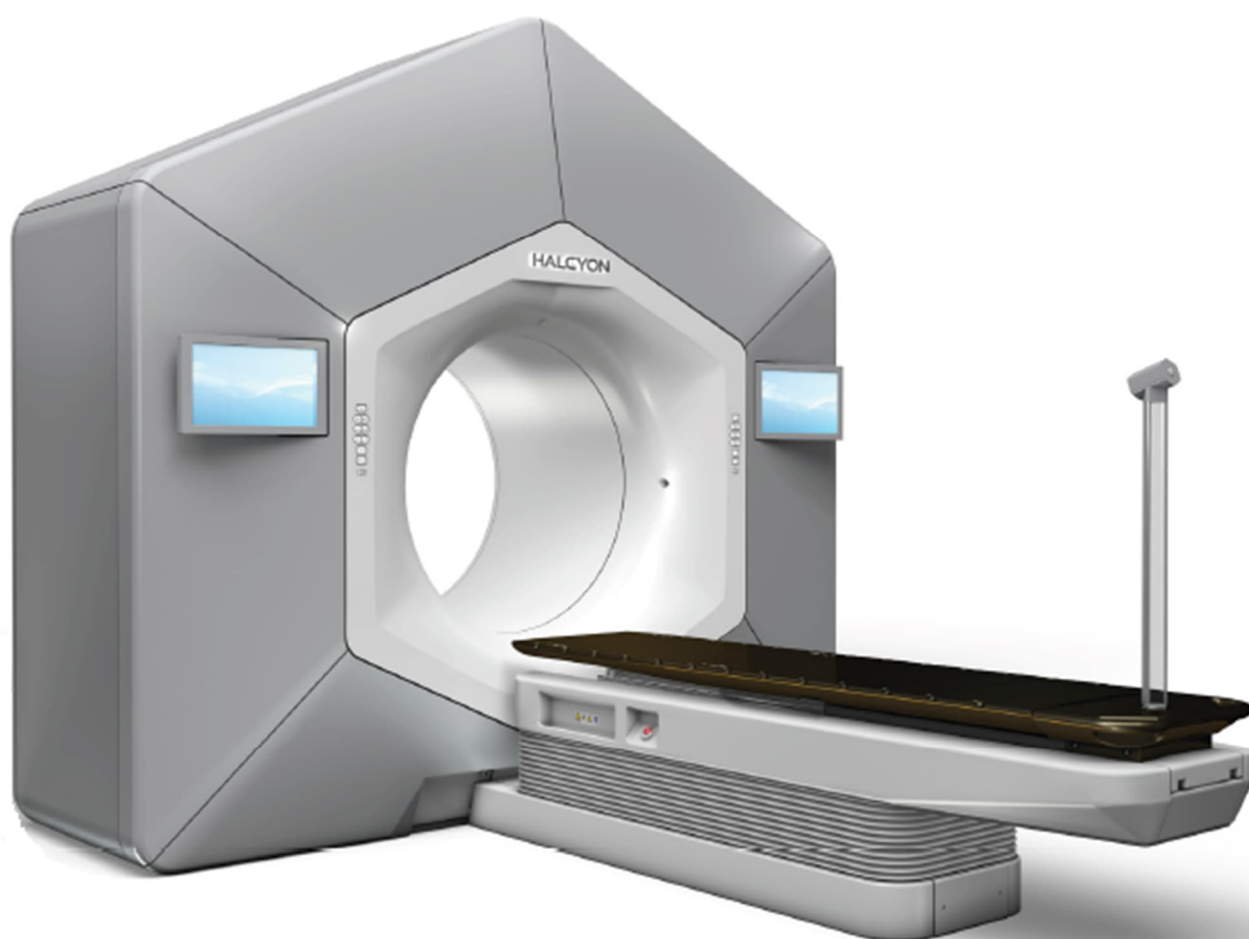


varian

HALCYON PRODUCT PLANNING GUIDE



SCAN FOR CURRENT RELEASE

PPG-AL-G

AUGUST 2025

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<p>CONVENTIONS</p>	<p>All dimension units are shown as Metric (primary) followed by Imperial (secondary).</p> <p>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. The metric to imperial construction dimension conversions may vary due to industry standards.</p> <p>All listed component weights are within a $\pm 5\%$ tolerance, not including system cabling or coolant, if applicable.</p>
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Executive Summary

Intended Audience

The intended audiences for the PPG are any Varian external Customers or their representatives.

Purpose

This document is designed to assist customers and their representatives in understanding the minimum requirements to enable a Varian Halcyon System to be installed. This document is a reference for the Halcyon system to be installed. This document 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, and references.
- Varian System - System components, size, weight, and limitations.
- Customer Requirements - Room sizes, utility, and environmental requirements in trade sections.
- Project Management - Customer project 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 Halcyon system. Refer to [4 Project Management](#) for more information.

Typical Lead-times and Durations

Min. lead-time from Customer order – **4 months** (may vary, confirm with Varian PM)

Third-party products (Power Conditioner, Chiller, etc.) – **10 weeks**

Standard machine installation and acceptance – **10 days** (Total, not including commissioning)

- Equipment Delivery and Rig-In – **1 day**
- Machine Cabling and Power up – **4 days**
- Initial Beam on and Acceptance Preparation – **2 days**
- SW installation – **1 day**
- Acceptance – **1 day**
- Clean-Up, Finalize Paperwork – **1 day**

Commissioning – **1 to 2 days** (Customer's discretion)

[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 completed must be approved by the Varian PM before the system can be delivered. The Varian installation engineer must have exclusive possession of the treatment area during system installation.



REVISION HISTORY

REV	DATE	DESCRIPTION OF CHANGE	AUTHOR NAME
G	August 2025	<ul style="list-style-type: none"> • Cover, Added QR code • 1-1, Revised note to reference shielding document • 1.3, Removed note referencing product compatibility matrix • Figure 2-1, Updated System dimensions • Table 2-4, Updated Monitor imperial dimensions • Figure 2-5, Updated the Monitors • 2.5, Added new note on the 380V Step-Up Transformer • Figure 2-7, Added mounting hole dimensions to IEC outlet • Table 2-7, Removed note on Quart Phantom • 3.1.1, Revised the Notice for more clarity • Figure 3-2, Revised Treatment Room Floor Pit levelness area • Figure 3-6, Revised the chilled water access zone • Figure 3-7, Revised drawing • 3.2, New Note on mounting bracket for power supplies • 3.3.1, Moved Notice to 3.3.3 • Table 3-3: <ul style="list-style-type: none"> • Revised the System Current Capacity • Revised the Console Capacity • Moved Electrical Loads to 3.3.1.1 • Added In-Rush Current • Moved Power Factor to 3.3.1.1 • Revised Source Impedance • 3.3.1, New Note, formerly 3.3.2 Step-Up Transformer • 3.3.1, Moved existing Note to 3.3.2 • 3.3.1.1, New Section "Electrical Loads" • 3.3.1.2, Revised Source Impedance description • 3.3.3.1, Added input "to" and output "from" the MDP • Table 3-4, Add note on ground conductor parity • Figure 3-10, Revised the "MV ON" and "MV OFF" colors • 3.3.4.1, New Note for Customer-provided components • 3.3.5.1, Added new outlet requirement for RJB • 3.3.5.2, New Figure 3-11 IEC Outlet • 3.3.5.2, Revised Notice for IEC receptacle • 3.3.6, Revised Grounding description • 3.3.6, Converted Caution to Warning, revised text • 3.3.7: <ul style="list-style-type: none"> • Added to Notice, 'do not terminate conduits' • Added link to Table 2-8 • Added to Note, page 32 'include distance' • Figure 3-13, Added Conduit K • Table 3-8, Added max length for conduit runs F, G, H • Table 3-8, Added new conduit K • 3.3.9, Revised bullet regarding the RJ 45 wiring pattern • Table 3-10: <ul style="list-style-type: none"> • Revised incoming temperature range • Remove Pressure Differential • Revised Inlet Pressure, 3.5 bar [50 PSI] • Revised the Pressure Drop, varies • Removed average water temperature rise 	DKU



		<ul style="list-style-type: none"> • Figure 3-14, Updated and Added pressure drop • Figure 3-15, Updated Coolant System Schematic • 3.4.1, New Notice regarding water pipe routing and floor drains • Figure 3-16, Revised Chilled Water Access Plan • Figure 3-17, Removed dimension to isolation valves • New Figure 3-18 Chilled Water Access (front view) • 3.4.2, New Note regarding location of isolation valves • 3.5.1, Removed bullet point regarding positive air pressure • 4.3, Revised Task and Acceptance lines • 4.4, Added to Customer responsibility to install cover plates • Appendix, New Table1 Environmental Storage and Transport Conditions • Appendix Table 2, Revised weight(s) and dimension(s) for following: <ul style="list-style-type: none"> • Box A, Gantry Crate • Box B, Couch Crate • Box C, Console Cabinet Crate • Box D, Utility Crate • Appendix Figure 1, Revised Stand and Gantry rigging dimensions 	
F	August 2021	<ul style="list-style-type: none"> • Table 2-1, Updated stand and total weight • Table 2-2, Updated Console Cabinet weight • Table 2-5, Updated MDP weight • Table 2-6, Updated RJB weight • 3.2, added bullet for Console Cabinet location • 3.3.1, revised name - Residual Current Device (RCD) • Appendix Table 2, updated rigging weight 	DKU



TABLE OF CONTENTS

1	Overview.....	7
1.1	Shielding.....	9
1.2	Compatibility.....	9
1.3	References.....	9
2	Varian System	10
2.1	Gantry and Couch	10
2.2	Console Cabinet.....	11
2.3	Floor Positioning Bracket.....	12
2.4	System Monitors and Control Console.....	12
2.5	Pre-Installation Kit (PIK)	13
2.6	Phantoms	15
2.7	Cables	16
2.8	Optional subsystem Components	17
3	Customer Requirements	18
3.1	Treatment room	18
3.2	Control Area	23
3.3	Electrical.....	24
3.4	Plumbing	36
3.5	Environmental Specifications.....	40
3.6	Vibration	40
3.7	Finishes.....	41
3.8	Acoustic.....	42
3.9	Fire Protection	42
4	Project Management.....	43
4.1	Responsibilities.....	43
4.2	Objectives.....	43
4.3	PIK Installation.....	44
4.4	Rig and Installation	45
4.5	Acceptance and Radiation Safety	46
Appendix A Shipping and Rigging		47
1	Crate Shipping Weights and Sizes	47
2	Rigging Information.....	47



1 OVERVIEW

Varian Medical Systems designed the Halcyon linear accelerator so that modern 21st-century radiotherapy treatment techniques could be offered in a way that greatly streamlines the treatment delivery process and clinical operations.

Utilizing advanced technology that was developed and pioneered on this treatment delivery platform, the Halcyon system represents a complete reformulation of the linear accelerator concept around operational efficiency for the clinic with a focus on the patient experience. The clinical operator is guided through the workflow by the user interface so that a given patient can be treated in a reproducible manner during every therapy session.

To effectively treat lesions throughout the entire body with high clinical quality, the foundational treatment capability of the Halcyon system is built upon image-guided intensity-modulated radiotherapy. Thus, the imaging and beam modulation properties of the Halcyon system are differentiated from that of a typical C-arm linear accelerator.

The system is integrated with the Eclipse treatment planning system and ARIA oncology information system software environments to support a range of Halcyon clinical operational roles in a variety of network configurations ranging from a stand-alone multi-purpose linac in a single vault clinic to a dedicated role, such as an image-guided RapidArc specialty machine within a fleet of linacs in a large-hospital network.

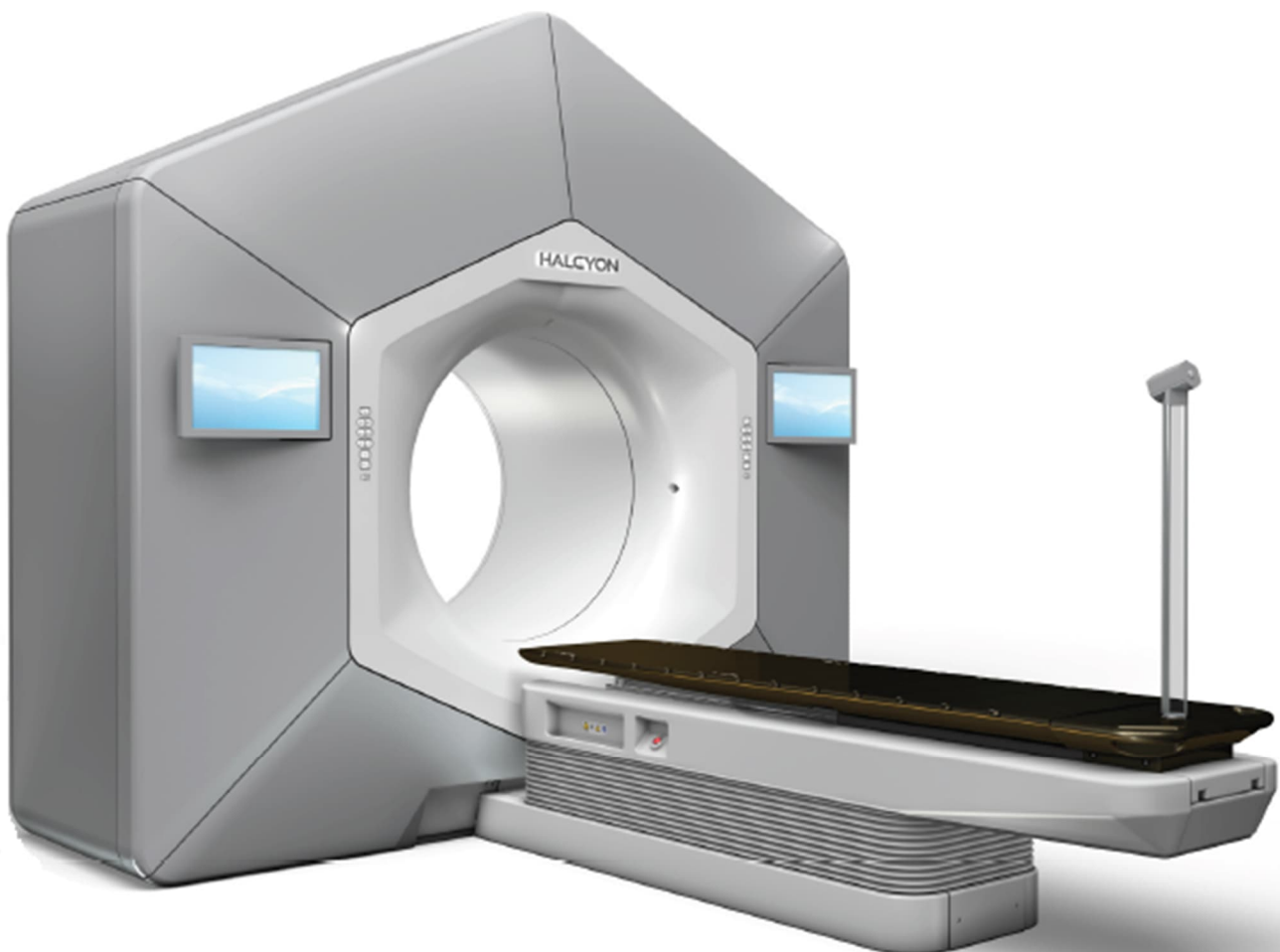


Figure 1-1 Halcyon Gantry and Couch

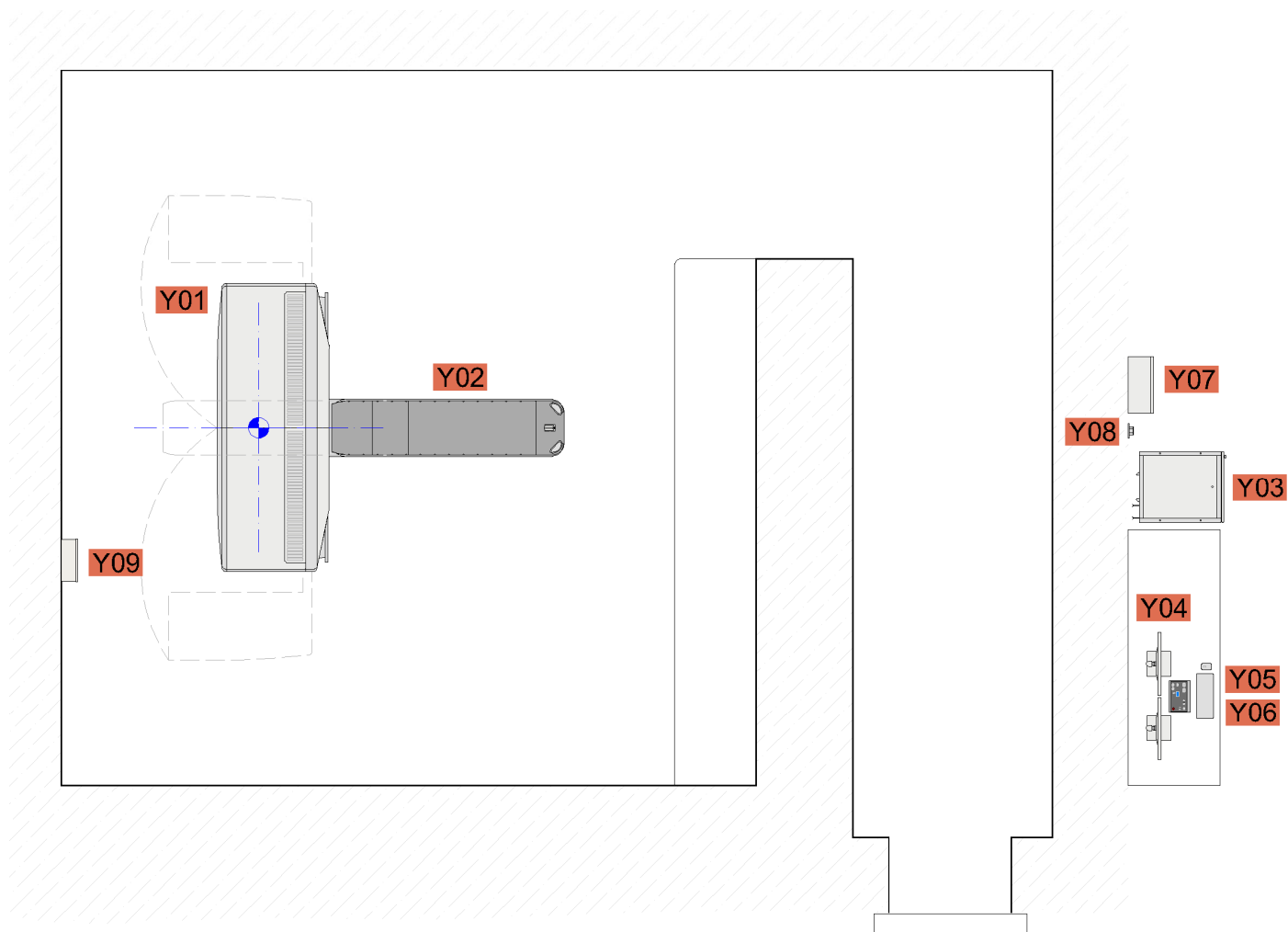


Figure 1-2 Halcyon System Components (*sample room layout*)

