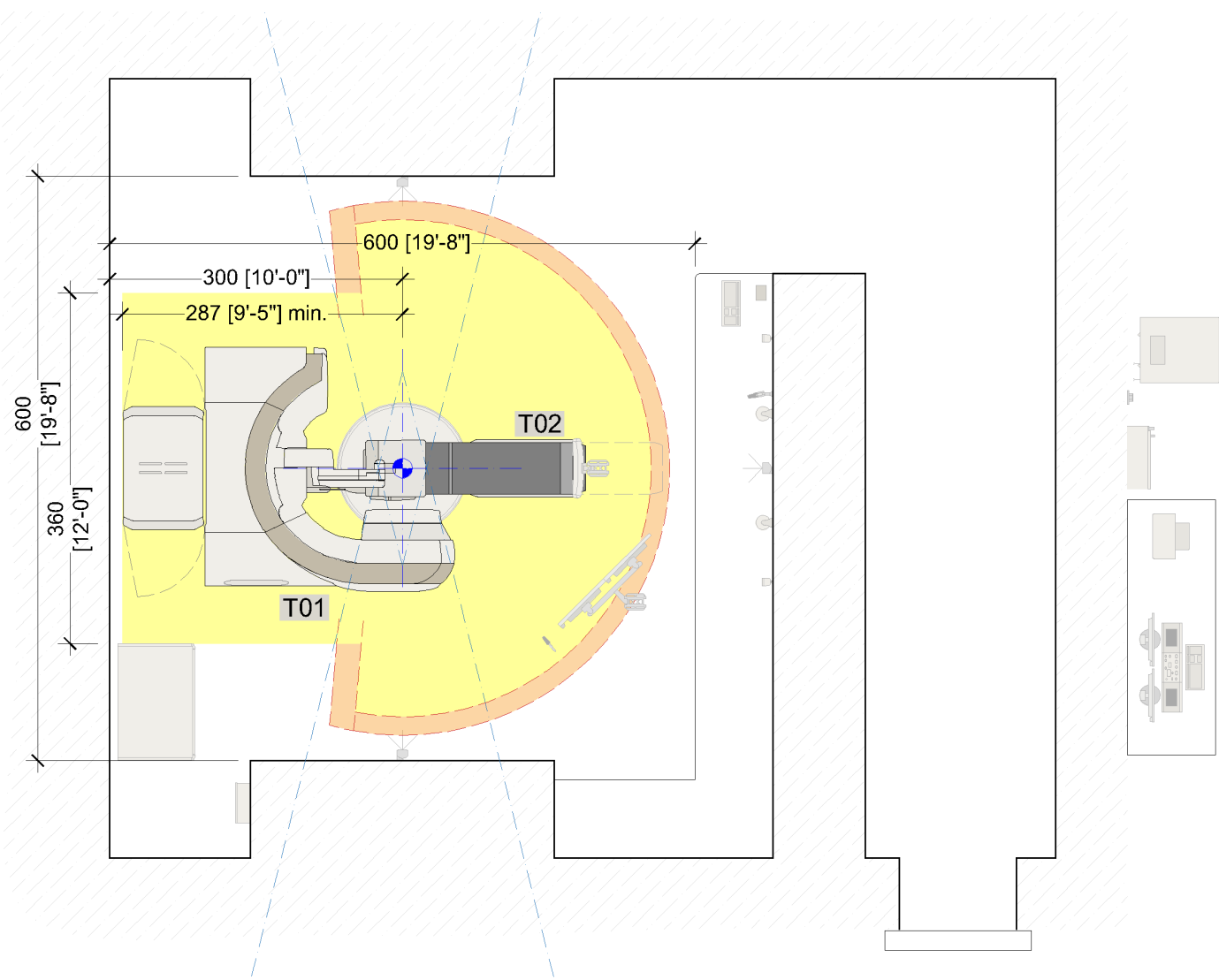


Figure 3-2 Minimum Room Clearances



#### 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

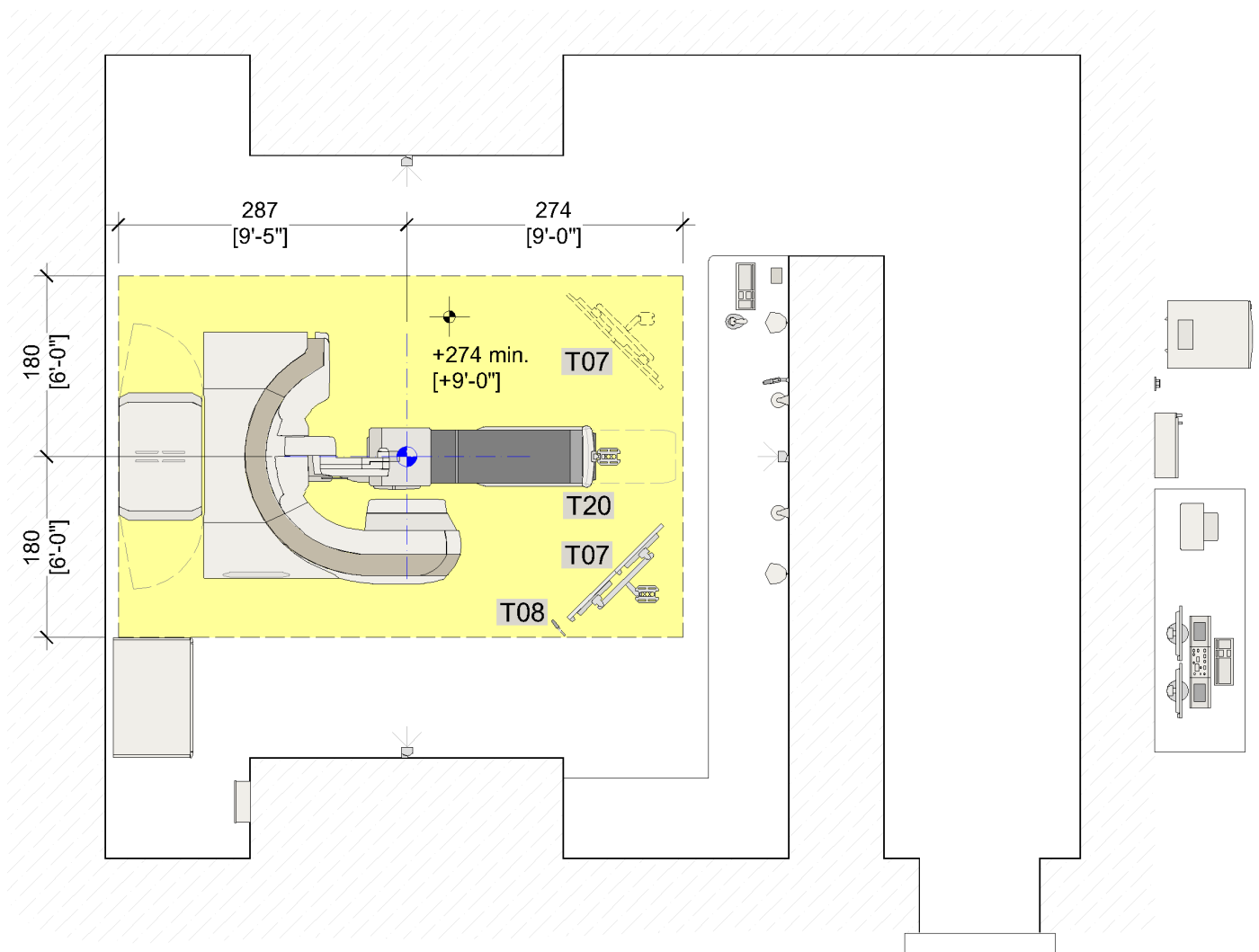


Obstructions between the minimum required couch arc and the maximum couch arc may be considered provided they are reviewed and approved by Varian and the Customer. In specific situations, such as dynamic stereotactic treatment, a larger area may be required.