Table 1-1 Halcyon System Components			
Y01	Stand & Gantry	Y03	Console Cabinet
	In-Room Monitors (<i>integrated</i>)	Y04	System Monitors (<i>Image and Data</i>)
	Positioning Laser (<i>integrated</i>)	Y05	Control Console
	Speaker (<i>integrated</i>)	Y06	USB Keyboard and Mouse
	Patient Microphone (<i>integrated</i>)	Y07	Main Disconnect Panel (MDP)
Y02	Treatment Couch	Y08	IEC 60309 Power Outlet
	Live View Camera (<i>integrated</i>)	Y09	Relay Junction Box (RJB)



The Halcyon system is designed to fit into small rooms with an option for direct entry through a suitably shielded door, or into a room with a maze entry, as shown above. The room layout in [Figure 1-2](#) is for component identification purposes only.



1.1 SHIELDING



WARNING

Varian Medical Systems will not have approval or responsibility for any matters related to the adequacy of radiation protection walls, barriers, or safety devices. All radiation shielding designs must comply with codes and regulations of all Authorities Having Jurisdiction (AHJ) and must be approved by the Customer's or Facility's Physicist of Record. The responsibility for these designs lies solely with the Customer/Facility. Factors such as hours of operation, patient workload, accelerator energy, and shielding materials should be considered when calculating shielding requirements. Improper radiation shielding can result in serious injury or death.



Refer to [1] SD-AL-Shielding for more information on Halcyon's internal 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 Halcyon Accelerator and associated video monitors should be located outside of the 100 μ T (1 Gauss) magnetic field.

1.2 COMPATIBILITY



NOTICE

All treatment room finishes and equipment must be compatible with ionizing radiation.

1.3 REFERENCES

The following reference/support documents are available from Varian Site Planning or the Varian PM.

- [1] SD-AL-Shielding
- [2] Varian Accelerator Pre-Installation Checklist
- [3] Halcyon and Ethos Radiotherapy System Customer Release Note (CRN)
- [4] MICAP Network Configuration Guide
- [5] SD-Step-Up Transformer (for 380VAC sites)



2 VARIAN SYSTEM

The Halcyon standard system components are listed in [Table 1-1 Halcyon System Components](#).

2.1 GANTRY AND COUCH

The Halcyon system is a self-contained single unit. Patient positioning and user interface devices are integrated into the stand and gantry covers.

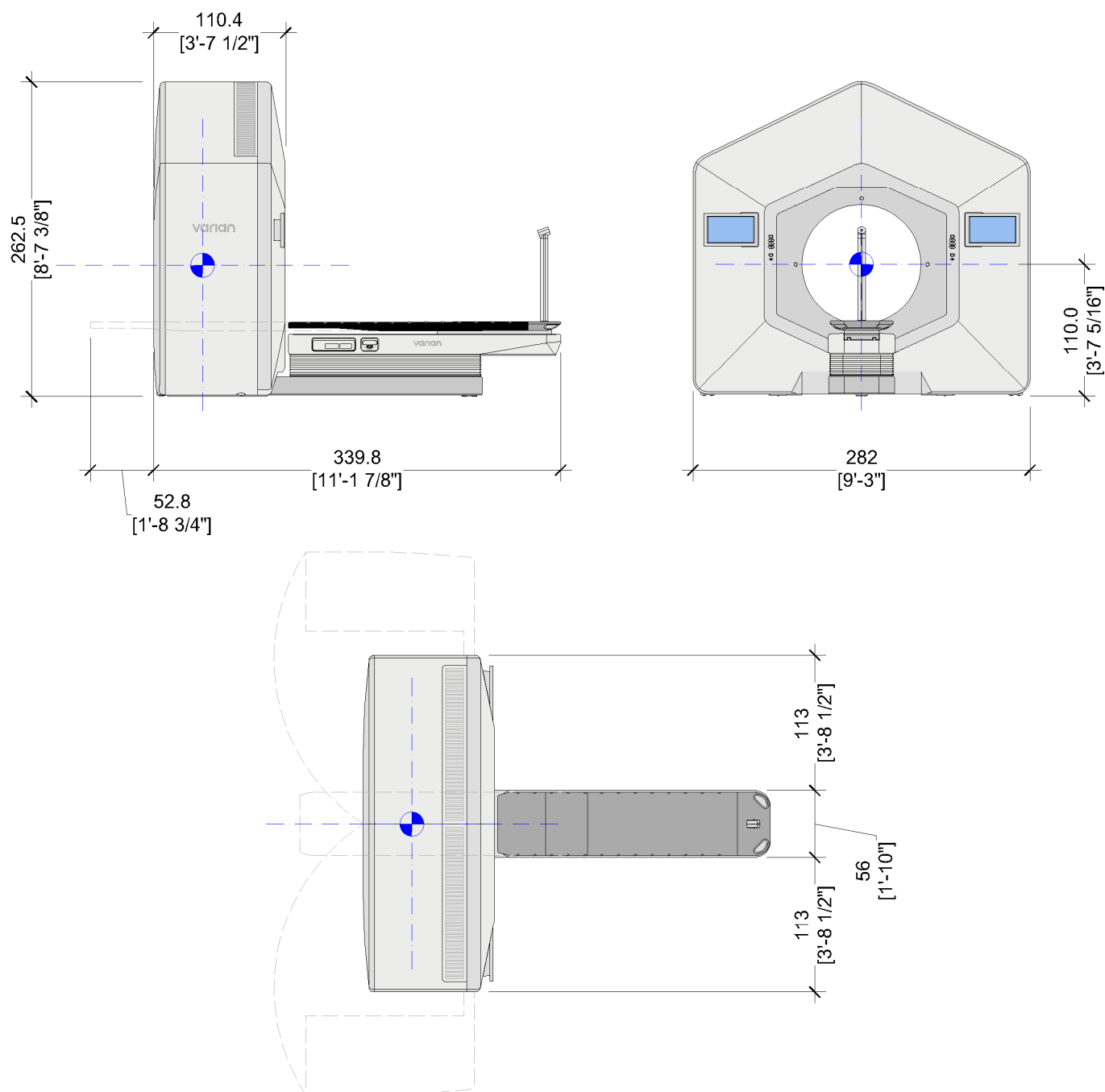


Figure 2-1 Halcyon System Dimensions

Table 2-1 Halcyon System Weights		
Description	kg	lb
Gantry and Covers	4575	10086
Couch	420	926
Total System (<i>installed</i>)	4995	11012



2.1.1 STAND INTEGRATED COMPONENTS

- (2) In-Room Monitors
- Patient Positioning Lasers
- Intercom Speaker and Microphone

2.1.2 COUCH INTEGRATED LIVE VIEW CAMERA

A "Live View" camera is mounted on the treatment couch, enabling the therapist to visually monitor the patient during treatment.

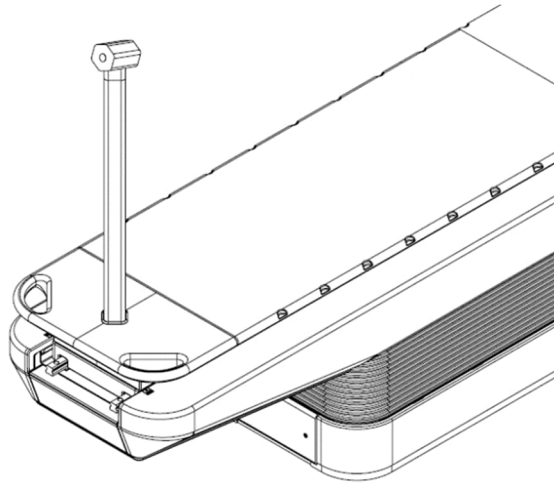


Figure 2-2 Couch Mounted Live View Camera

2.2 CONSOLE CABINET

The Console Cabinet houses rack-mounted computers and imaging equipment required to run the system and user interface. The Console Cabinet is powered by the Main Disconnect Panel. See [Table 3-2](#) for details of the specific requirements and electrical connection required for the cabinet. An optional excess cable storage box is shown installed on top of the cabinet. Ominous

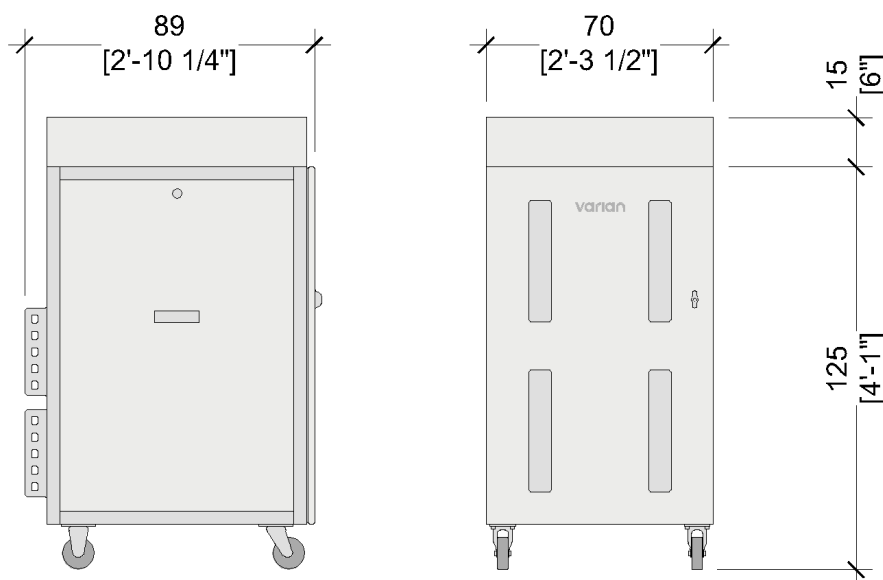


Figure 2-3 Console Cabinet

Table 2-2 Console Cabinet Weight		
Description	kg	lb
Console Cabinet	310	683

2.3 FLOOR POSITIONING BRACKET

The Floor Positioning Bracket allows for the proper positioning of the Console Cabinet. Refer to [3.2.1](#) for installation clearance requirements.

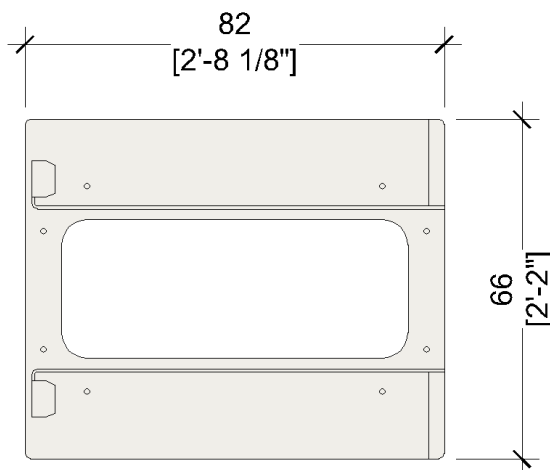


Figure 2-4 Floor Positioning Bracket

Table 2-3 Floor Positioning Bracket Weight		
Description	kg	lb
Floor Positioning Bracket	23.5	52

2.4 SYSTEM MONITORS AND CONTROL CONSOLE

These are the Halcyon user interface components that are located in the control area.

- (2) 27" Monitors
- Control Console, a.k.a "Dedicated Keyboard"
- Keyboard and Mouse, wired

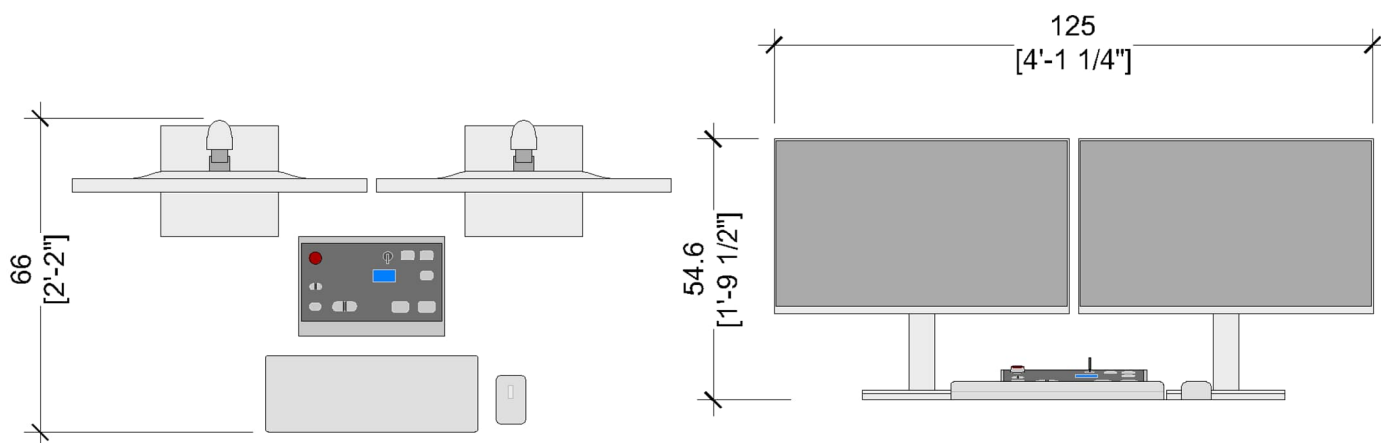


Figure 2-5 Typical Console Layout

Table 2-4 Console Component Weights and Sizes				
Description	kg	W x D x H (cm)	lb	W x D x H (in)
Monitor (with stand)	7.5	61.5 x 27.6 x 54.6	16.5	2'-0 1/4" x 10 7/8" x 1'-9 1/2"
Control Console	1.8	29.6 x 20.3 x 7.3	4.0	11 3/4" x 8" x 2 3/4"
Keyboard (wired)	n/a	43 x 12.7 x 2.6	n/a	1'-5" x 5" x 1"
Mouse (wired)	n/a	6.2 x 11.3 x 3.8	n/a	2 3/8" x 4 1/2" x 1 1/2"

2.5 PRE-INSTALLATION KIT (PIK)

The PIK includes a Main Disconnect Panel and Relay Junction Box. These components are delivered to the site by the Varian PM for customer installation prior to the Halcyon delivery. The Varian-supplied components must be installed in compliance with local codes and regulations, using customer-provided and appropriately sized mounting hardware engineered to support the component weights.



In countries where 380VAC is standard, a Step-Up Transformer will be provided by Varian as part of the PIK, refer to [3.3.1](#).

2.5.1 MAIN DISCONNECT PANEL (MDP)

The MDP serves as the primary distribution point for power to the Halcyon system. It includes safety features to control power to the system.

- Provides a single point of connection for the site's 3-phase power to the Halcyon System
- Splits the mains power into two independent switchable power outputs
 - Three-phase delta power output to the Halcyon Stand, which matches the incoming 3-phase voltage phase-to-phase, refer to [3.3.1](#) for more information.
 - Single-phase power output to the Console Cabinet via an IEC60309 outlet that is included with the MDP.
- Provides for various system safety features:
 - Overcurrent protection for the outputs
 - Mains Incoming Power Switch (non-emergency)
 - Emergency Disconnect Button
 - System Start



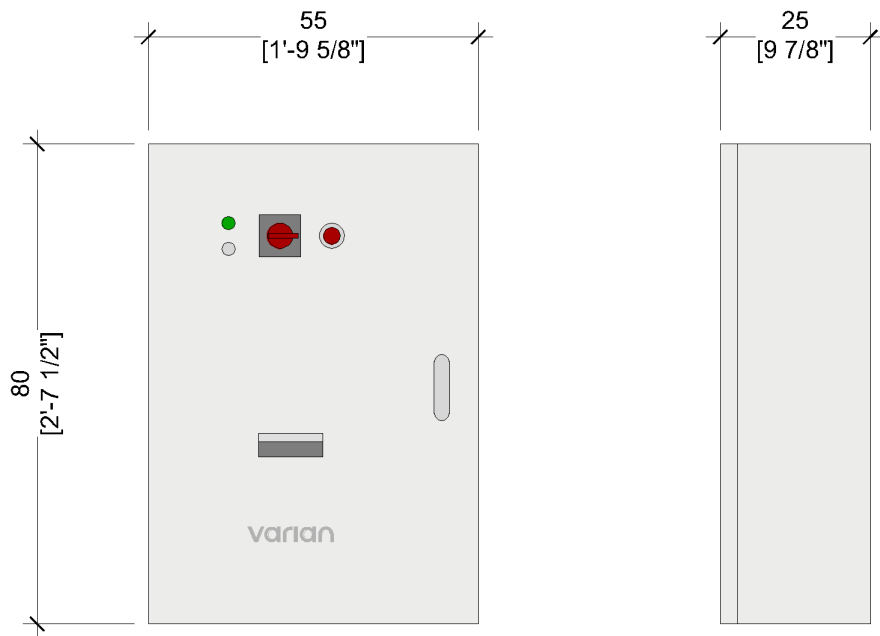


Figure 2-6 Main Disconnect Panel (MDP)

Table 2-5 MDP Weight		
Description	kg	lb
MDP	47	104

2.5.1.1 IEC 60309 OUTLET

- 2-pole, 3-wire
- Blue, 6-hour position
- 230VAC, 16A, 50/60Hz, refer to [3.3.5.2](#) for more information.

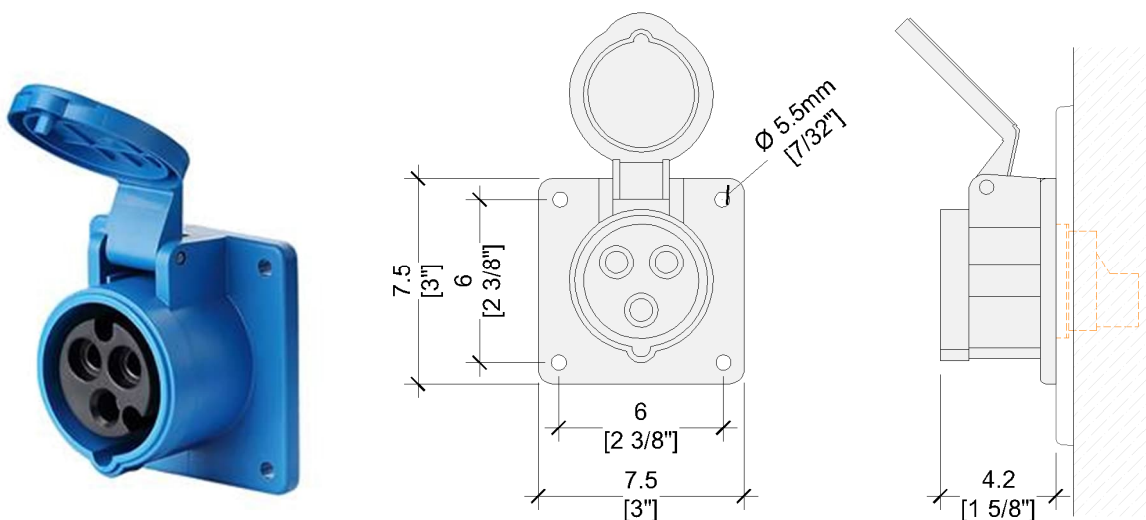


Figure 2-7 Console Cabinet - IEC 60309 Outlet

2.5.2 RELAY JUNCTION BOX (RJB)

The RJB is a factory-assembled and tested control panel that serves as a central interface connection point for Customer-provided system status warning lights, door interlock switches, and remote emergency-off buttons. It features an integrated extender card that offers additional connections for optional Customer-provided safety devices. Refer to [3.3.4 Relay Junction Box \(RJB\)](#).

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

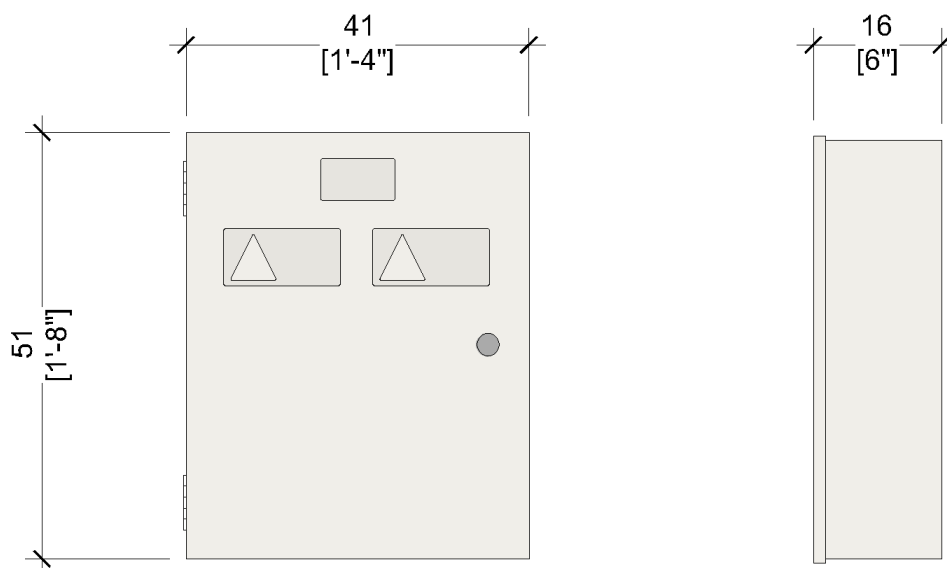


Figure 2-8 Relay Junction Box (Front and Side View)

Table 2-6 RJB Weight		
Description	kg	lb
RJB	12.5	27.5

2.6 PHANTOMS

The Halcyon system is supplied with a Phantoms Kit for machine performance and physics QA testing.

Table 2-7 Phantom Weights and Sizes				
Description	kg	W x D x H (cm)	lb	W x D x H (in)
Drum Phantom	3	55.2 x 33.5 x 24.5	6.6	1'-9 3/4" x 1'-1 1/8" x 9 5/8"
Las Vegas Phantom	1.1	14 x 14 x 2.5	2.4	5 1/2" x 5 1/2" x 1"
Wire Phantom	n/a	10 L	n/a	4" L
Quart Phantom	n/a	16 x 16.2 x 17	n/a	6 5/16" x 6 3/8" x 6 3/4"

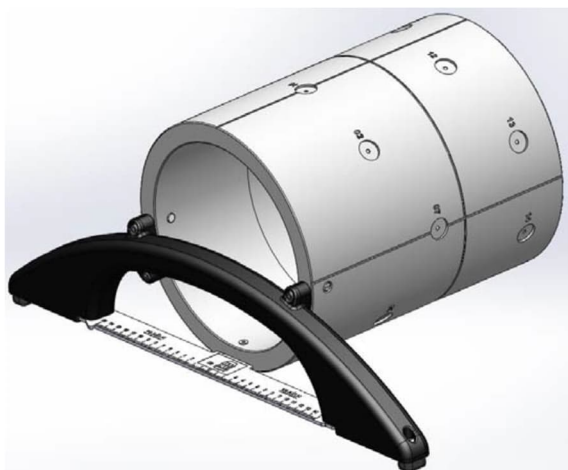


Figure 2-9 Drum Phantom

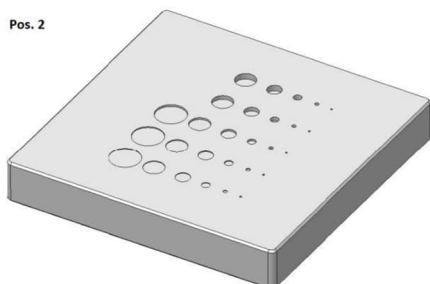


Figure 2-10 Las Vegas Phantom

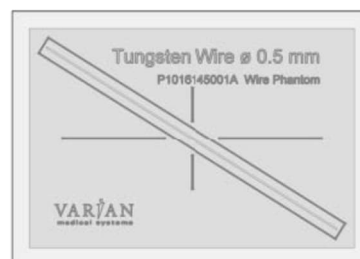


Figure 2-11 Wire Phantom

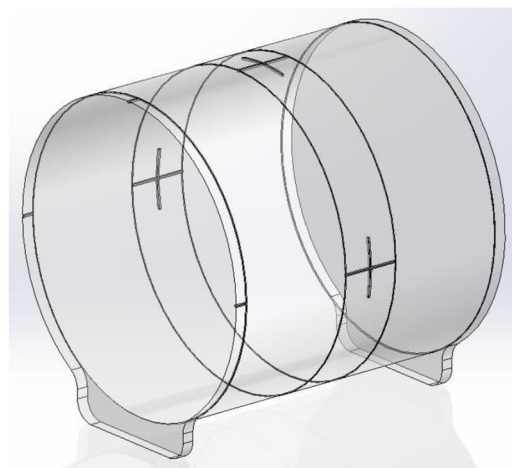


Figure 2-12 Quart Phantom

2.7 CABLES

This section provides the point-to-point connection and the maximum cable length available for the Varian-supplied system cables. Refer to [Table 3-8](#) for maximum containment lengths.

Table 2-8 Halcyon System Cables					
Run	Standard Cable Length	Extended Cable Length	Qty	Start (From)	Finish (To)
A	33m [108']	46m [150']	17	Y03 – Console Cabinet	Y01 – Stand/Gantry
B	33m [108']	46m [150']	1		Y07 – MDP
C	15m [49']	n/a	1		Y07 – MDP
D	62m [203']	n/a	1	Y01 – Stand/Gantry	Y09 – RJB
E	34m [111']	46m [150']	2		Y05 – Control Console
F	15m [49']	n/a	10	Y03 – Console Cabinet	Y08 – IEC Outlet
G	3m [10']	n/a	1		Network Outlet (by Customer)
H	10m [32']	n/a	1		



2.8 OPTIONAL SUBSYSTEM COMPONENTS

2.8.1 CLOSED-CIRCUIT TELEVISION (CCTV)

CCTV cameras are not included with the Halcyon system. An independent camera system may be required to comply with local regulations for visual coverage in the treatment room. Consult the Customer about their specific CCTV camera requirements.



Varian offers a two-camera CCTV system as an optional purchase. Contact Varian Sales or Varian Site Planning for more information.



3 CUSTOMER REQUIREMENTS



NOTICE

The Customer is responsible for ensuring that the site-specific design documents for the Varian system, to be installed, comply with all 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.

3.1 TREATMENT ROOM

The highlighted area below shows the installation, operational, and service clearances required for the Halcyon Stand and Couch.

- A minimum ceiling height clearance of 274 cm [9'-0"] is required above the finished floor.

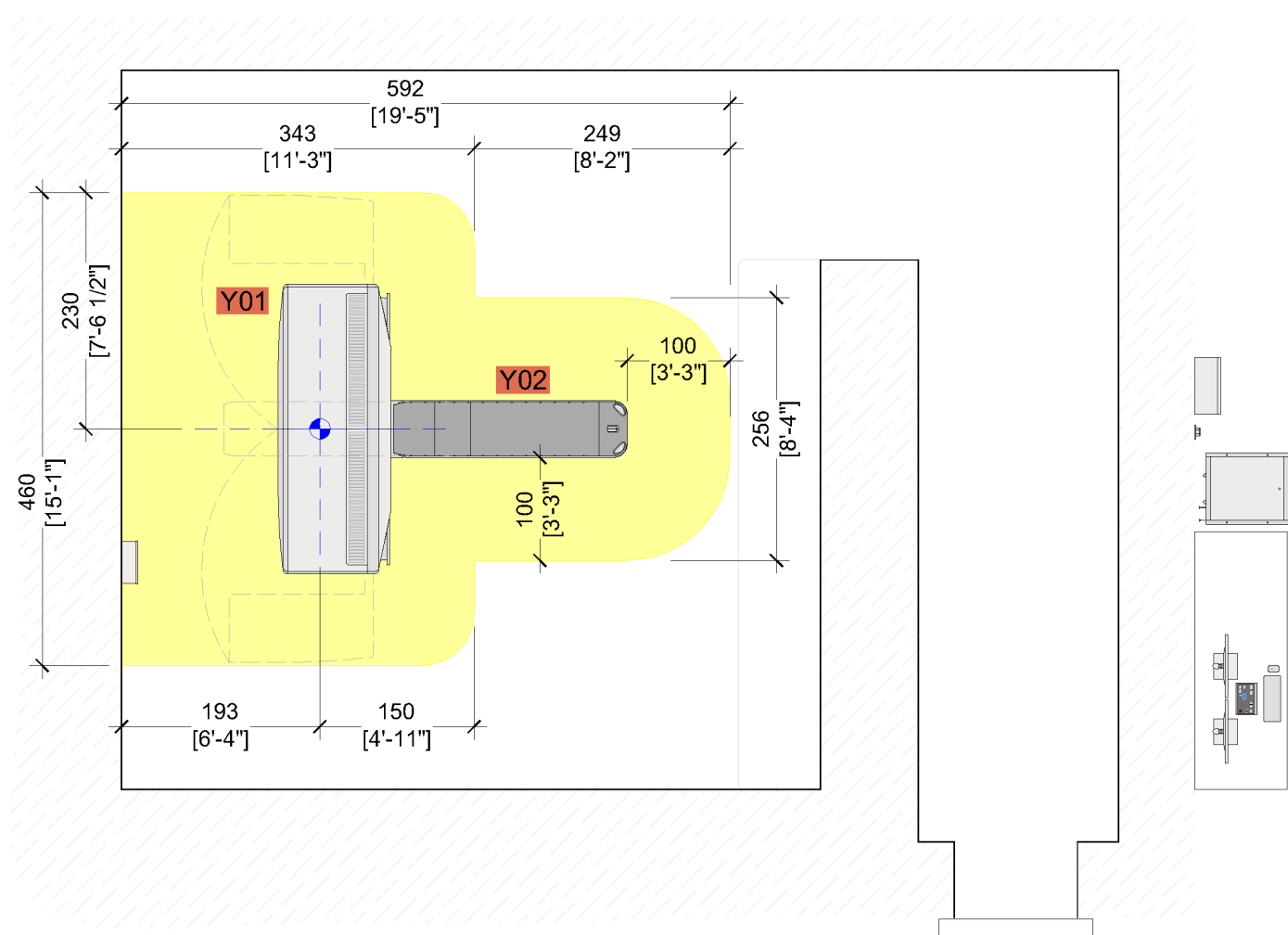


Figure 3-1 Minimum Room Clearances



NOTICE

Failure to maintain the minimum dimension from the isocenter to the rear finished wall may prevent the installation of other Varian products.

Contact Varian Site Planning for options that do not meet the minimum requirements in [Figure 3-1](#).



3.1.1 FLOOR PIT

The Treatment Room Floor Pit provides the required clearance needed for the rotating gantry and is the pathway that allows the electrical cables and chilled water line access to the Halcyon Stand.

- All exposed concrete shall be suitably sealed before the Halcyon Installation.
- Pit depth shall not vary more than 6mm [1/4"].



NOTICE

The concrete finished floor outside of the floor pit must be level.

The boundary of the shaded area must be within $\pm 3\text{mm}$ [$1/8''$] from the edge of the floor pit, with in a total allowance of 6mm [$1/4''$] across the shaded area shown in [Figure 3-2](#).