### 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.

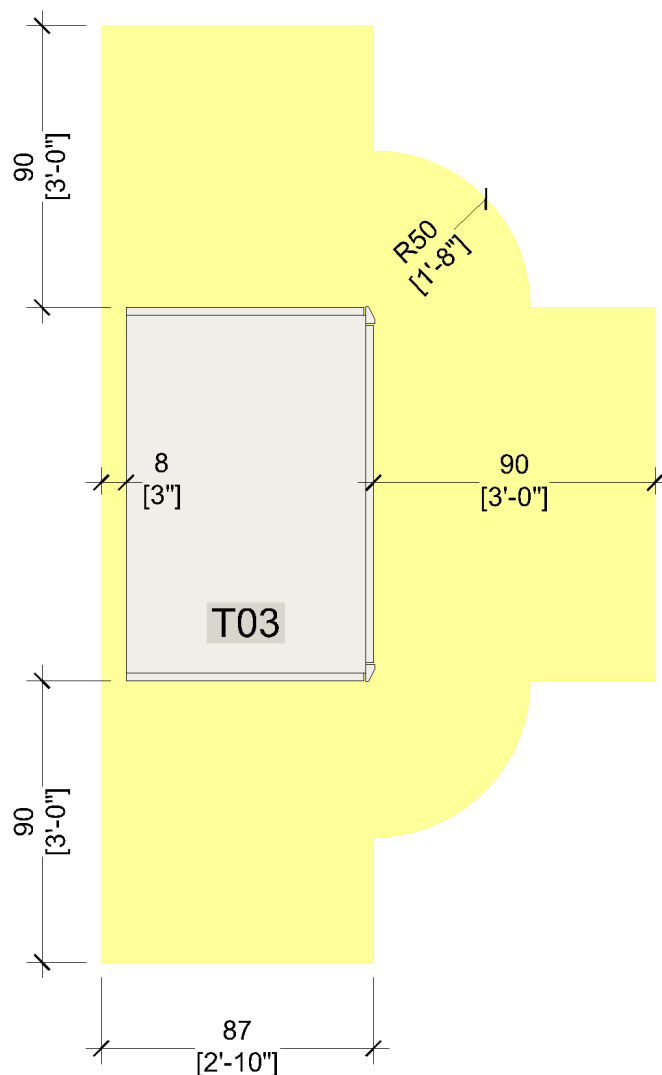


Figure 3-4 Modulator Service Clearances

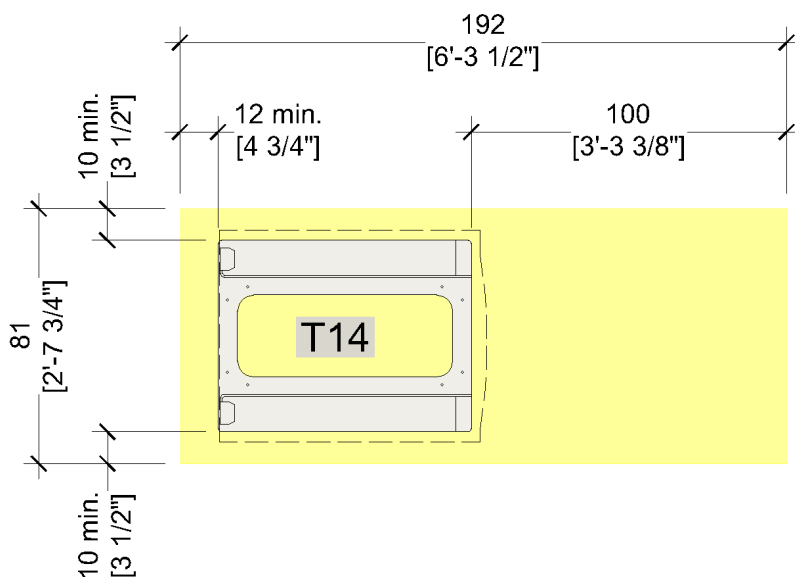


Figure 3-5 Console Cabinet Service Clearances



### 3.1.4 ACCESSORY COMPONENTS LOCATIONS

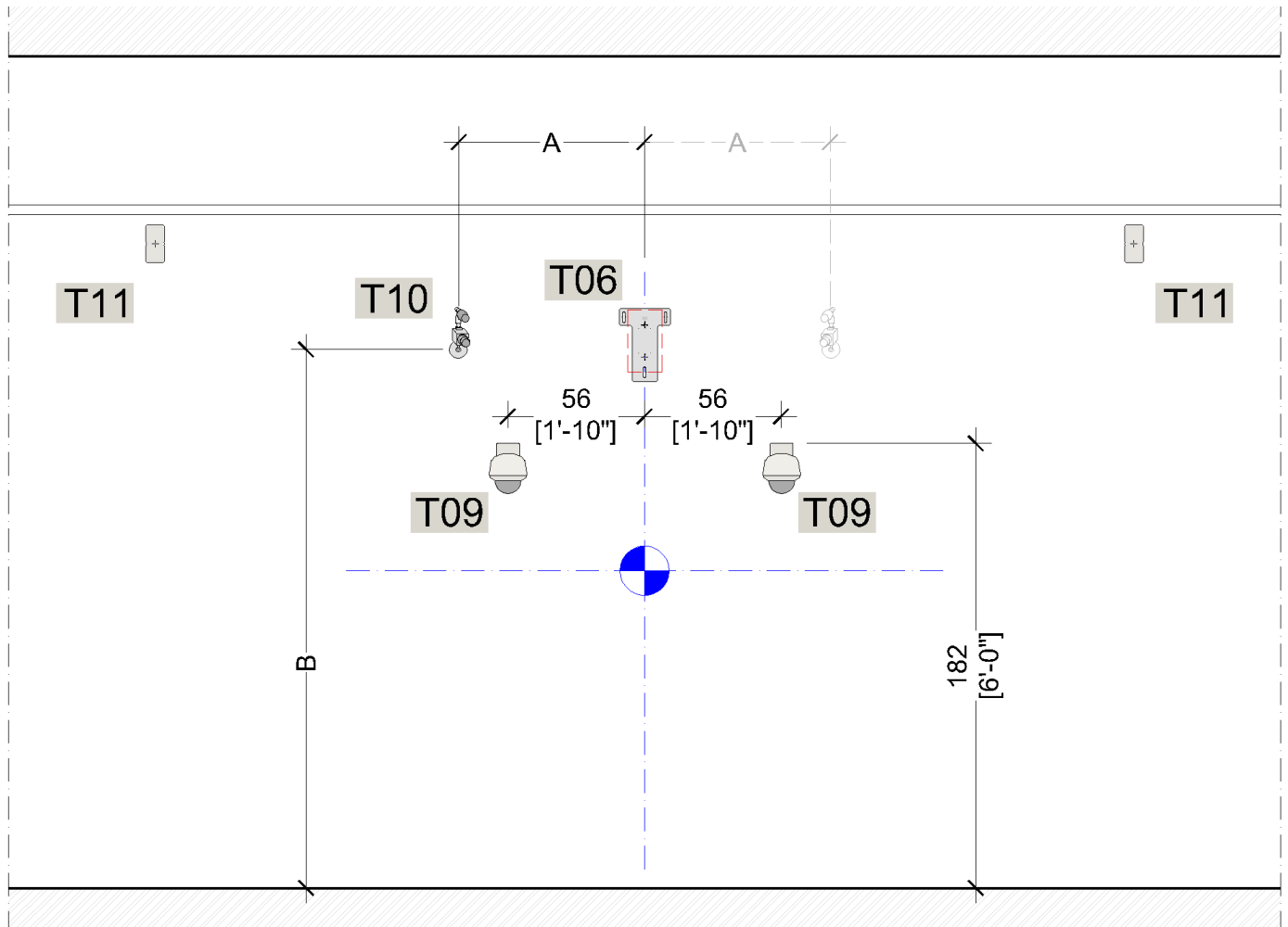


Figure 3-6 Treatment Room Sagittal Wall (Elevation)

- 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.**



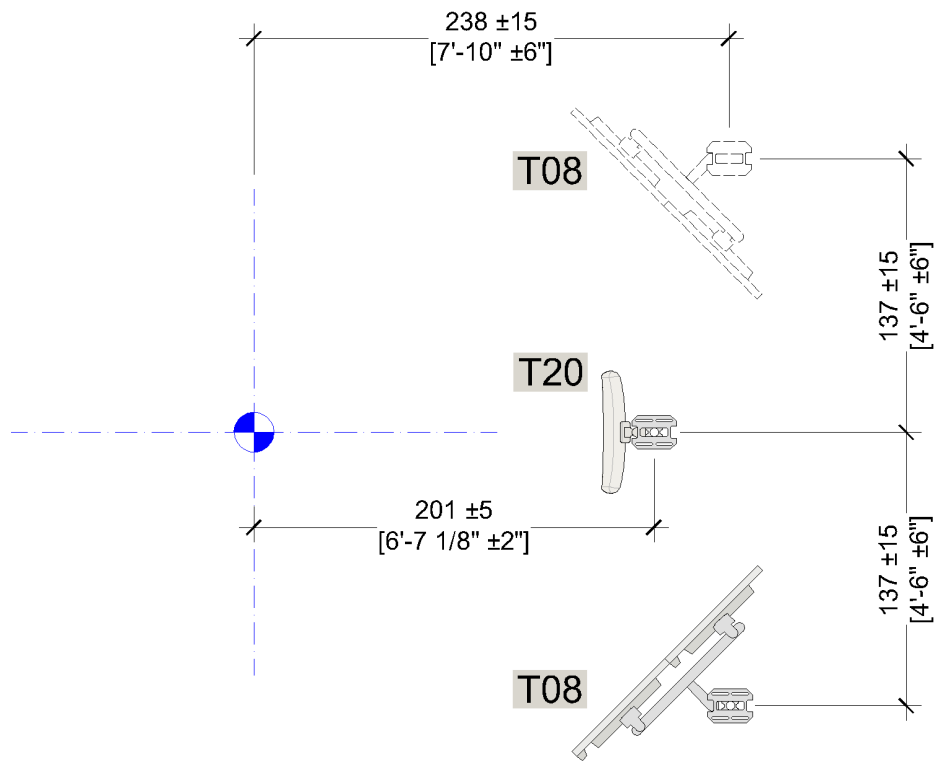


Figure 3-7 Treatment Room Ceiling Mounted Components (Plan)