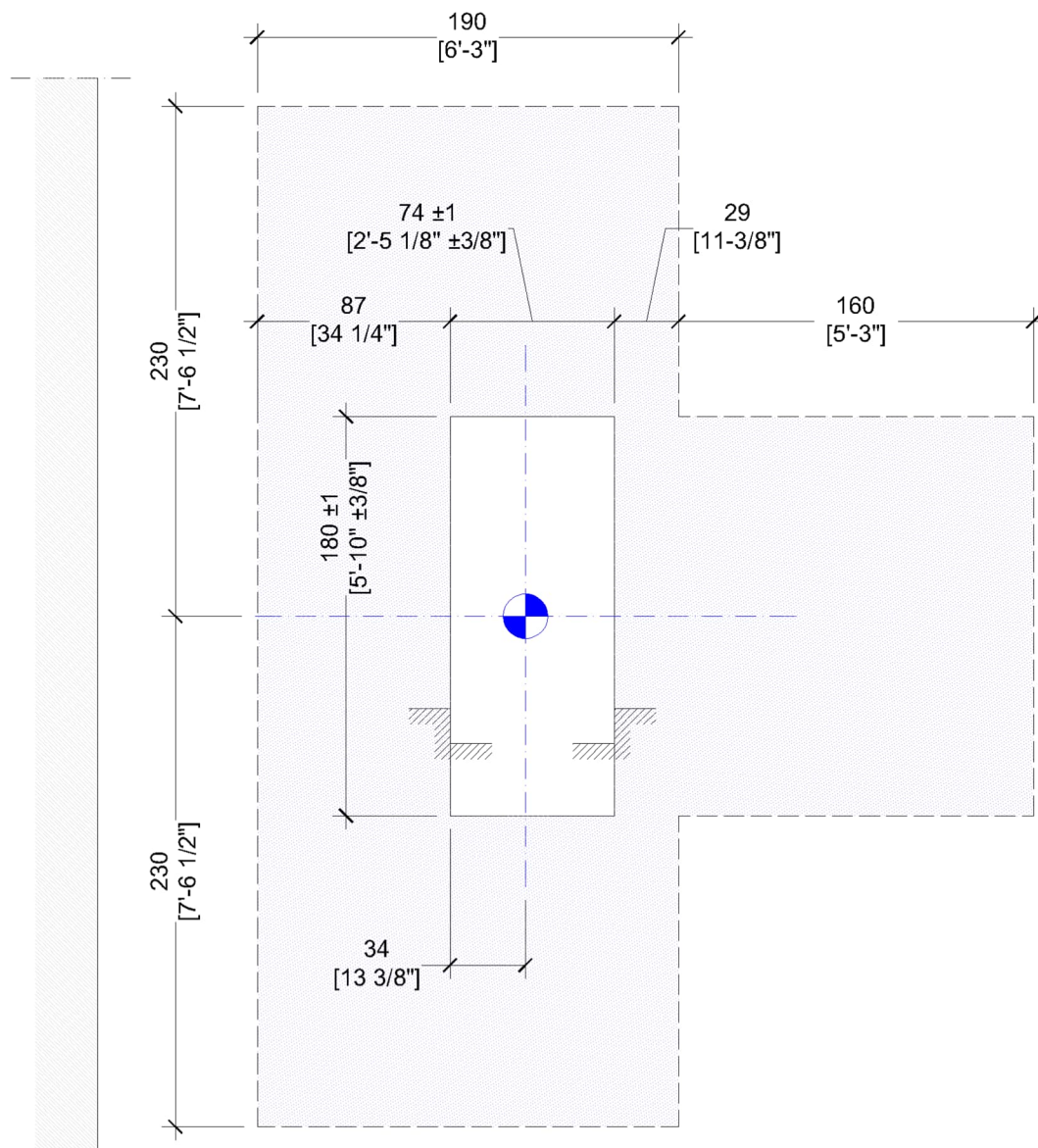


Figure 3-2 Treatment Room Floor Pit – Plan View



When renovating an existing Varian accelerator, it is acceptable to use the existing BaseFrame pit. Contact Varian Site Planning for more information.



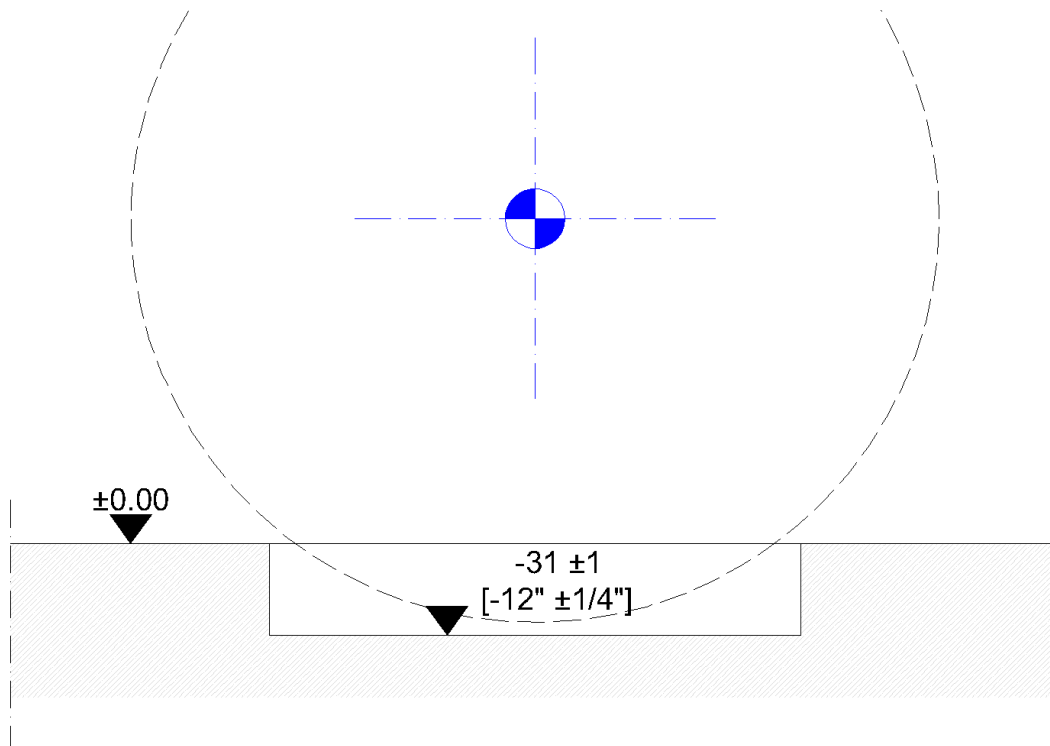


Figure 3-3 Treatment Room Floor Pit – Section with Gantry Rotation

3.1.2 FLOOR LOADS



WARNING

The Halcyon system is supplied with mounting hardware that is not suitable for sites subject to seismic activity. If seismic anchoring is required, it is the Customer's responsibility 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 building. Varian Site Planning or Varian PM can provide more information.

The concrete slab below the Stand Base Pad (B) and Stand Leveling Foot (C) shall be no less than 30cm [12"] thick. In addition, the area below the Stand mounting brackets (D) shall be clear of rebar, conduits, water lines, voids, and other sub-floor structures that could interfere with equipment anchorage to a depth of 12cm [5"] at the Stand Bracket (D) and 7.5cm [3"] at the Couch Bracket (E) for the non-seismic, Varian-provided anchors.

Table 3-1 Stand and Couch Floor Loads			
Location	Description	kN	Lbf
A	Couch Foot Pad, (3) Ø2.5cm [1"], <i>combined</i>	4.2	945
B	Stand Base Pad, Ø9cm [3 9/16"]	17.1	3845
C	Stand Leveling Foot, Ø6cm [2 3/8"]	7.8	1754
D	Stand Mounting Bracket	n/a	n/a
E	Couch Mounting Bracket	n/a	n/a



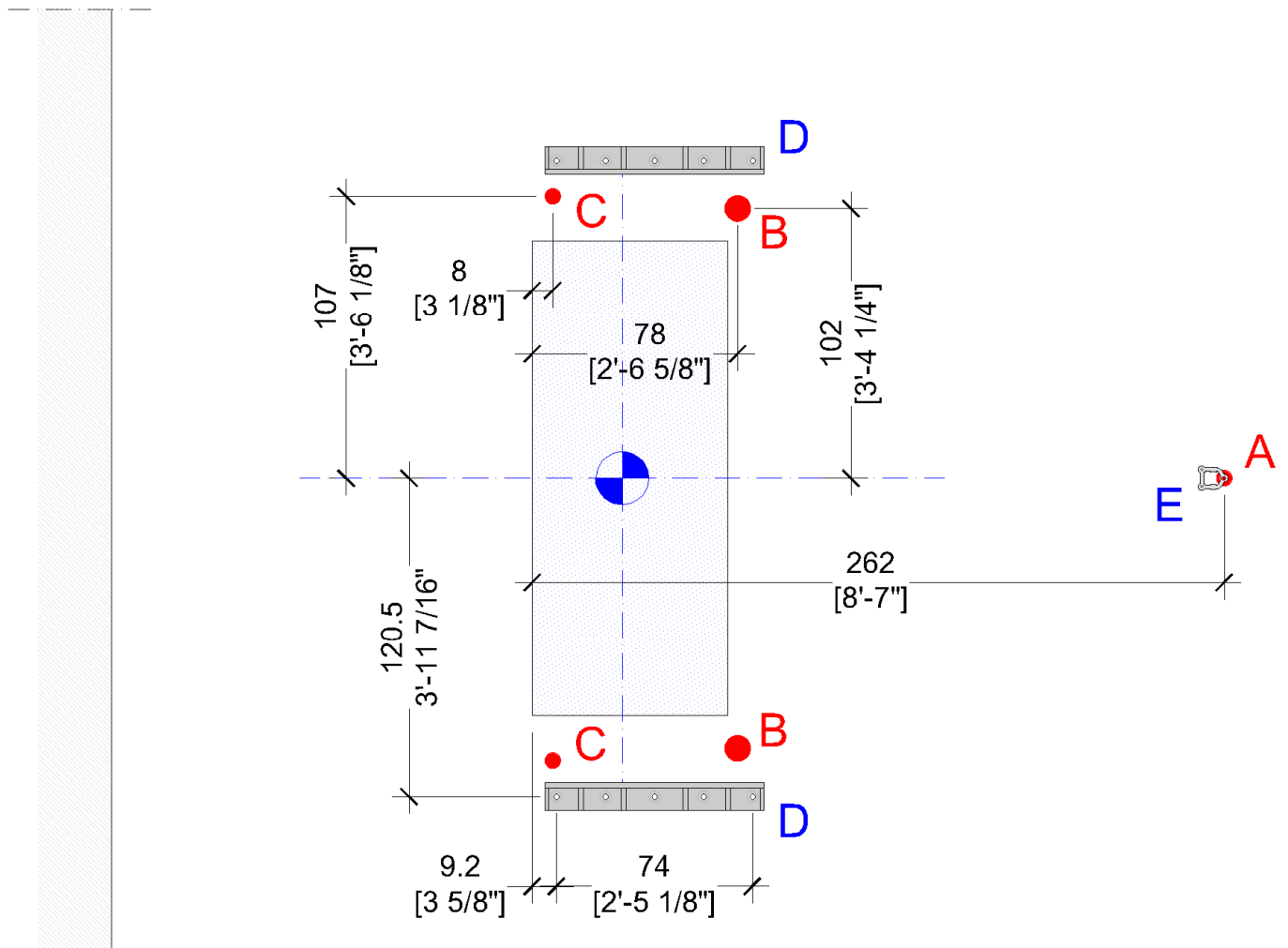


Figure 3-4 Stand and Couch Floor Loads – Plan

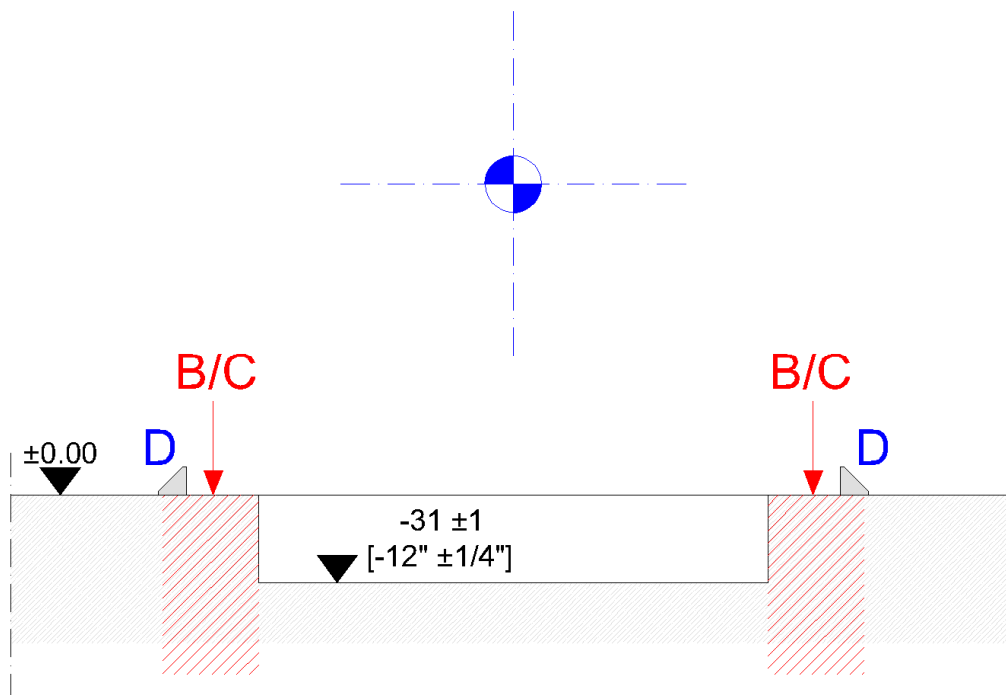


Figure 3-5 Stand and Couch Floor Loads – Section

3.1.3 FLOOR PIT CABLE ACCESS DETAILS

The Halcyon system cables and Customer 3-phase power conductors are required to enter the left front or left rear face of the Floor Pit at location **E**. Additionally, the chilled water supply and return lines must enter the right rear face of the Floor Pit at location **W**. These entries should be within the designated shaded areas to avoid interference with the rotating gantry. [Figure 3-6](#) illustrates the maximum dimensions for the three access areas.

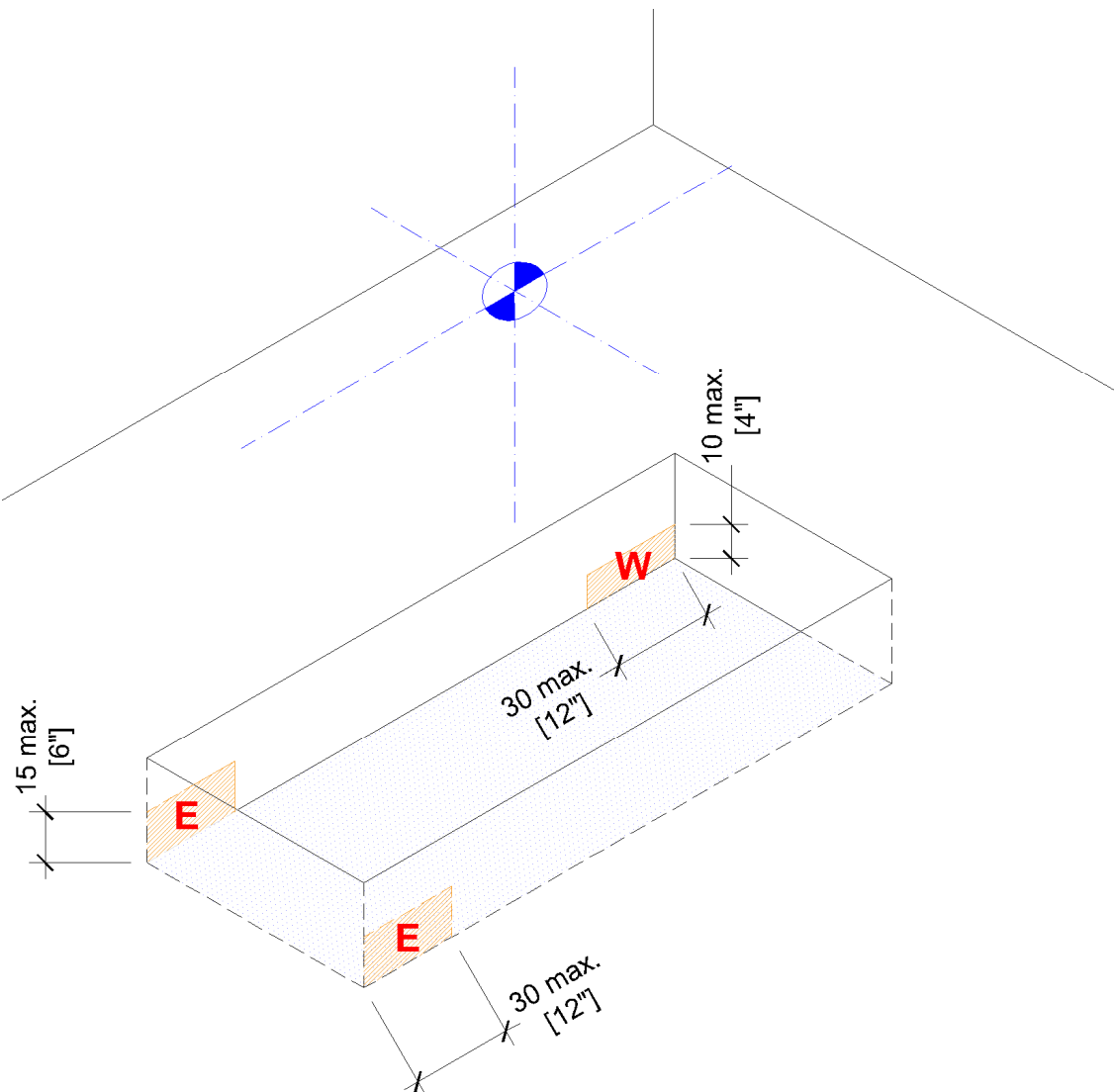


Figure 3-6 Treatment Room Floor Pit Cable Access

3.2 CONTROL AREA

Control area component positioning may vary per site-specific conditions. Consult with the Customer on the desired layout and for any additional cabinetry needs, refer to [Figure 2-5](#).

- The Console Cabinet must be located in a radiation-free environment.

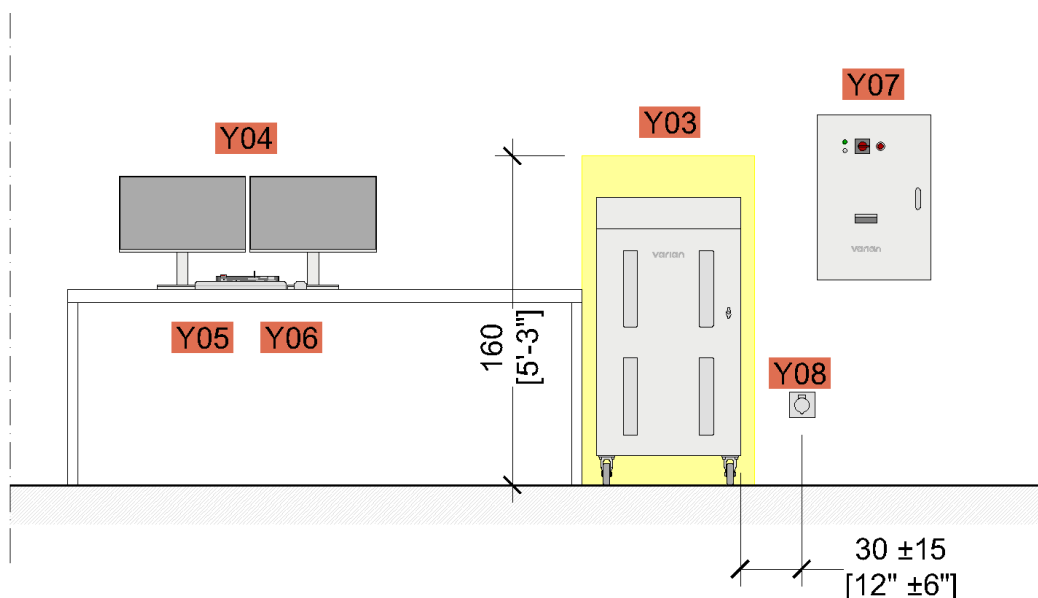


Figure 3-7 Generic Control Console Layout



Varian provides a mounting bracket for the monitor power supplies. The bracket can be installed on the wall below the counter or attached to the underside of the countertop.

The bracket dimensions are 41 x 22 x 4.5 [16 1/8" x 8 3/4" x 1 3/4"]

3.2.1 CONSOLE FLOOR POSITIONING BRACKET

Non-seismic anchors are provided to mount the bracket to the concrete floor to a depth of 7.5cm [3"].

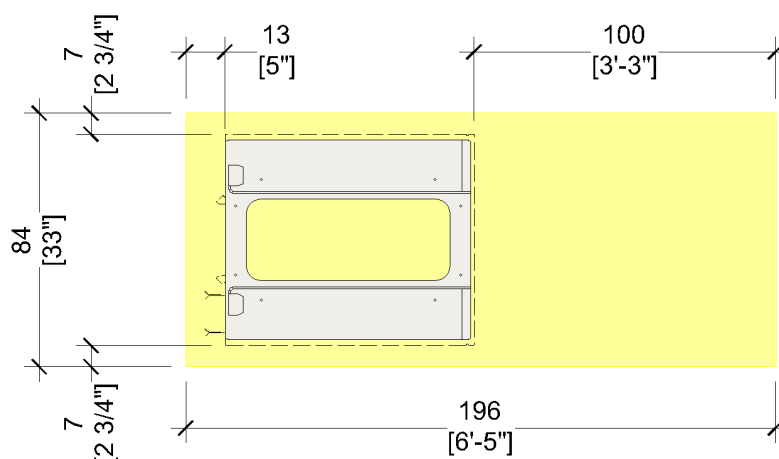


Figure 3-8 Console Cabinet Service Clearances



CAUTION

The Floor Positioning Bracket must be installed. Locking pins prevent the Console Cabinet from tipping over or rolling unintentionally.



3.3 ELECTRICAL

3.3.1 POWER REQUIREMENTS

Table 3-2 System Power Requirements	
Input Voltage	400Y/231VAC to 480Y/277VAC, see 3.3.3.1 380VAC (requires a step-up transformer, see note below)
System Current Capacity (including the Console Cabinet)	400 – 480VAC: 21 / 18A (15 kVA) 380VAC 60Hz: 23A (with step-up transformer) (15 kVA) 380VAC 50Hz: 28A (with step-up transformer) (18 kVA)
Console Capacity	208 – 230V 50/60Hz: 9A (2 kVA), see 3.3.3.1
Line Voltage Range	±10% maximum. 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 (<i>Beam-On</i>).
Input Frequency	50Hz ±3 or 60Hz ±3
In-Rush Current	At power on, and in various operational modes there is an instantaneous peak current: <ul style="list-style-type: none">• 170A @ 342V 50Hz• 105A @ 480V 60Hz.
Source Impedance	2.5% maximum, see 3.3.1.2
Mandatory Grounding	3.3.6 Grounding Requirements



In select countries where 380V is the standard voltage, a Step-Up Transformer will be provided with the order. The Step-Up Transformer outputs to 440Y/254V, refer to [3] SD Mains Step-Up Transformer (for 380VAC sites) document for specifications.

3.3.1.1 ELECTRICAL LOADS FOR SYSTEM STATES

The nominal electrical loads for each Halcyon operational state are as follows:

- 3 kVA in Stand-By
- 5 kVA in Ready
- 15 kVA in Beam-On

The minimum power factor is 75%, the line current is non-sinusoidal due to the presence of harmonics.

3.3.1.2 SOURCE IMPEDANCE

The line currents are not symmetrical across the three phases. Contributions from each of the following site-induced sources should be combined, and the total must be less than the maximum impedance defined in [Table 3-2](#).

- A distribution transformer
- The three-phase field-installed wiring input to the MDP
- The three-phase field-installed wiring between the MDP and the Halcyon Stand PDU



3.3.2 POWER CONDITIONING REQUIREMENTS

The equipment is sensitive to line voltage variations and source impedance. An electrical survey should be completed prior to installing the equipment, and a copy of this survey should be provided to the Varian PM for the equipment file. Isolation transformers and/or power conditioners are required if the electrical power requirements listed in [Table 3-2](#) cannot be met.



Transients that last only a few cycles will not cause harm when limited to the specified steady-state line voltage regulation. Where larger, prolonged, or frequent transients are present, transient suppression is necessary to prevent operational interruptions or equipment damage.

For sites that intend to use a third-party "Power Conditioning Equipment", contact Varian Site Planning for more information.

3.3.3 MAINS DISCONNECT PANEL (MDP)



NOTICE

Halcyon MDP mains power must be provided from a private branch circuit, such as a dedicated transformer. Room lighting, receptacles, and other equipment must use a separate power source.

- Wall mount the MDP at a standing height from the finished floor.
- Locate in view and within 3m [10'-0"] of the Console Cabinet.

Table 3-3 MDP Components	
A	Circuit Breaker 1 (CB1), 60A
B	Circuit Breaker 2 (CB2), 50A
C	K1 Contact
D	Transformer
E	Circuit Breaker 3 (CB3), 16A
F	K3 Contact
G	Control Relay
H	Start Button
I	Emergency Disconnect



Customer-provided wiring



Varian-provided cables

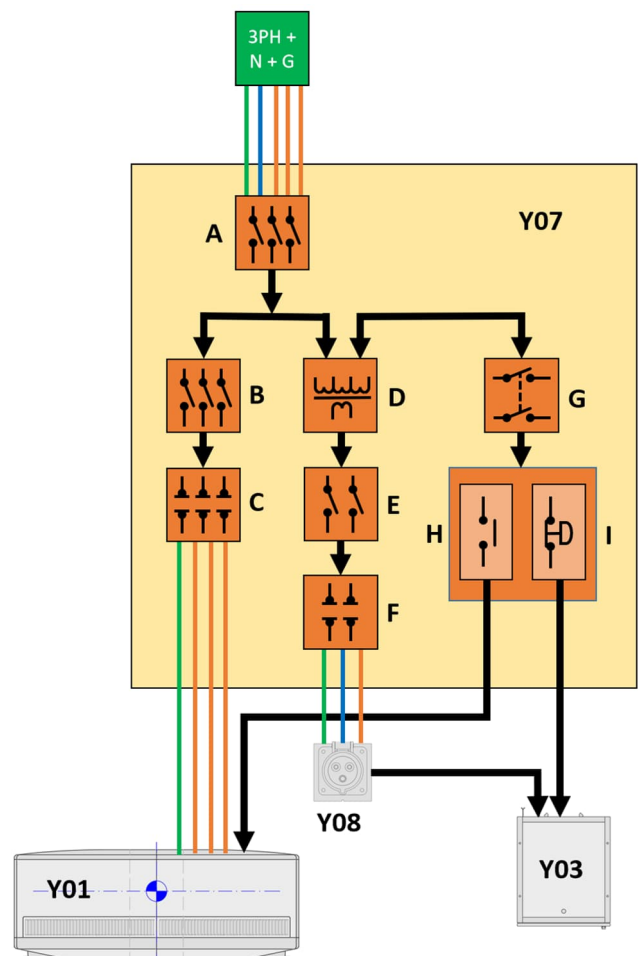


Figure 3-9 Generic MDP Panel Components





If the MDP cannot be placed near the Console Cabinet, contact Varian Site Planning for alternative installation options using the Remote Emergency Disconnect (R.E.D.) Box.

3.3.3.1 MDP CUSTOMER CONNECTIONS

The Customer-provided 3-phase wires must meet the following specifications:

- CB1 input to the MDP (**Y07**), see [Table 3-4](#)
- K1 output from the MDP to the Stand (**Y01**), see [Table 3-4](#)
- K3 output to the IEC 60309 Power Outlet (**Y08**), see [Table 3-4](#)
- Overall maximum source impedance requirements, see [Table 3-2](#)
- Use Copper Conductors Only
- Wires routing from the MDP to the Stand must be rated for wet locations and must be routed separately from other wires.
- CB1 and K1 wires must be rated for 600V, with a temperature range of 90°C dry/75°C wet, minimum.
- K3 wires must be rated for 300V minimum, with a minimum temperature rating of 90°C dry.
- Provide a 4m [13'-0"] coil of excess conductors in the treatment room floor pit.

Table 3-4 MDP Wires Size Connection Ranges

Description	Wire	Metric	Imperial
MDP Input Terminals (CB1)	3-Phase, N, & G	16 to 50mm ²	6 to 0 AWG
MDP Output Terminals (K1)	3-Phase & G	16 to 35mm ²	6 to 2 AWG
MDP Output Terminals (K3)	1-Phase, N, & G	3 to 6mm ²	12 to 10 AWG

Note: The ground conductors for **CB1** and **K1** must be equal in size (parity), refer see [3.3.6](#).



3.3.4 RELAY JUNCTION BOX (RJB)

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

3.3.4.1 RJB CUSTOMER CONNECTIONS

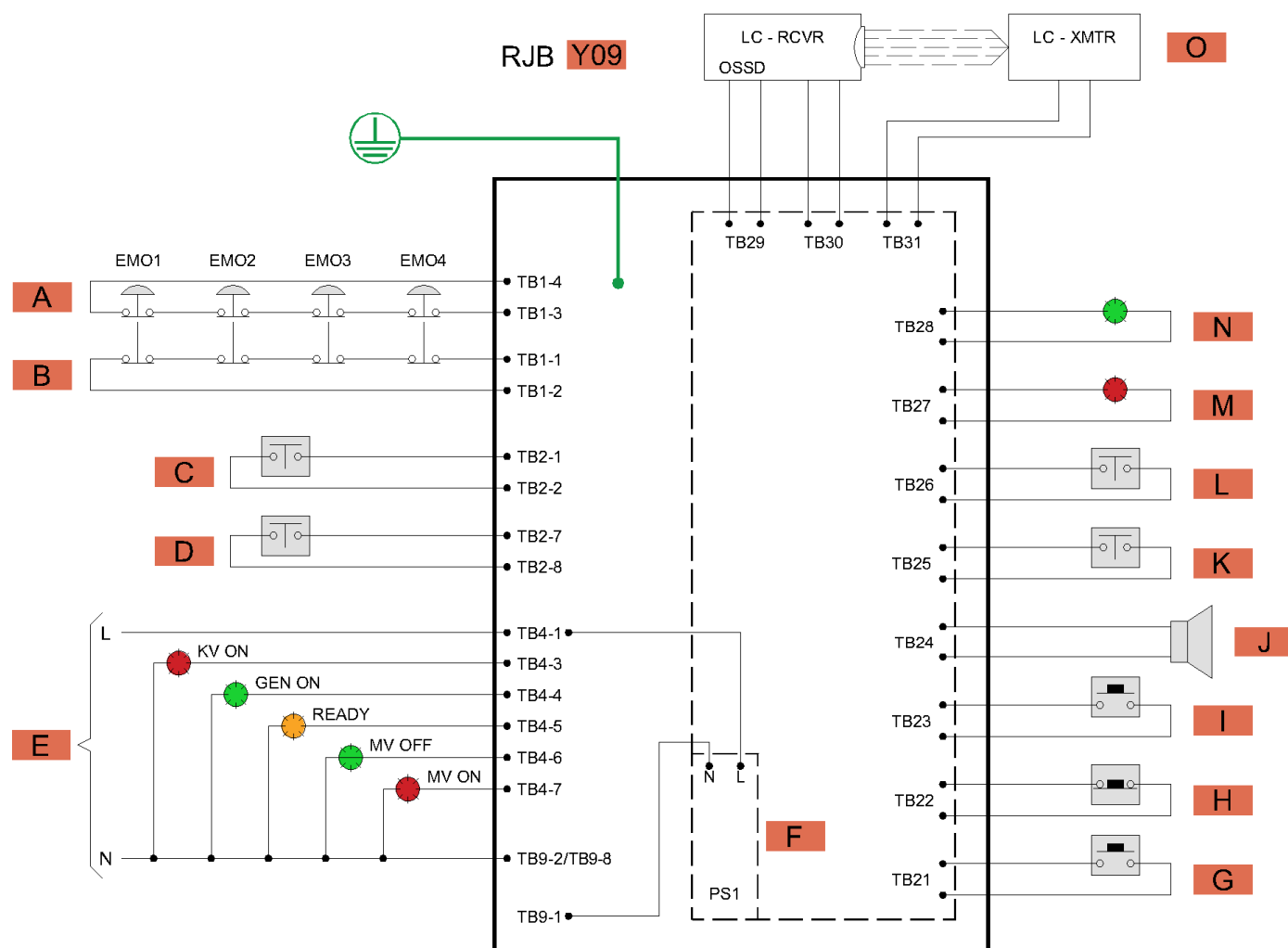


Figure 3-10 RJB Customer Connections



Refer to 3.3.8 for more detailed information on the Customer-provided components.



Table 3-5 RJB Main Customer Connections			
	Device	Power	Notes
A	EMO Primary Circuit	24VDC *	see 3.3.8.3
B	EMO Secondary Circuit		
C	Secondary Door Switch **	24VDC *	see 3.3.8.2
D	Primary Door Switch **	48VDC *	
E	Warning Lights	100 – 250VAC (50/60Hz)	see 3.3.8.1
* Power is provided from the RJB			
** If the RJB Expander is used connect the Door Switches to terminals “K” and “L”.			

Table 3-6 RJB Expander Card Customer Connections *			
	Device	Power	Notes
F	PS1 (Power Supply) ***	100 – 250VAC (50/60Hz)	n/a
G	Last Person Out (LPO) Button	24VDC **	see 3.3.8.5
H	Cancel Button		
I	Accept Button		
J	LPO Audible Alarm		
K	Primary Door Switch	48VDC **	see 3.3.8.2
L	Secondary Door Switch	24VDC **	
M	Interlock Status Light (Armed)	24VDC **	see 3.3.8.5
N	Interlock Status Light (Not Armed)		
O	Light Curtain (Transmitter/Receiver)		
	Output Signal Switching Device		
* The use of the RJB Expander is optional. If enabled, the LPO feature is required.			
** Power is provided from the RJB			
*** Power may be connected to RJB TB4-1 (Warning Light Power IN) or provided from an external source.			