### 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.

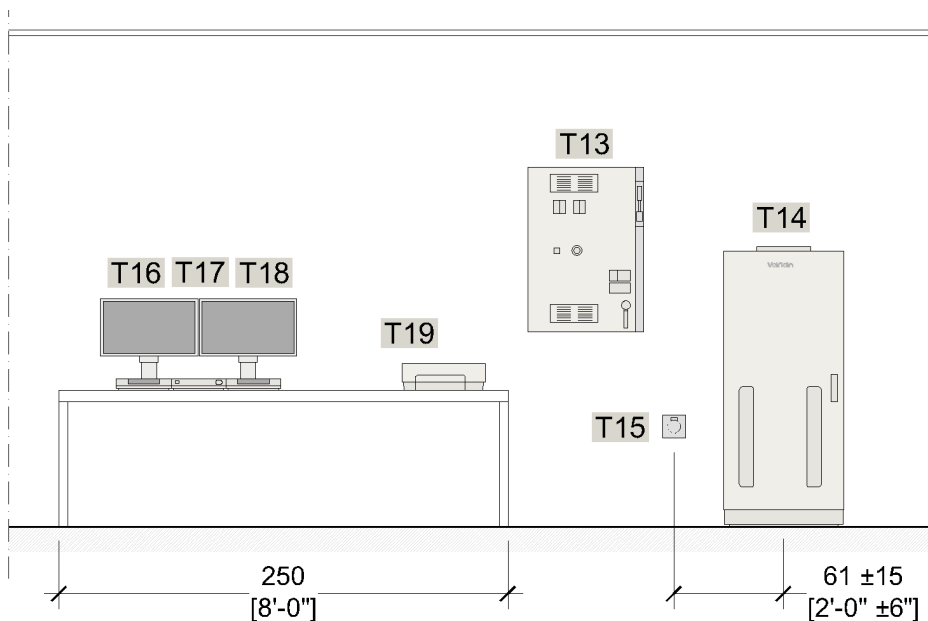


Figure 3-8 Generic Control Console Layout





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	
<b>Input Voltage</b>	200VAC, 208VAC, 240VAC, 380VAC, <b>400VAC</b> , 415VAC, or <b>480VAC</b> (nominal), Line-to-line, 5-wire (3-phase, neutral, and ground [equal in size to the conductors]).
<b>System Current</b>	100A @ 400V 50Hz or 80A @ 480V 60Hz
<b>Console Current</b>	20A @ 208-230V (50/60Hz) (1-phase, neutral, and ground, via the MCB panel)
<b>Line Voltage Regulation</b>	±5%. This is the maximum allowable steady-state deviation from the nominal value selected. Sinusoidal with less than 5% total harmonic distortion.
<b>Maximum Phase Voltage Imbalance</b>	3% of the nominal value. This is the maximum difference between any 2-phase voltages when operating at full load (Beam-On).
<b>Input Frequency</b>	50 or 60 Hz ±1 Hz.
<b>Electrical Loads</b>	7kVA in Stand-By state, 48kVA in Beam-On state. (Including console, 3kVA)
<b>Long-Time Load</b>	48kVA (Including console, 3kVA)
<b>Power Factor</b>	Equal to or greater than 90% The load is inductive and can exhibit a non-sinusoidal current waveform
<b>Source Impedance</b>	2.5% maximum For 45kVA: 208VAC = 24.0mOhm; 400VAC = 88.8mOhm For 48kVA: 208VAC = 22.5mOhm; 400VAC = 83.3mOhm
<b>Max. Fault Current</b>	10,000A.
<b>Mandatory Grounding</b>	See <a href="#">3.2.6 Dedicated Ground/Protective Earth Requirements</a>



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.
- In sight 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

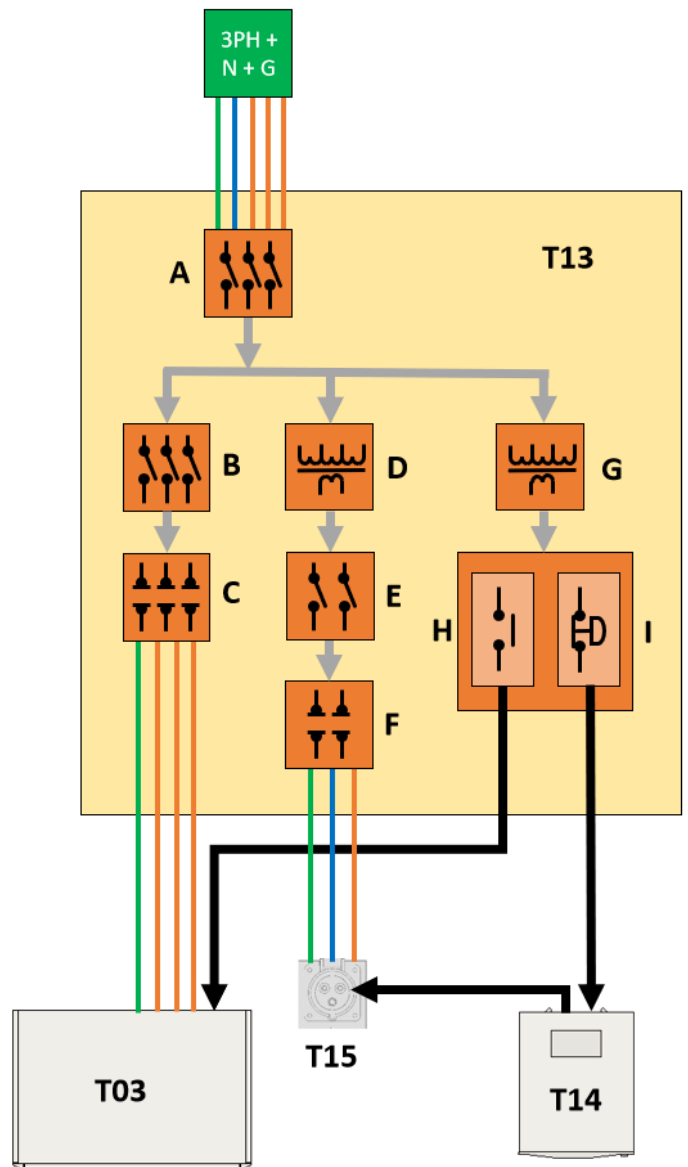
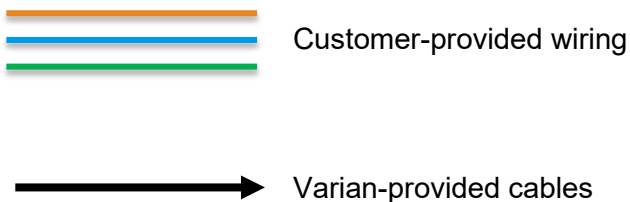


Figure 3-9 Generic MCB Panel Components



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)