Table 3-7 RJB Wires Size Connection Ranges		
Description	Metric	Imperial
RJB Main Input Terminals	0.75 to 10mm ²	18 to 6 AWG
TB21 – TB31 Terminals	0.14 to 1.5mm ²	26 to 14 AWG
PS1 Terminals	0.14 to 3mm ²	26 to 12 AWG



The Customer neutral connections may be terminated on the RJB neutral bar or by other means, per local electrical codes. The RJB neutral bar is provided for convenience.



3.3.5 POWER OUTLETS

3.3.5.1 TREATMENT ROOM

- Provide (1) standard power outlet within 1.5m [5'-0"] of the RJB (Y09)
- Provide power outlets as required by the Customer

3.3.5.2 CONTROL AREA

- Provide power outlets as required by the Customer
- (1) IEC 60309 outlet (Y08) for the Console Cabinet, see 2.5.1.1 and Table 3-4

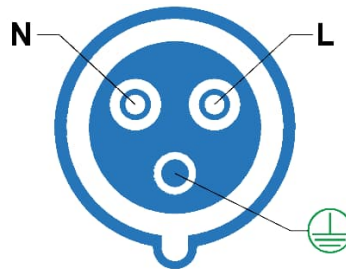


Figure 3-11 IEC Outlet (Front View)



NOTICE

Do not install the IEC outlet behind the Console Cabinet. It must be located it on either side of the cabinet as shown in Figure 3-7.

The provided IEC receptacle is for panel mount applications.



3.3.6 GROUNDING REQUIREMENTS

The Halcyon requires Ground/Protective Earth (G/PE) circuits. The primary circuit is part of the main power supply and grounds the Halcyon Stand and Couch as outlined in Section 3.3.3.

Additional G/PE circuits are required for the RJB (Y09) and Console Cabinet (Y03) to ensure the grounding meets the IEC 60101-1 standard. All ground conductors must be connected to the facility's primary grounding point through the Hospital Grid System.



WARNING

The G/PE conductors supplied by the customer for all 3-phase power must meet code standards and be in parity with the corresponding supply conductors, with a minimum cross-sectional area of 16mm² [#6 AWG].

To avoid the risk of electric shock, this equipment must be connected to supply mains with protective earth. Do not ground to water supply piping.

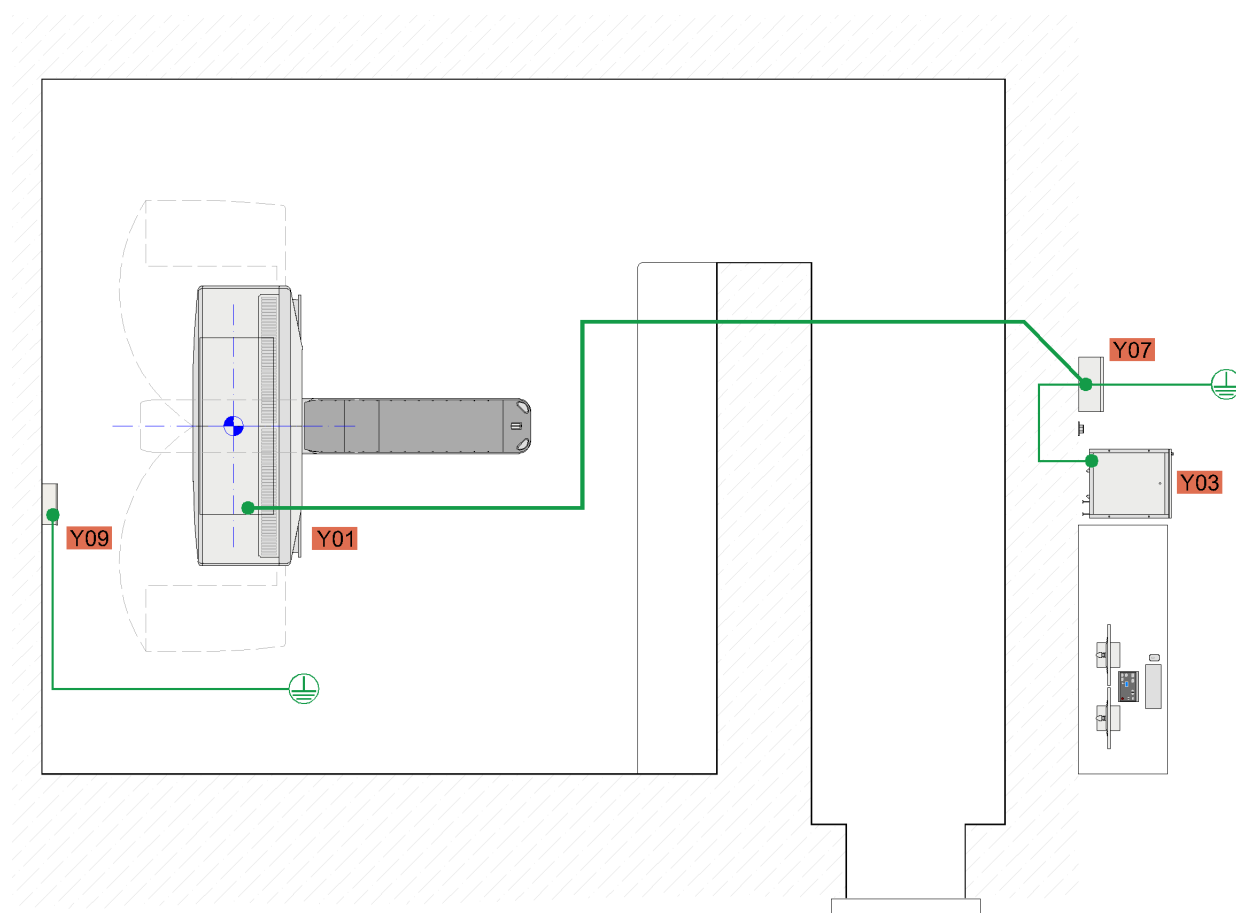


Figure 3-12 Halcyon G/PE Conductor Layout

- (1) G/PE conductor from the MDP (Y07) to the Stand (Y01) PDU, see 3.3.3.1.
- (1) Dedicated G/PE conductor from the MDP (Y07) to the Console Cabinet (Y03).
 - 6mm² [10 AWG] or per code, whichever is greater.
 - Terminate with an M6 ring terminal.
 - Provide a 3m [9'-0"] minimum "service loop" at the Console Cabinet (Y03).
- (1) Dedicated G/PE conductor to the RJB (Y09) sub-panel, see Figure 3-10.
 - 6mm² [10 AWG] or per code, whichever is greater.
 - Terminate with an M6 ring terminal.



3.3.7 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 conduits or raceway ducts for all system cables, as described in this section.

The Varian system cables are not plenum-rated.

Excess cable cannot be stored in the treatment room floor pit.

Refer to [Figure 3-6](#) for the required cable access zones in the treatment room floor pit.

Do not terminate conduits behind the Console Cabinet (Y03).

- All conduits shall be smooth-walled.
- All conduits that are routed underground shall be dry and watertight.
- Terminate conduits with insulating bushings or similar devices to protect cables from abrasion.
- Conduit bends must have a radius at least 6 times the conduit diameter.
- A maximum of three 90-degree bends are permitted per conduit run or a total of 270 degrees.
- All system cable conduits should include a pull string.
- Verify all room penetrations with the Physicist of Record.
- Reference [Table 2-8 Halcyon System Cables](#) for maximum cable lengths.
- Cable conduit/duct route must be shorter than the maximum cable length. Allow for 3m [10'-0"] of excess cable at each end for connection and service, unless otherwise noted.



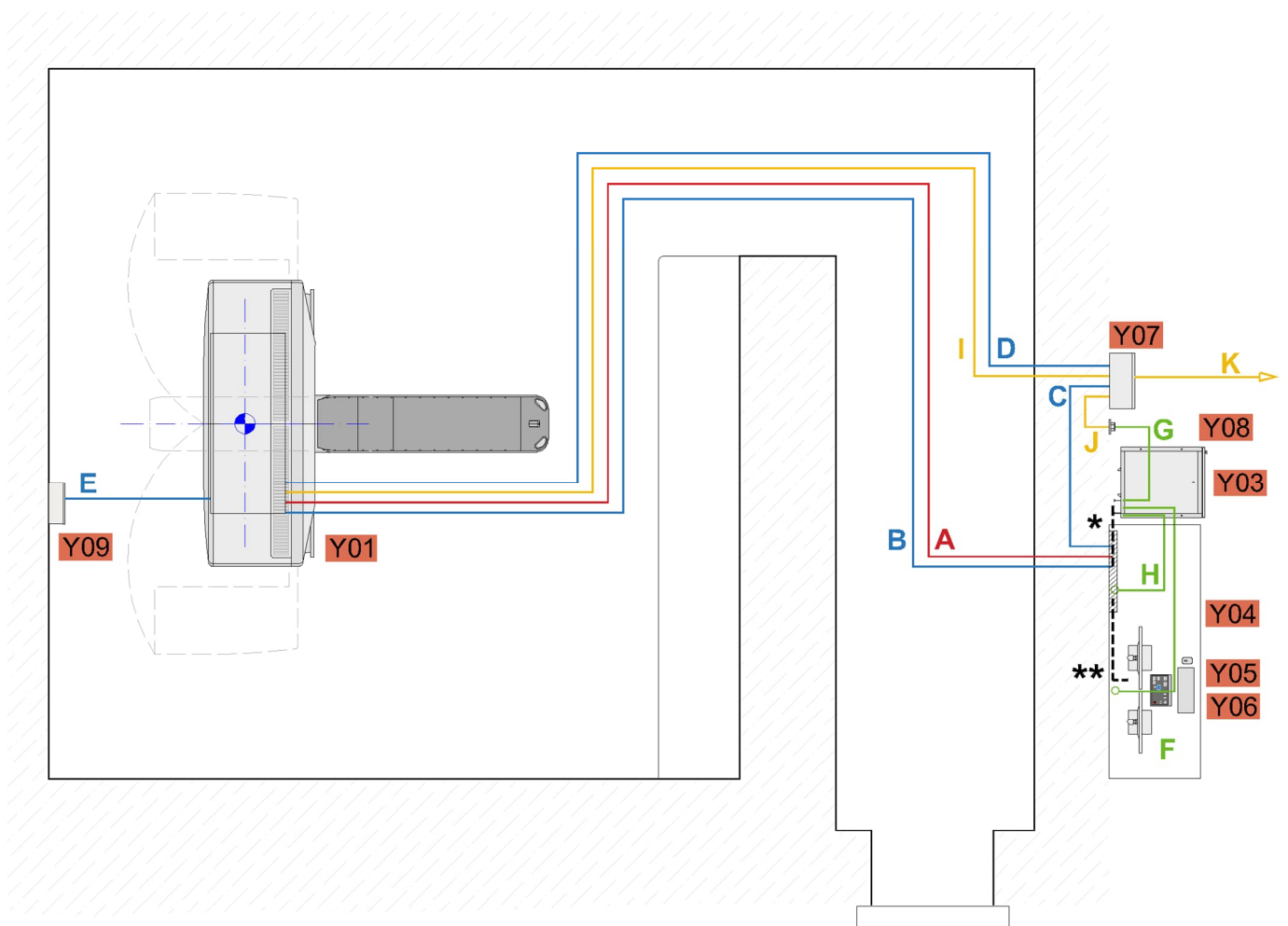


Figure 3-13 Cable Containment Identification

Table 3-8 Halcyon Containment Specifications

Run	Minimum Conduit Ø	Maximum Length	Conduit Quantity	Start (From)	Finish (To)
A	100mm [4"]	38m [125']	1	Y03 – Console Cabinet	Y01 – Stand
B	50mm [2"]	38m [125']	1		Y07 – MDP
C		11m [36']	1		
D		57m [187']	1	Y01 – Stand	Y09 – RJB
E		41m [135']	1		
F	n/a	13m [43']	n/a	Y03 – Console Cabinet	Y05 – Control Console
G		1m [3']			Y08 – IEC Outlet
H		8m [26']			Network Outlet (by Customer)
I	32mm [1 1/4"]	n/a	1	Y07 – MDP	Y01 – Stand
J	per code	n/a	1		Y08 – IEC Outlet
K	per code	n/a	1		Hospital MAINS Power

Customer-provided wiring, see Table 3-4



Include the distance from the conduit termination point to the back of the Console Cabinet or Desktop components (shown as * or ** in [Figure 3-13](#)) in the total run length.



Allowance for mid-run storage of excess cable may be required depending on site conditions. This consideration commonly applies to cable runs “D” and “E”.

Varian supplies a 32mm diameter, 3m [10'-0"] long Flexible Metal Conduit for routing the 3-phase and ground conductors from the floor pit to the Halcyon Stand Power Distribution Unit, which is to be installed per local code.

3.3.7.1 OTHER CONTAINMENT REQUIREMENTS

The following Customer-provided safety components require a containment path to the RJB, which is not shown in [Figure 3-13](#).

- Warning Lights
- Door Interlock Switch
- Emergency-Off Buttons
- Optional Safety Devices, see [3.3.8.5](#)



Consult with the Customer for Experimental Access (Physics Q/A Port) requirements.

3.3.8 EMERGENCY AND SAFETY DEVICES

The following Customer-provided safety devices must be installed with guidance from the customer's Radiation Safety Officer and in accordance with regulatory requirements.

3.3.8.1 WARNING LIGHTS

System warning lights are required to be installed both inside and outside the treatment room to indicate the beam-status. They may be required to flash when the beam is on. The colored lights must be visible from any location within the treatment room. Five warning light circuits are 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 3-9 Warning Lights	
Beam ON	Illuminates during MV beam treatment (mandatory).
Beam READY	Illuminates to show the MV system has no open interlocks and is ready to treat.
Beam OFF	Illuminates when the accelerator is not generating radiation.
Generator ON	Illuminates 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.

3.3.8.2 DOOR INTERLOCK SWITCHES

Door interlock switches must be installed on the treatment room door. Two independent safety switches, a primary and a secondary, are required. Both switches must be in the same state (either both open or both closed) within 5 seconds of actuation. For connection details, refer to [Figure 3-10](#).

- Capable of switching 80V, 500mA (maximum)
- Primary – 48VDC, 250mA (nominal), Normally Open, (i.e. Switch open – Door open; Switch closed – Door closed).
- Secondary – 24VDC 1mA (nominal), Normally Open



For rooms with double door entries or a secondary maze door, each door panel requires its own set of interlock switches. Wire the primary switches and the secondary switches in series separately so that both circuits are independent from one another.

3.3.8.3 EMERGENCY-OFF BUTTONS

The Emergency-Off (EMO) button disconnects mains power from the Halcyon system while maintaining power to the Console Cabinet UPS. EMO buttons are integrated into the Halcyon Stand (2), Couch (2), and Control Console (1).

Additional Customer-supplied EMO buttons are typically required in the treatment room. Consult with the site's Radiation Safety Officer to verify the requirements. Each switch must be wired in series across two parallel circuits, refer to [Figure 3-10](#).

- (2) Two-pole, both Normally Closed (NC), “dry type” contacts, manual reset.



Locate the EMO buttons to avoid unintentional activation.



3.3.8.4 EMERGENCY DISCONNECT BUTTON

An Emergency Disconnect Button must be mounted in the control area. When activated, it disconnects mains power from all system components, including the Halcyon Stand and the Console Cabinet. This button is integrated into the MDP panel, refer to 3.3.3 for more information.

3.3.8.5 OPTIONAL SAFETY DEVICES

The following optional safety devices are provided and installed by the customer and connect directly to the RJB Extender Card, refer to Figure 3-10.

- **Last Person Out (LPO)**

The LPO activates a momentary switch to start a timer relay in the RJB, providing users a configured set time to clear the treatment room and close the door before the door interlock inputs are locked out requiring the process to start over.

- Momentary, Normally Open, 24VDC, 500mA (minimum)

- **Light Curtain**

The light curtain serves as an alternative to mechanical door switches for LPO functionality.

- Output Signal Sensing Device (OSSD) – 24VDC (nominal), 250mA (minimum)
- Transmitter and Receiver – 24VDC, 250mA each (maximum)



The RJB expander card allows for the use of either a light curtain or door interlock switches, but not both. If the light curtain inputs are used, the system must be configured with an accept button.

- **Accept Button**

The Accept button is a control located outside the treatment room, which must be activated to complete the door interlock circuit after engaging the door or light curtain interlocks.

- Momentary, Normally Open, 24VDC, 500mA (minimum)

- **Cancel Button**

The Cancel button stops the LPO system timer and requires the process to be restarted.

- Momentary, Normally Closed, 24VDC, 500mA (minimum)

- **LPO Audible Alarm**

Allows for an audible alarm to be activated during LPO operation.

- 24VDC, 500mA (maximum)

- **Interlock Status Lights**

The status indicator outputs visibly show whether the door interlocks are armed (closed) or not armed (open).

- LED or Incandescent Light, 24VDC, 1000mA (maximum)



3.3.9 NETWORK

The IT NETWORK connection allows the Halcyon system to communicate with hospital or clinic Oncology Information Systems (OIS).

- Provide (1) Network outlet near the Console Cabinet (**Y03**) required
 - (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 (8P8C) jack must implement wiring pattern T568A as defined in ANSI/TIA-568.
- Varian recommends isolating the Oncology domain from the Enterprise Network.
- The Console Cabinet (**Y03**) requires a static IP address.
- The Varian PM will provide the [4] MICAP network configuration guide before the final equipment installation.



Wi-Fi is recommended in both the control area and treatment room for training, education, and service support.

3.4 PLUMBING

Table 3-10 Chilled Water Requirements and Heat Loads

Ideal Coolant Temperature & Flow Rate	18° C. at 12 LPM [65° F. at 3.2 GPM]
Incoming Coolant Temperature Range	10 – 23.8° C [50 – 75° F]
Flow Range <i>(based on incoming coolant temperature)</i>	7 - 23 LPM [2 - 6 GPM]
Glycol Content of Coolant	Not to exceed 50%
Minimum Heat Load <i>(required, 24 hours)</i>	1.0 kW [3,414 Btu/Hr]
Normal Treatment Cycle Heat Load	2.2 kW [7,511 Btu/Hr]
Maximum Heat Load <i>(Beam-ON)</i>	7.0 kW [23,900 Btu/Hr]
Inlet Pressure <i>(maximum)</i>	3.5 bar [50 PSI]
Pressure Drop <i>(through the stand's internal cooling system)</i>	Varies, refer to Figure 3-14



NOTICE

To avoid equipment damage due to condensation, ensure that the minimum temperature of the incoming coolant is above the facility's dew point.



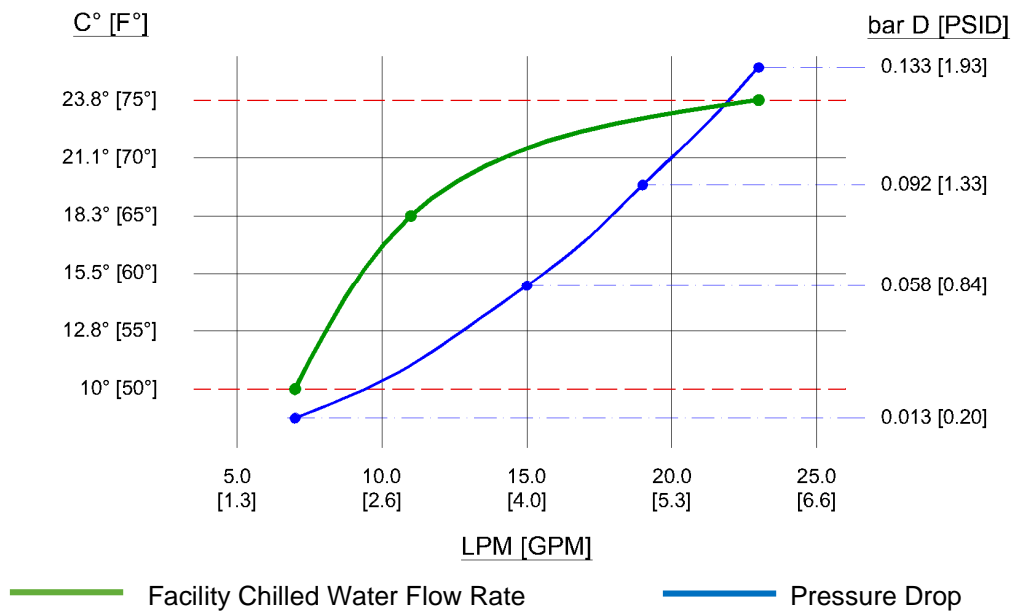


Figure 3-14 Facility Chilled Water Temperature, Flow Rate, and Pressure Drop

3.4.1 CHILLED WATER

The chilled water requirement can be met using a Closed-Loop system (such as Central Plant Chilled Water or a Dedicated Chiller) or a One-Pass system (using Domestic Water). These methods may also be combined to provide resilience and redundancy. The customer's design team and water quality professionals are responsible to determine the most suitable design configuration.

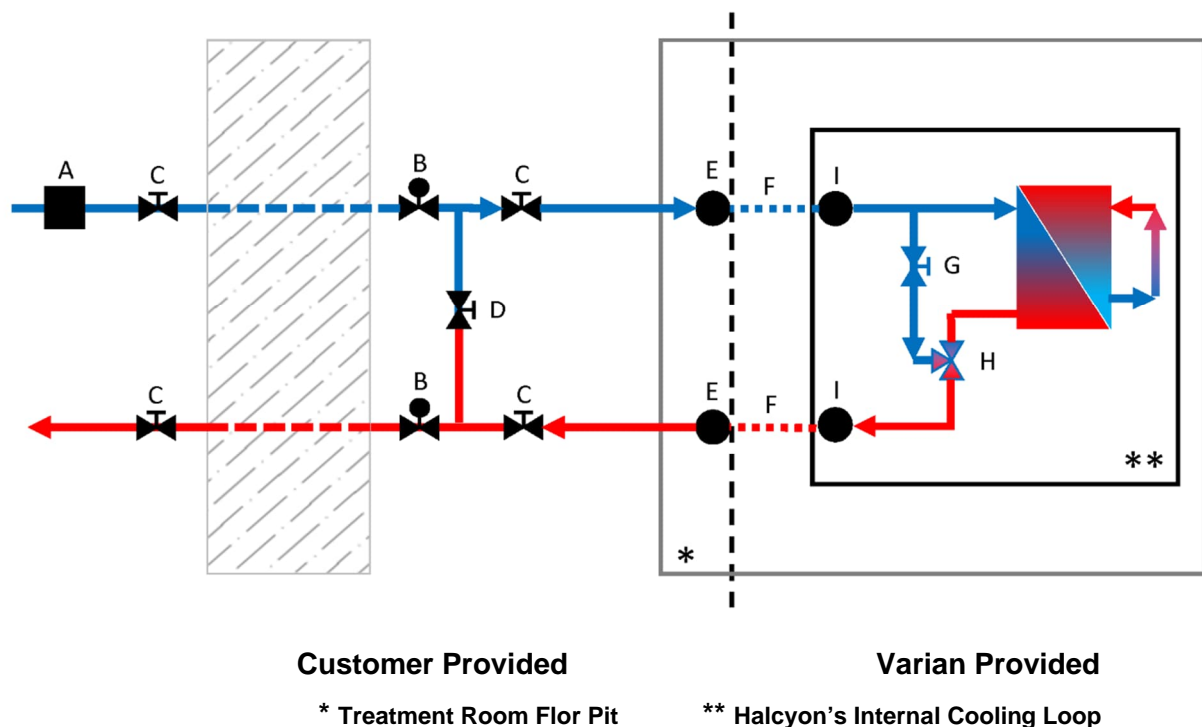


Figure 3-15 Coolant System Schematic

- The chilled water supply must not exceed the maximum inlet pressure listed in [Table 3-10](#), controlled by a customer-provided and installed pressure regulator (A).
- Provide isolation valves (C) and terminate piping with a 25mm [1"] FNPT Plug (E).
- Provide a bypass valve (D) before the isolation valves (C) for testing and service.



- Provide a minimum of one flow meter (**B**) on the supply or return line to monitor the flow rate.
- Install another set of isolation valves (**C**) in an accessible location outside the treatment room.
- Copper piping is recommended, a filter/strainer should be installed for dissimilar metals.
- A Varian-provided, Customer-installed flexible hose kit (**F**) is used to connect the piping to the accelerator in the treatment room floor pit (**I**).
- A bypass valve (**G**) is located inside the system stand. This valve is open for Closed-Loop systems and closed for One-Pass systems.
- The modulating control valve (**H**) located inside the system stand maintains an internal coolant loop temperature of 30°C [86°F]



If a Closed-Loop system includes a One-Pass backup system, it is recommended to provide a way to alert users to close the accelerator's internal bypass valve when the emergency One-Pass backup is activated.



NOTICE

Do not route water piping above the Accelerator, as potential leaks may result in serious damage to the mechanical systems.

Do not locate floor drains in the treatment room.

3.4.2 CHILLED WATER LINE ACCESS AT FLOOR PIT

Extend two 2.5cm [1"] chilled water lines into the Treatment Room Floor Pit and terminate with a 1" FNPT bushing and plug, see [Figure 3-16](#) and [Figure 3-6](#).

Install isolation valves for the chilled water supply and return lines on the rear wall behind the Stand, see [Figure 3-17](#) and [Figure 3-18](#).

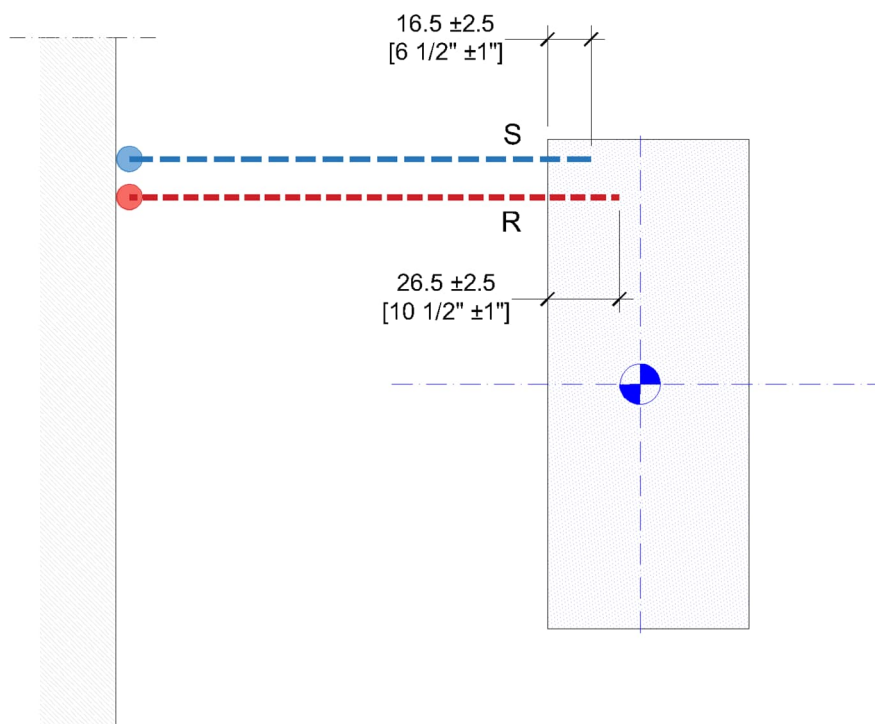


Figure 3-16 Chilled Water Access (Plan View)



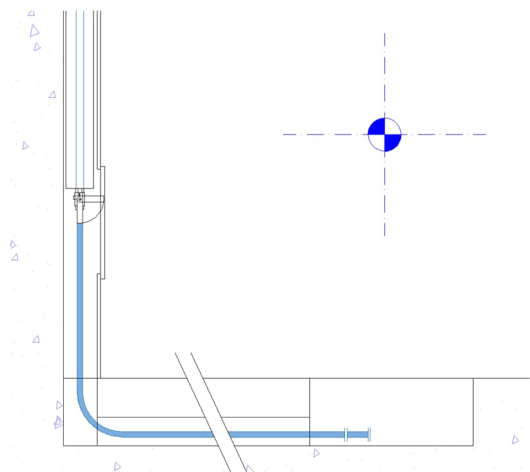


Figure 3-17 Chilled Water Access (Side View)

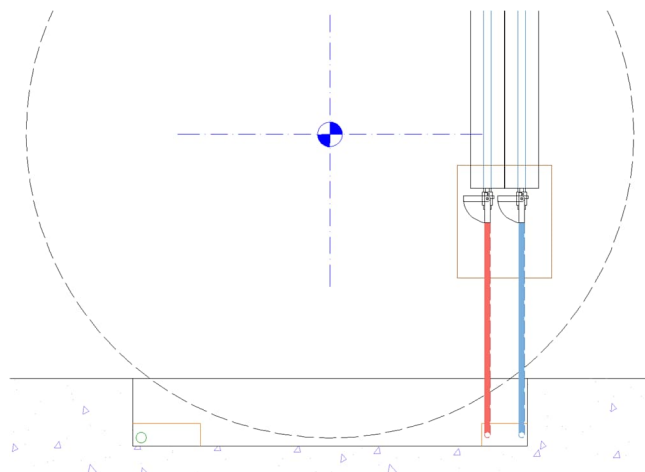


Figure 3-18 Chilled Water Access (Front View)



The isolation valves are typically installed in the wall behind the Accelerator. They should be located to ensure easy accessibility.

3.4.3 CHILLED WATER QUALITY

Table 3-11 Minimum Chilled Water Quality	
Quality	Value
Appearance	Clean, colorless, non-turbid, and disinfected; closed-loop should be treated with a corrosion inhibitor, which may add color.
Heterotrophic Plate Count (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), not to exceed 50% by volume (v/v).

External domestic “city” or hospital “facility” water 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.



3.5 ENVIRONMENTAL SPECIFICATIONS

Table 3-12 Environmental Specification		
Condition	Metric	Imperial
Maximum Altitude	2000 m	6562 ft
Ambient Temperature	16° to 27°C	60° to 80°F
Relative Humidity	30% to 75%, Non-condensing	

3.5.1 VENTILATION

Accelerators will produce detectable levels of ozone under certain conditions.

- Typically, 4 to 6 air changes per hour are required to remove ozone, check with your local regulations.
- Fresh air should be used as part of the HVAC design.

Table 3-13 Control Area Heat Loads		
Description	kW	BTU/Hr
(Y03) - Console Cabinet	1.1	3,770
Optional ARIA Workstation and Monitor	0.5	1,707

Table 3-14 Treatment Room Heat Loads		
Description	kW	BTU/Hr
Halcyon Stand during Beam-On State	6.0	20,487
Halcyon Stand during all other States	1.0	3,413



The Halcyon airflow enters from the top and exits through the bottom of the Stand.

The customer shall provide a means to remove the heat generated by the components listed in the Tables above.

3.6 VIBRATION

The Halcyon system is immune to vibration, but consideration should be given to selected locations where nearby equipment could cause excessive vibration. Most installations are at or below grade so vibration is normally not an issue. The overall design should account for nearby equipment like compressors, generators, elevators, and train lines. The total allowable patient-field position error is specified as 0.1mm (100 microns) zero-to-peak. Contact Varian Site Planning for more information on assessing site-specific situations.



3.7 FINISHES

3.7.1 FLOORING

The Halcyon 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 the propensity to create static electricity exceeding 2.0 kV at 20% relative humidity when measured using standard methods.

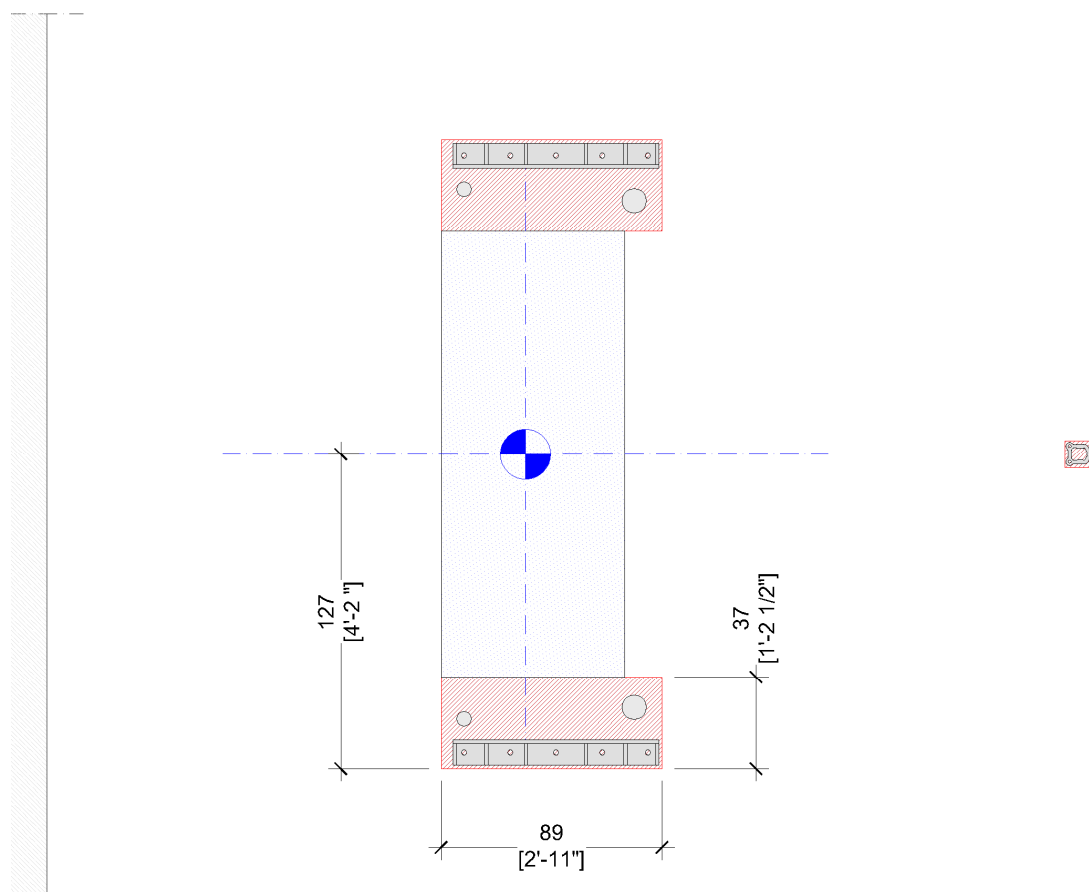


Figure 3-19 Flooring at Floor Pit



NOTICE

DO NOT install flooring in the hatched areas to each side of the floor pit. The Stand base pads, leveling feet, floor brackets, and Couch foot pad must be installed directly on the concrete (non-compressible material).