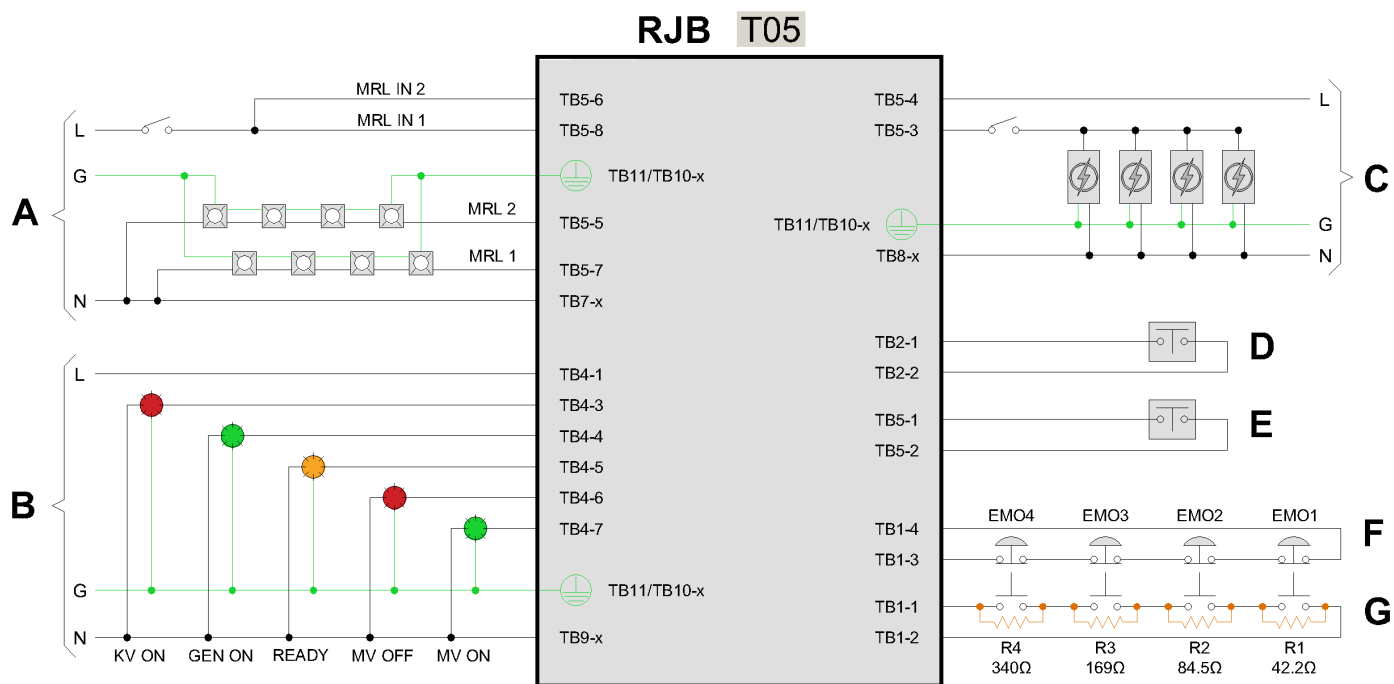
- Wall mount the RJB in the treatment room at a standing height from the finished floor for service accessibility.
- The RJB may be surface-mounted or semi-recessed, up to a maximum of 12cm [4 3/4"].



**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			
<b>A</b>	Main Room Lights	100 – 277 VAC (50/60Hz), 20A maximum	see <a href="#">3.2.9 Room Lighting</a>
<b>B</b>	Warning Lights	100 – 250 VAC (50/60Hz), 10A maximum	see <a href="#">3.2.10.1 Warning Lights</a>
<b>C</b>	Lasers Power Outlet	100 – 250 VAC (50/60Hz), 10A maximum	see <a href="#">3.2.5.1 Treatment Room</a>
<b>D</b>	DC Door Interlock	24 VDC provided by Varian	see <a href="#">3.2.10.2 Door Interlock Switches</a>
<b>E</b>	AC Door Interlock	120 VAC provided by Varian	
<b>F</b>	EMO, “safety loop”, Normally Closed	24 VDC provided by Varian	see <a href="#">3.2.10.3 Emergency Off</a>
<b>G</b>	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.

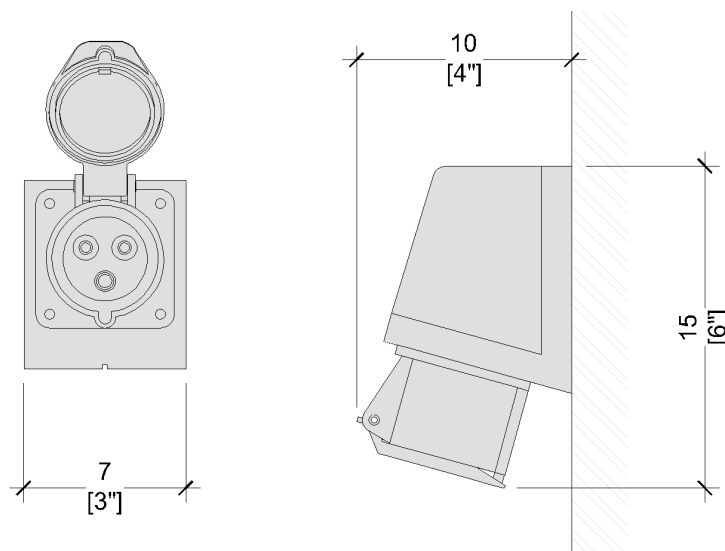


Figure 3-11 Console Cabinet - IEC 60309 Outlet



#### 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 16mm<sup>2</sup> [#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 mm<sup>2</sup> [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](#).

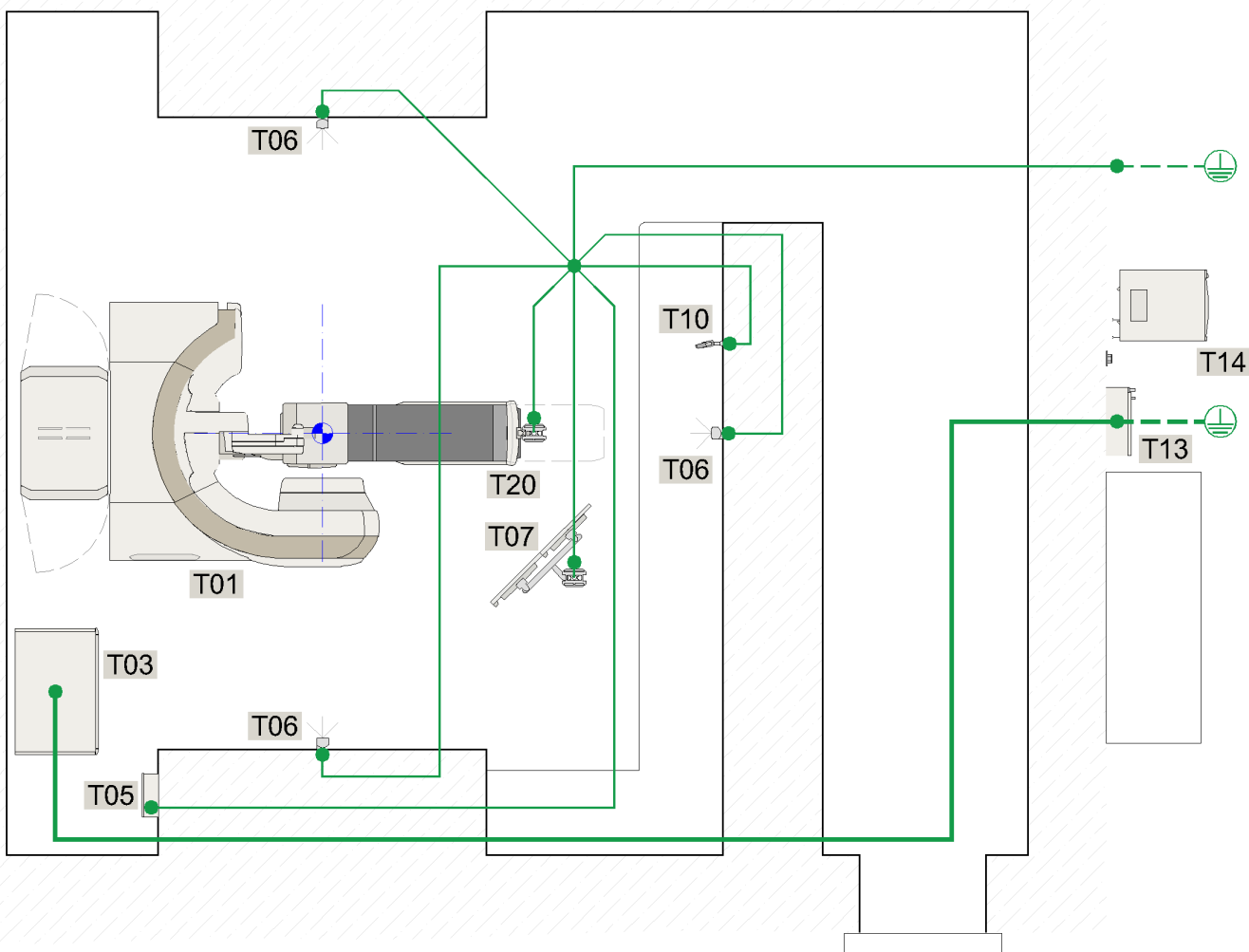


Figure 3-12 Ground/Earthing Conductor Diagram

- 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.