To ensure precision, the customer will complete the flooring cutout beneath the Couch foot pad during installation.

Refer to [Figure 3-2](#) for floor levelness requirement.

3.7.2 CEILING

There is no requirement for finished ceiling type, but 60 x 120 [24" x 48"] or 60 x 60 [24" x 24"] lay-in acoustical ceiling tiles are recommended. These offer easy access to overhead systems, low repair and modification costs, sound attenuation, and aesthetic flexibility with modern grids and tiles.



3.7.3 ACCESSORIES

It's recommended that custom cabinetry be built to store accessories for the Phantoms, see 2.6. Verify all requirements and storage preferences with the Customer.

3.8 ACOUSTIC

There are no recognized acoustical standards for therapy rooms. Varian has encountered no acoustical problems with the Halcyon 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.

Halcyon System meets the IEC standard for Acoustic Energy

- IEC 60601-1:2005 Clause 9.6.1
- IEC 60601-1:2005 Clause 9.6.2.1

Table 3-15 Acoustic Levels			
Equipment	Condition	Location	Sound Pressure Level, dBA*
(Y01) – Halcyon Stand	Ready State	@ Isocenter	46
	Beam-On State		49
(Y03) – Console Cabinet	@ 1m [3'-3"]	@ 1m [3'-3"]	53
<i>*dBA values are a typical representation, taken under normal conditions, the site-specific design and installation may affect the values.</i>			

3.9 FIRE PROTECTION

The fire protection system must comply with all local codes and regulations.



NOTICE

Sprinkler systems inside the treatment room are not recommended, as their activation or leakage may result in significant equipment damage.

Consult a fire protection specialist to design a code-compliant detector or extinguisher system 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, avoid placing sprinkler heads directly above the equipment. A pre-action sprinkler system managed by an independent detection system is preferred; however if a wet pipe system is used, recessed high-temperature heads should be considered to minimize the risk of accidental breakage. When employing a chemical system, consider the safety requirements for nonambulatory patients.





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 Site 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 and the Construction Completion/Pre-Installation Final Inspection. This final visit typically occurs 7 - 10 days before the RIG date to verify site readiness is at 100% completion as defined by the [2] Varian Accelerator Pre-Installation Checklist.

Table 4-1 Sample Project Schedule																			
Task (estimated in weeks)	1	...	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Place Machine Order	X																		
Design & Construction (varies)																			
MDP & RJB (delivered/installed)																			
Pre-Installation Inspection																			
Machine Delivery (weekend)																			
Machine RIG (weekend)																			
System Installation																			
Machine Acceptance																			

 = Critical STOP/GO Inspections  = Varian Install dates to suit Customer program  = Work by others

4.2 OBJECTIVES

The items listed below are required to be completed before the Varian PM conducts the final inspection and releases the equipment for delivery. Varian's installation timeline is dependent on these items being finished. The [2] Varian Accelerator Pre-Installation Checklist is available from the Varian PM upon request.

- The treatment room and control area meet clinical standards, are dust-free, and are restricted from the construction trades.
- The customer has secured and signed all necessary licenses and approvals for this installation.
- A defined, load-bearing rig path is present; all clearances from the unloading or staging area to the vault should meet the specified minimum requirements.
- A live hospital network with 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, main disconnect panel, power conditioner (*optional*), and power outlets.
- All safety-related items are installed and connected.
- The chilled water supply at the accelerator is tested and fully operational.
- The treatment and control room HVAC system is tested and fully operational.
- Flooring and casework are installed or prepared as previously agreed.



4.3 PIK INSTALLATION

Sub Project No.	1	The purpose of this section is to provide an overview of the roles and responsibilities of Varian and the Customer's contractors during this phase of the project. It should be coordinated with the Halcyon PPG. For clarifications, please contact the Varian PM.	
Task Name	Main Disconnect Panel (MDP) and Relay Junction Box (RJB)		
Task Overview	To accept delivery of Varian-provided PIK components, assemble and install them in their final position.		
Prerequisites	<ul style="list-style-type: none">• The treatment room must be water-tight• The location of MDP & RJB defined in the construction documents• An isolated power source available• Mains incoming power conductors installed• Dedicated earth termination bar installed		
Responsibilities	Task	Varian	Customer
	Schedule delivery date	X	X
	Unpack RJB and MDP		X
	Install the RJB, MDP, and IEC outlet		X
	Install cable containment, provide end-to-end distances, and install pull strings		X
	Connect to the isolated incoming source		X
	Connect dedicated G/PE to facility bar		X
	Connect warning lights to RJB		X
	Connect door interlocks to RJB		X
	Connect EMO switches to RJB		X
	Testing as defined by Varian and local regulations		X
	Dispose of Varian packing materials		X
Duration	Customer defined		
Customer Supplied Resources & Materials	General contractor to unbox and mount the MDP and RJB, using appropriate mounting hardware Electrical contractor to connect the incoming power and peripherals Materials for installing cable containment Materials for console power connection per PPG		
Results	MDP and RJB installed – incoming power supply connected, and power supply cable ready for connection to Halcyon. IEC Outlet installed near the Console Cabinet and wired to the MDP.		
Acceptance	Performed by Varian Project Manager, [1] Varian Accelerator Pre-Installation Checklist		



4.4 RIG AND INSTALLATION

Sub Project No.	2	The purpose of this section is to provide an overview of the roles and responsibilities of Varian and the Customer's contractors during this phase of the project. It should be coordinated with the Halcyon PPG. For clarifications, please contact the Varian PM.		
Task Name	RIG and Installation			
Task Overview	Installation of the Accelerator and Peripherals			
Prerequisites	<ul style="list-style-type: none">• Sub-projects 1 – 3 completed• Pull strings in the conduits• Storage locations for spares and accessories• Power cable (customer-supplied) in floor pit• Electrical supply available, lockout tag of electrical supply.• Active network available			
Responsibilities	Task	Varian	Customer	
	Schedule delivery date for the system	X	X	
	Risk assessments and method statements	X		
	Designated area for the delivery truck		X	
	City Permits, street closures (<i>if required</i>)		X	
	Crane (<i>if required</i>)		X	
	Ensure the RIG path is structurally suitable		X	
	Lay floor protection internally	X	X	
	Unload/Unpack system and move into the room	X		
	Pull system cables	X		
	Install the accelerator	X		
	Drill 12mm Ø anchor holes for stand brackets, couch bracket, and floor positioning bracket.		X	
	Provide non-seismic anchors.	X		
	Install non-seismic anchors for the stand brackets, couch bracket, and floor positioning bracket.		X	
	Provide and install seismic anchors for the stand brackets and floor positioning brackets (<i>if required</i>).		X	
	Torque the stand bolts to the stand brackets	X		
	Insert and tighten non-seismic anchors for the stand brackets, couch bracket, and floor positioning bracket to the floor		X	
	Connect power to the MDP and Halcyon		X	
	Connect power to the IEC connector		X	
	Connect warning lights, EMO switches, and interlocks to the RJB		X	
	Connect chilled water supply and return lines		X	
	Commissioning supplied peripherals	X		
	Install cover plate on conduit pull boxes, as required		X	
Duration	5 Days			
Customer Supplied Resources & Materials	Access to the site outside of normal working hours Contractors to connect power and water Waste container for Varian package disposal			
Results	Machine delivered and installed			
Acceptance	Performed by RIG contractor and PM – CK-AL-RIG			



4.5 ACCEPTANCE AND RADIATION SAFETY

Sub Project No.	3	The purpose of this section is to provide an overview of the roles and responsibilities of Varian and the Customer's contractors during this phase of the project. It should be coordinated with the Halcyon PPG. For clarifications, please contact the Varian PM.		
Task Name	Acceptance and Radiation Safety			
Task Overview	Completion of Radiation and Safety Forms			
Prerequisites	<ul style="list-style-type: none">• All services fully working and commissioned.• Machine installed and commissioned• Room clinically ready.			
Responsibilities	Task		Varian	Customer
	Arrange a date for IPA		X	X
	Perform IPA		X	X
	Critical Exam (safety interlocks etc. Europe).		X	
	Failure correction			X
	Radiation survey (Room shielding)			X
	Magnetic Field room survey (flux density)			X
Duration	1 Day			
Customer Supplied Resources & Materials	RPA or physicist availability Radiation 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-AL			



APPENDIX A SHIPPING AND RIGGING

1 CRATE SHIPPING WEIGHTS AND SIZES

Appendix Table 1 Environmental Storage and Transport Conditions		
Condition	Metric	Imperial
Ambient Temperature Range	0° to 40° C	32° to 104° F
Relative Humidity	10% to 90%, non-condensing	

Appendix Table 2 Crate Weights and Sizes						
Box	P/N	Kit Description	Metric		Imperial	
			Weight (kg)	L x W x H (cm)	Weight (lb)	L x W x H (in)
A	P1014666	Gantry, Crate	5240	310 x 155 x 244	11552	122 x 61 x 96
B	P1014798	Couch, Crate	719	292 x 97 x 152	1585	115 x 38 x 60
C	P1013839	Console Cabinet, Crate	478	114 x 102 x 157	1054	45 x 40 x 62
D	P1024563	Utility, Crate	340	155 x 86 x 178	750	61 x 34 x 70
E	P1037299	Cover Kit, Crate	530	213 x 213 x 183	1168	84 x 84 x 72
F	P1025054	RJB Crate	31	69 x 61 x 41	68	27 x 24 x 16
G	P1025056	MDP Crate	95	112 x 82 x 59	209	44 x 32 x 23
H	P1025055	Step-Up Transformer (Opt.)	230	86 x 71 x 97	507	34 x 28 x 38

2 RIGGING INFORMATION



NOTICE

In [Appendix Figure 1](#) the dimension for “X” is variable, dependent on the rigging equipment (skates or dollies) used.

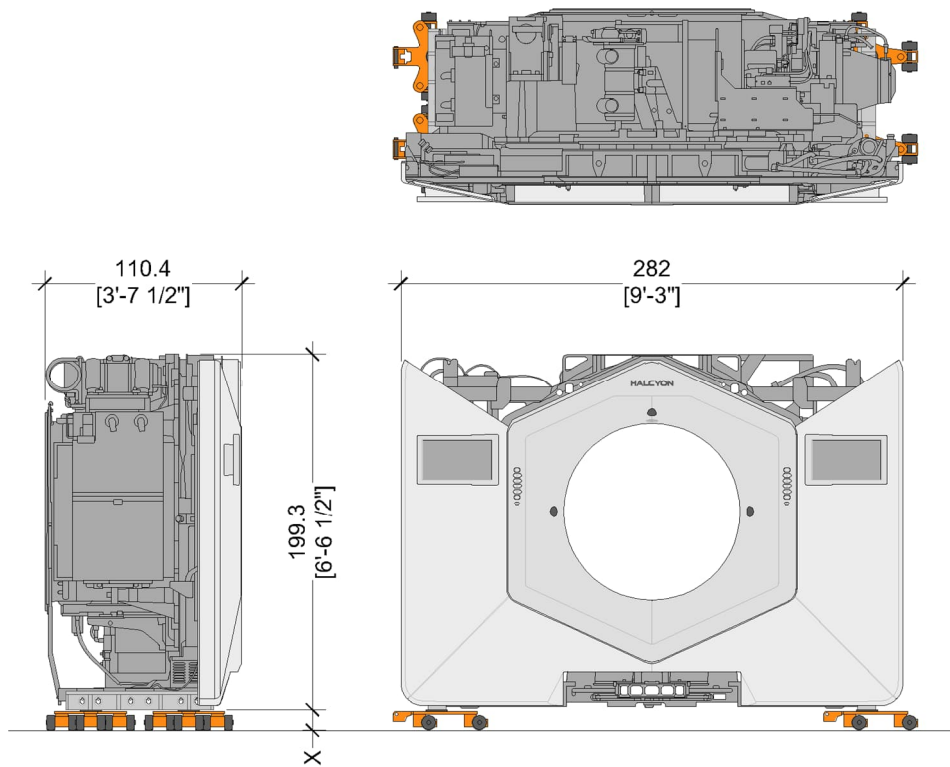
The minimum door clearance height is 213cm [7'-0"].



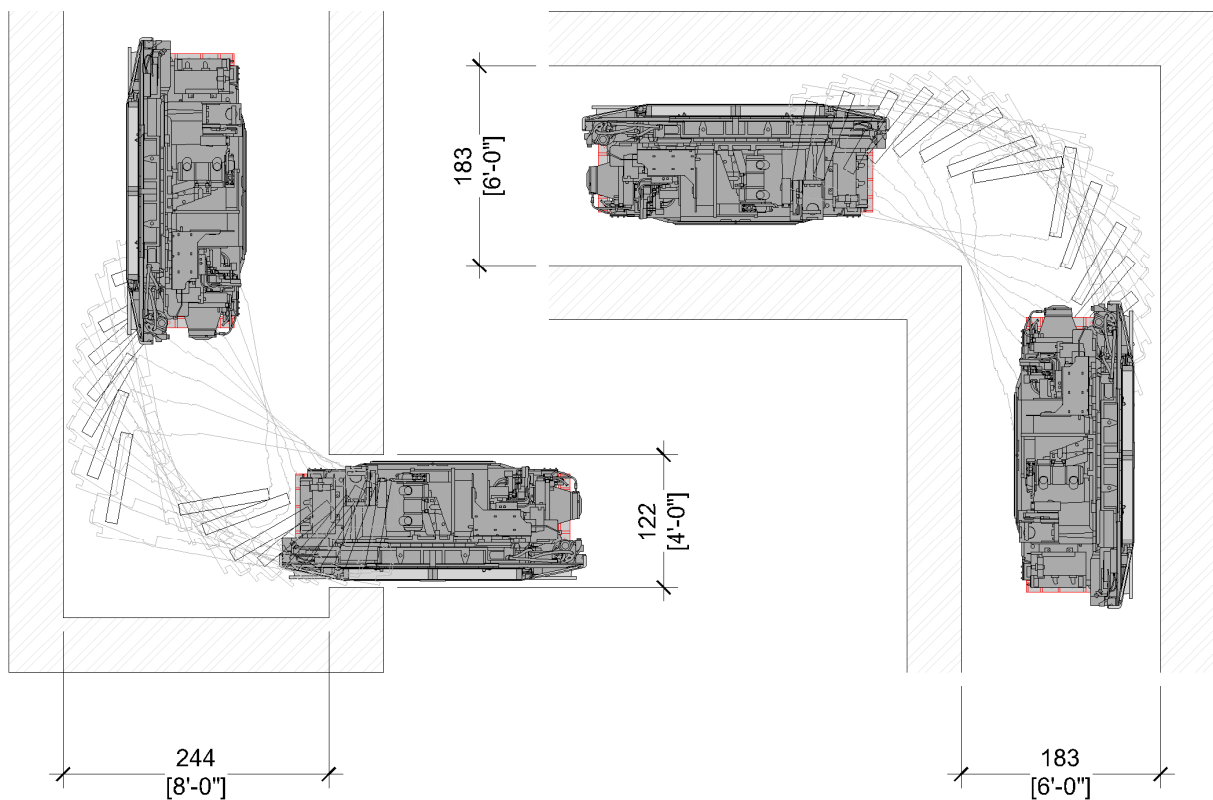
Provide approximately 10 m² [100 ft²] of secure temporary storage area during installation.

Appendix Table 3 Rigging Weight		
Description	kg	lb
Halcyon Stand and Gantry	4455	9822





Appendix Figure 1 Stand and Gantry Rigging Dimensions



Appendix Figure 2 Tracking Route – Option “A”



For rigging options that do not meet these minimum requirements, please contact Varian Site Planning.