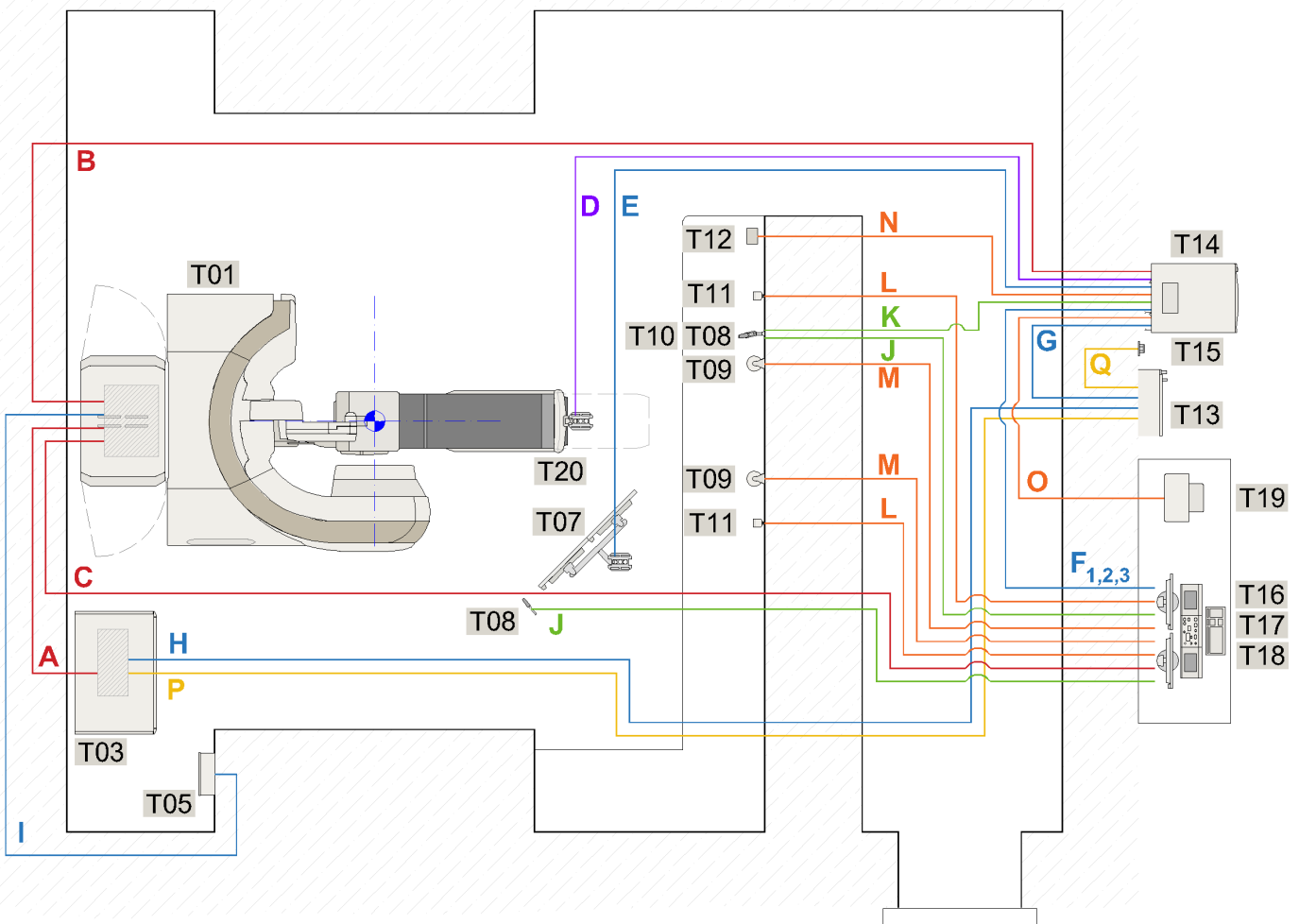


Figure 3-13 Containment Identification



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 <sub>1</sub>	1	n/a		T17 - Control Console
	F <sub>2</sub>	1	n/a		T16 - System Monitors
	F <sub>3</sub>	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.

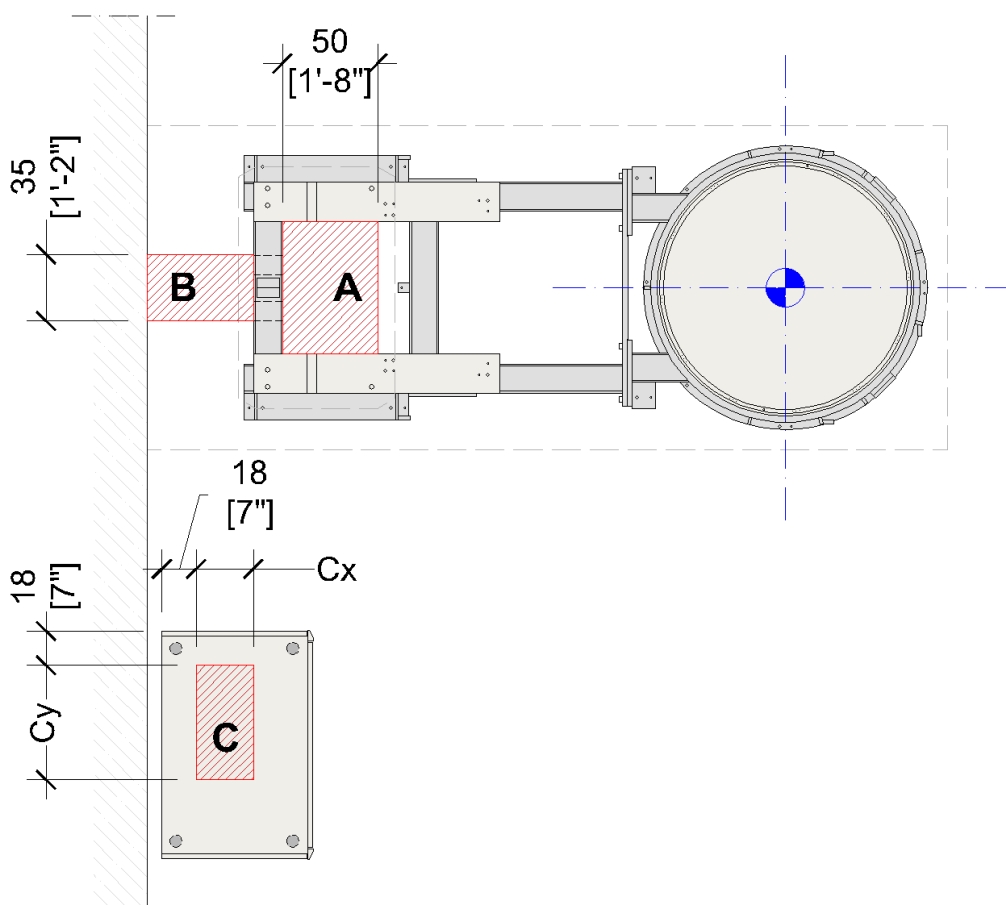


Figure 3-14 BaseFrame and Modulator Cable Access

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

Table 3-7 Warning Lights	
<b>Beam READY</b>	Illuminates to show the MV system has no open interlocks and is ready to treat.
<b>Beam ON</b>	Illuminates during MV beam treatment, mandatory.
<b>Beam OFF</b>	Illuminates when the accelerator is not in a radiation-generating state.
<b>Generator ON</b>	Illuminated to show the KV system is ready to image the patient.
<b>X-Ray ON</b>	Illuminates during KV imaging, mandatory for accelerators with On-Board Imaging.



#### NOTICE

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.



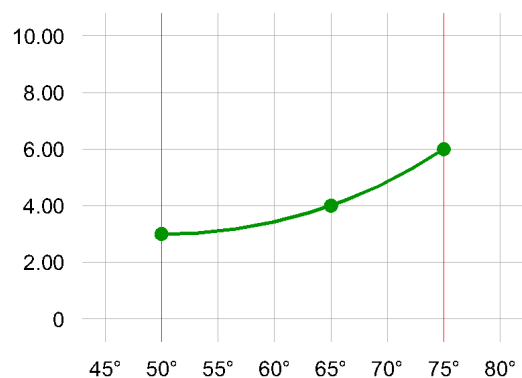
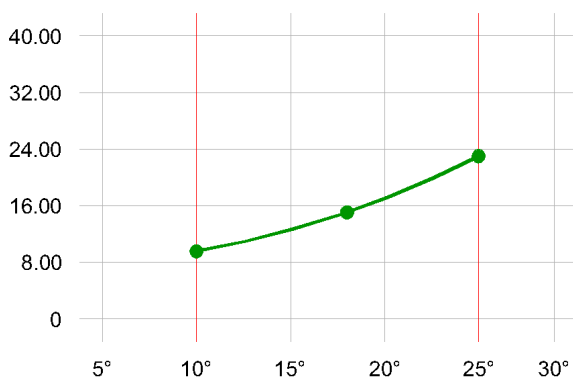
- Varian recommends isolating the Oncology domain from the Enterprise Network.
- The Console Cabinet (**T14**) requires a static IP address.
- Refer to Varian network configuration guide - MICAP, contact Varian PM for document details.



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	
<b>Ideal Coolant Flow</b>	18° C. at 15 LPM [65° F. at 4 GPM]
<b>Flow Range</b>	10 - 23 LPM [3 - 6 GPM]
<b>Incoming Coolant Temperature Range</b>	10 – 25° C [50 - 75° F]
<b>Glycol Content of Coolant</b>	Not to exceed 50%
<b>Minimum, Low Power Coolant Heat Load</b> <i>(Required, 24 hours)</i>	2 kW (6,830 Btu/hr)
<b>On State Coolant Heat Load</b> <i>(no energy selected)</i>	10 kW (34,152 Btu/hr)
<b>Ready/Energy Select State Coolant Heat Load</b>	12.5 kW (42,690 Btu/hr)
<b>Maximum, Beam-On Coolant Heat Load</b>	25 kW (85,379 Btu/hr)
<b>Normal Treatment Cycle Coolant Heat Load</b>	13.3 kW (45,422 Btu/hr)
<b>Pressure Differential between the Inlet and Outlet Fittings at the TrueBeam Stand</b> <i>(while in the Ready State)</i>	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]
<b>Maximum Input Pressure</b>	6.9 bar [100 PSI]
<b>Pressure Drop</b> <i>(under maximum heat load conditions)</i>	1.7 bar [24 PSI]
<b>Average Water Temperature Rise</b> <i>(during all states w/closed bypass valve)</i>	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.

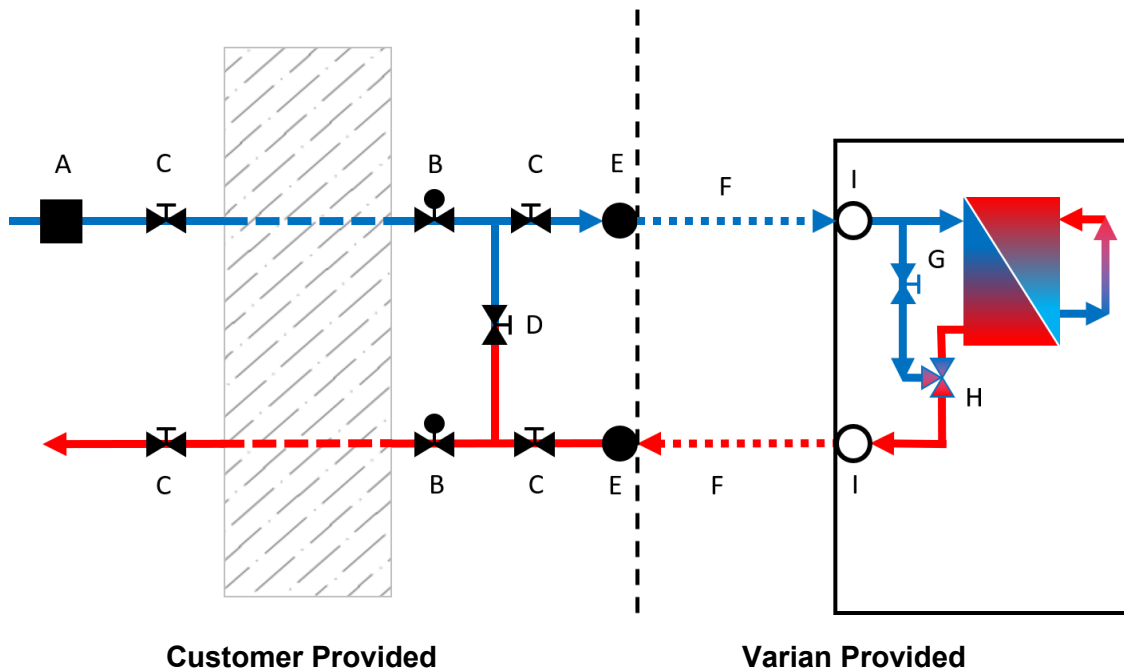


Figure 3-16 Coolant System Schematic

- 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.

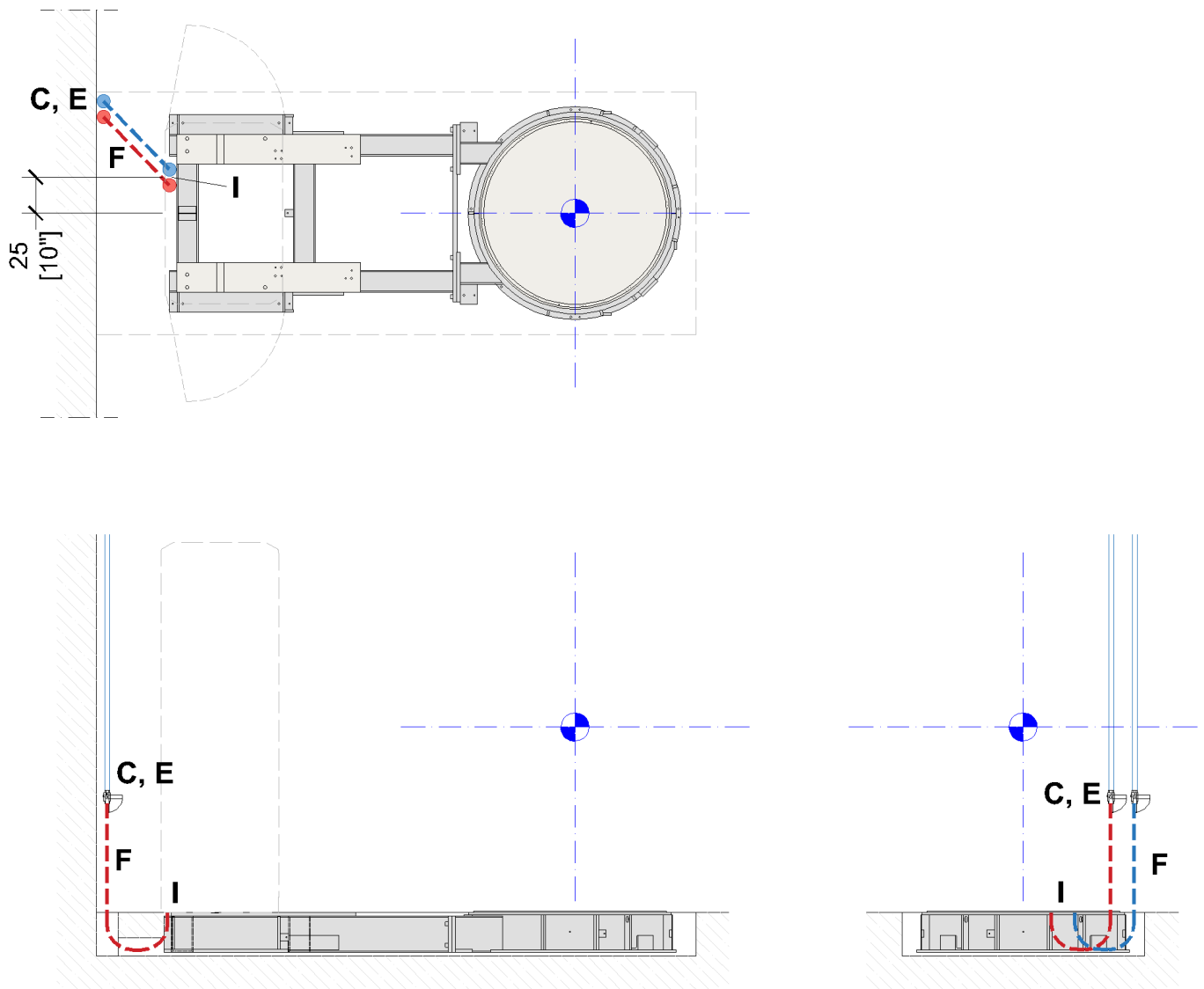


Figure 3-17 Cooling Line Access – Plan, Side, and Front



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 <sub>3</sub> )	>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.

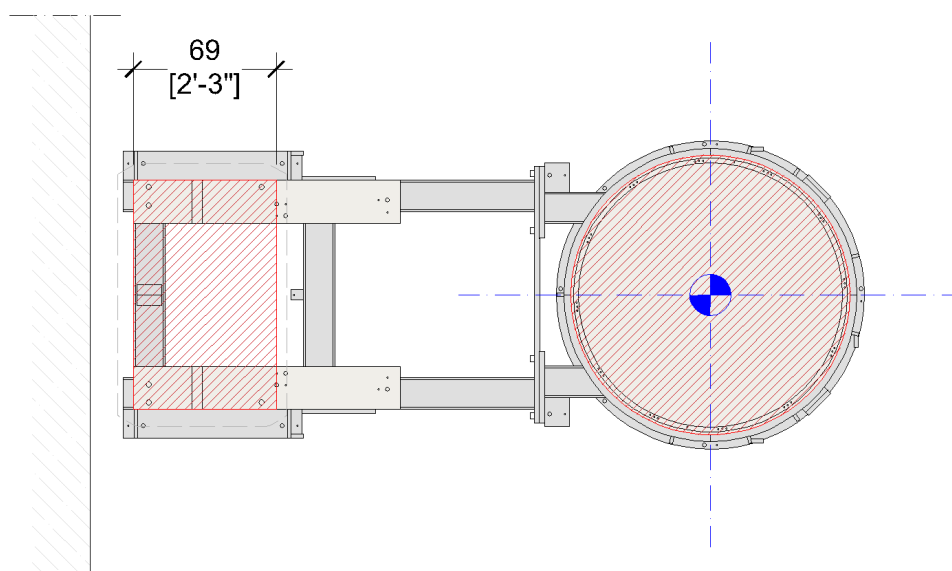


Figure 3-18 Finished Flooring Voids at the BaseFrame



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

<b>Sub Project No.</b>	<b>1</b>	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.	
<b>Task Name</b>	<b>Varian BaseFrame Installation</b>		
<b>Task Overview</b>	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.		
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>• BaseFrame pit concrete must be cured, per the Site-Specific Drawings (SSD).</li> <li>• The treatment room must be watertight</li> <li>• The floor around the isocenter must be level per <a href="#">3.1.1 BaseFrame Pit</a> of the PPG.</li> <li>• Power and lighting must be available in the room</li> <li>• Isocenter and the finished floor level (FFL) are defined.</li> <li>• An approved delivery path must be available</li> <li>• Customer Sub-contractors must be available.</li> <li>• Seismic calculations and fixings available (If required)</li> </ul>		
<b>Responsibilities</b>	<b>Task</b>	<b>Varian</b>	<b>Customer</b>
	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
<b>Duration</b>	2 days		
<b>Customer Supplied Resources &amp; Materials</b>	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 <sup>2</sup> [2000psi, 6-7" slump, 3/8" aggregate ~ 1. 6 yds <sup>3</sup> ] Welding contractor for seismic brackets plus approved anchors.		
<b>Results</b>	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.		
<b>Acceptance</b>	Acceptance document filled in by Varian and returned - RIG-BF.		



## 4.4 MCB AND RJB

<b>Sub Project No.</b>	2	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.	
<b>Task Name</b>	<b>Main Circuit Breaker (MCB) and Relay Junction Box (RJB)</b>		
<b>Task Overview</b>	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.		
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>• The treatment room must be watertight.</li> <li>• Site-Specific Drawings (SSD) for the location of MCB &amp; RJB</li> <li>• Isolated power source available</li> <li>• Mains incoming wire installed.</li> <li>• Dedicated earth termination bar installed</li> </ul>		
<b>Responsibilities</b>	<b>Task</b>	<b>Varian</b>	<b>Customer</b>
	Schedule delivery date	X	X
	Unpack RJB and MCB (if supplied)		X
	Install the RJB, MCB, and IEC outlet per the SSD		X
	Install cable containment		X
	Connect to an isolated power source		X
	Install power to console cabinet per PPG		X
	Wire peripherals to RJB		X
	Testing as defined by Varian and local regulations		X
	Dispose of Varian packing materials		X
<b>Duration</b>	Customer defined		
<b>Customer Supplied Resources &amp; Materials</b>	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		
<b>Results</b>	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.		
<b>Acceptance</b>	Inspected by Varian Project Manager, Pre-Installation checklist		



## 4.5 PRE-INSTALLATION KIT (PIK)

<b>Sub Project No.</b>	<b>3</b>	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.	
<b>Task Name</b>	<b>Installation of the Pre-Installation Kit (PIK)</b>		
<b>Task Overview</b>	To take receipt of the Varian provided PIK, assemble components, and install them in their final position.		
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>• Scheduled delivery date</li> <li>• BaseFrame installed and accepted</li> <li>• Ceiling height defined</li> <li>• Isocenter lines are marked on walls for the laser mounting plates</li> <li>• Site-specific plans available for component locations</li> <li>• Cable containment installed</li> </ul>		
<b>Responsibilities</b>	<b>Task</b>	<b>Varian</b>	<b>Customer</b>
	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
<b>Duration</b>	1-2 Days dependent on options		
<b>Customer Supplied Resources &amp; Materials</b>	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		
<b>Results</b>	All Varian-provided mounting plates and brackets are installed. Posts are configured to meet the height requirements.		
<b>Acceptance</b>	Inspected by Varian Project Manager, Pre-Installation checklist		



## 4.6 DELIVERY AND RIG

<b>Sub Project No.</b>	<b>4</b>	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.	
<b>Task Name</b>	RIG		
<b>Task Overview</b>	Installation of the Machine and Peripherals		
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>• Sub-projects 1 – 3 completed</li> <li>• System cables pulled in the conduits</li> <li>• Storage locations for spares and accessories</li> <li>• Power cable (customer supplied) in modulator pull box</li> <li>• Electrical supply available, lockout tag of electrical supply.</li> <li>• Network point available</li> </ul>		
<b>Responsibilities</b>	<b>Task</b>	<b>Varian</b>	<b>Customer</b>
	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	
<b>Duration</b>	5 Days		
<b>Customer Supplied Resources &amp; Materials</b>	Access to the site for out of hours working Contractors to connect power and water		
<b>Results</b>	Machine delivered and installed		
<b>Acceptance</b>	Inspected by RIG Contractor and PM – RIG-HT		



## 4.7 RADIATION AND SAFETY

<b>Sub Project No.</b>	<b>5</b>	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.		
<b>Task Name</b>	Radiation and Safety Surveys			
<b>Task Overview</b>	Completion of Radiation and Safety Forms			
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>• All facility services are fully operational</li> <li>• Machine installed</li> <li>• Room clinically ready</li> </ul>			
<b>Responsibilities</b>	<b>Task</b>	<b>Varian</b>	<b>Customer</b>	
	Arrange date for IPA	<b>X</b>	<b>X</b>	
	Perform IPA	<b>X</b>	<b>X</b>	
	Critical Exam (safety interlocks etc. Europe).	<b>X</b>		
	Failure correction		<b>X</b>	
	Radiation survey (Room shielding)		<b>X</b>	
<b>Duration</b>	2 Days			
<b>Customer Supplied Resources &amp; Materials</b>	RPA or physicist availability Radiation meter Neutron meter Water tank and CC13 chambers or equivalent Dosimetry equipment and chambers			
<b>Results</b>	Passed IPA - passed Radiation Survey and Critical Exam.			
<b>Acceptance</b>	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).

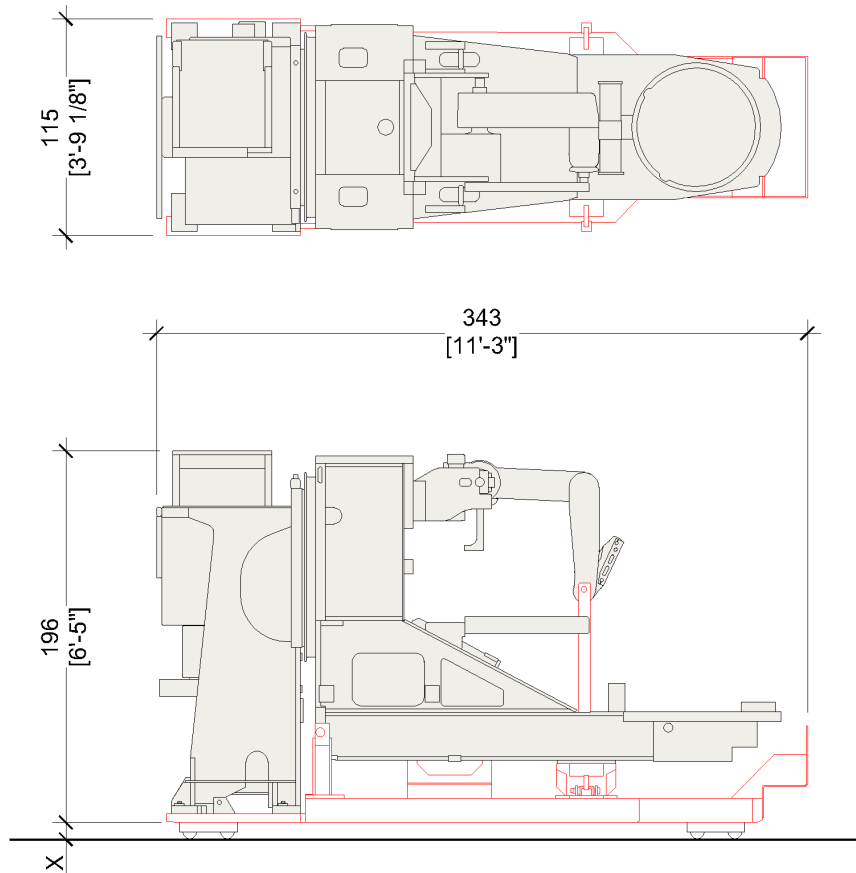
The recommended door clearance height is 213cm [7'-0"].



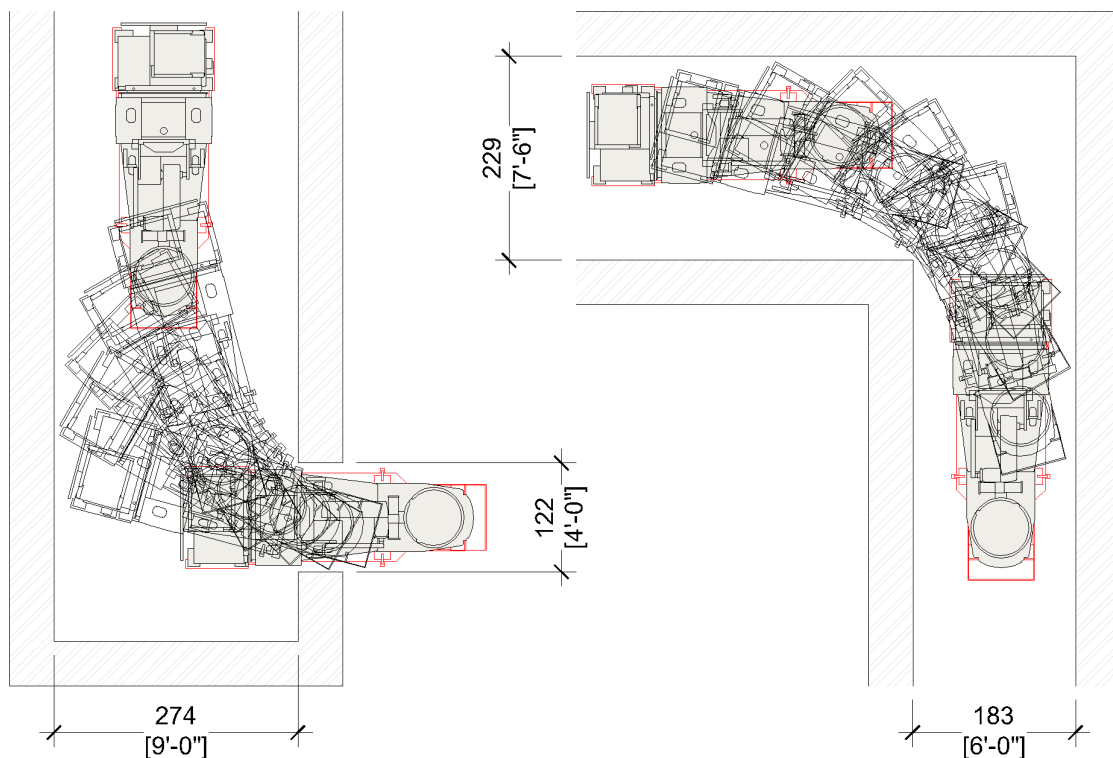
## 2.1 STANDARD CONFIGURATION

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

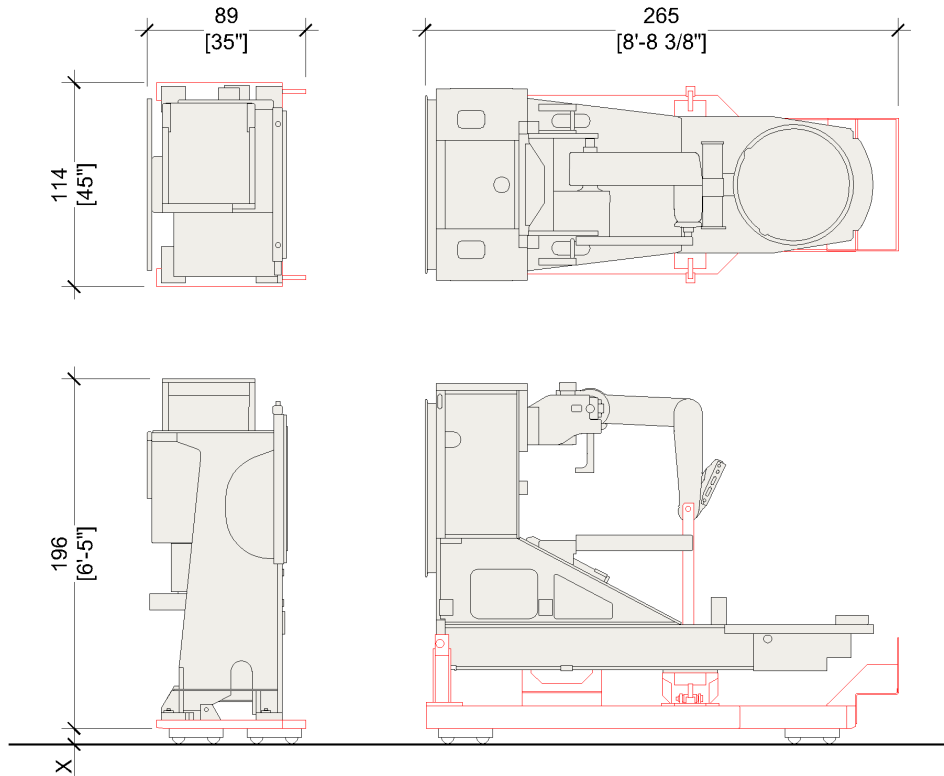




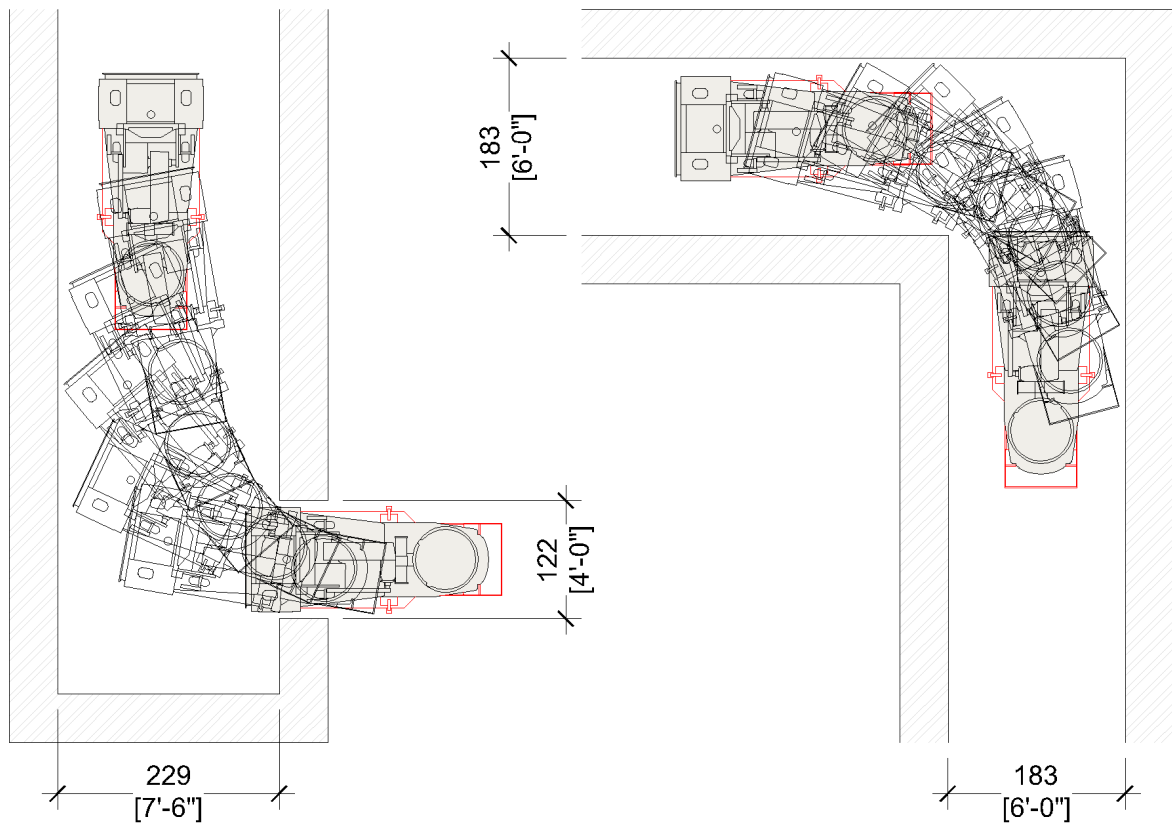
## 2.2 “FACTORY BREAK” CONFIGURATION

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 Break" Configuration

