Volar™ Boom System

Pre-Installation Requirement Reference

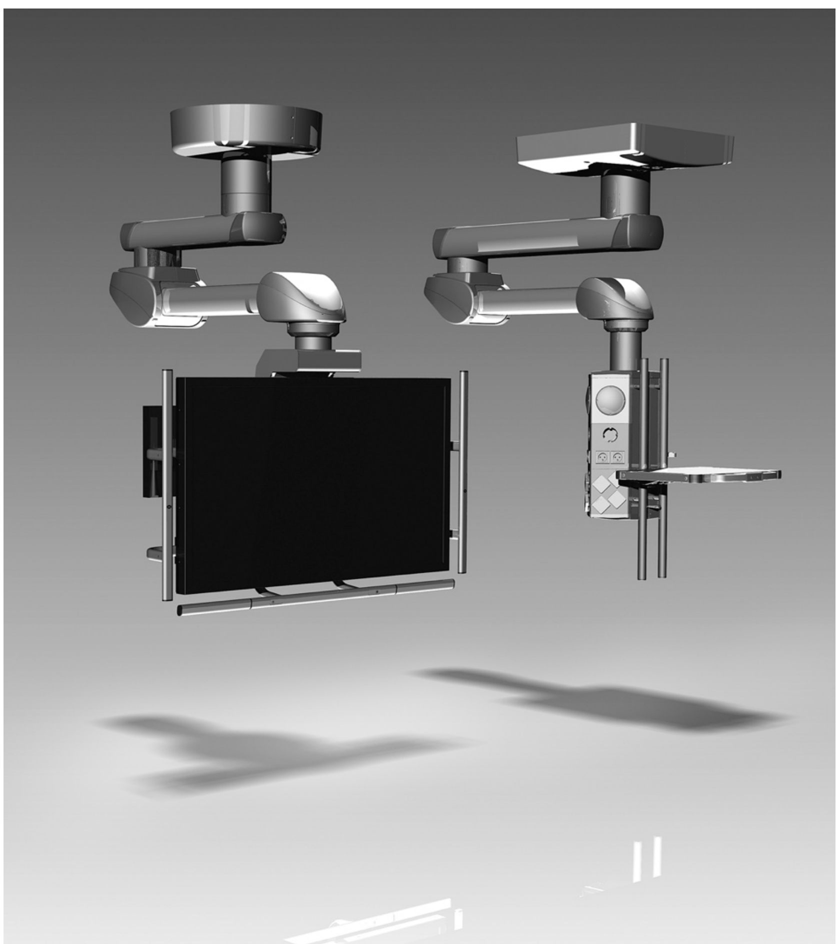

TABLE OF CONTENTS

GENERAL INFORMATION

Thank you for purchasing this Zimmer Biomet product. Please read this pre-installation reference document carefully and abide by the safety notices.

PRODUCTS IN SCOPE OF THIS REFERENCE DOCUMENT

- Volar 180 Single
- Volar 180 Dual
- Volar XL 180 Dual

CONTACT INFORMATION

Distributor

Zimmer Surgical, Inc.
200 West Ohio Avenue Dover, Ohio 44622 USA
(800) 830-0970
www.ZimmerBiomet.com

Manufacturer

Ondal Medical Systems of America, Inc.
540 Eastpark Court, Suite A
Sandston, VA 23150 • USA
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Ondal Medical Systems GmbH
Wellastraße 6
36088 Hünfeld Germany

INSTALLATION AND SERVICE

Installation **MUST BE PERFORMED** by a Zimmer Biomet authorized service provider to ensure the safety and effectiveness of the system. Prior to installation, information necessary for customization of the system will be obtained as part of the ordering process.

Zimmer Biomet Service
Phone: (800) 830-0971
Email: OmniSuiteSupport@zimmerbiomet.com

PARTY RESPONSIBILITIES

The responsibilities associated with planning and preparation for installation of Volar Boom System equipment will be shared between the Hospital, Contractor, and Zimmer Biomet. These responsibilities are outlined below.

Hospital Responsibilities

- Complete and sign room drawings and provide to Zimmer Biomet. This must be completed fourteen (14) weeks prior to the requested ship date.
- The hospital must supply Zimmer Biomet with up-to-date drawings in .dwg format (CAD) including but not limited to:
  - Room layout plans (current and proposed)
  - Electrical services drawings
  - Mechanical services drawings
  - Elevation drawings
  - Structural steel (support structure) drawings
  - Ceiling drawings
- The hospital must ensure Zimmer Biomet is notified of all revisions and changes to drawings prior to and during the scope of the project.
- Accept delivery of Zimmer Biomet equipment.
- All Zimmer Biomet-supplied equipment should be stored in a clean, temperature-controlled, dry environment prior to installation. Failure to comply may result in damage to the equipment.
  - Ambient conditions for storage and transport (in original packing materials):
    - Ambient temperature: -25°C to 70°C
    - Relative humidity: 10% to 75%
    - Atmospheric pressure: 500hPa to 1,060hPa
- Provide method for transport of Zimmer Biomet equipment from storage to the operating room (pallet jack).
- On the final day of installation, sign Zimmer Biomet Installation Acknowledgement Form. This form must be signed before the room can be turned over to the hospital.
- Install 3rd party equipment including pulling cables and installation related activities.
- Coordination of any 3rd party equipment to be attached to the Zimmer Biomet Volar Boom System.

Contractor Responsibilities

- Coordinate subcontractors.
- Prior to the installation start date, provide all rough-in requirements as explained in this reference document and the Zimmer Biomet rough-in drawings.
- Prior to the installation start date, run all cabling, electrical, and data as instructed in this reference document and the Zimmer Biomet drawings.
- Provide and pull all cables outside the operating room as specified in this reference document.
- Prior to the installation start date, connect all the required electrical circuits.
- Prior to the installation start date, complete all work involving dust, paint, and flooring.
- All Zimmer Biomet equipment that attaches to the building structure, such as mounting plate and brackets, must be mounted prior to Zimmer Biomet's installation date.
- All rooms must be reserved for Zimmer Biomet installation technicians only at all times during the installation dates.

Zimmer Biomet Responsibilities

- Provide design assistance and recommendations.
- Provide rough-in, cabling, electrical, and data requirements listed in this reference document.
- Provide rough-in drawings.
- Provide the hospital with a scope of work for Zimmer Biomet equipment installation.
- Pull all cables within the operating room. Hospital provides and pulls all cables outside of the operating room.
- Break down packaging material and gather all trash in a central location in the work area for Hospital / Contractor removal.
- Perform a final review and "walk through" of the installation to ensure all equipment is functioning and all installation requirements have been met.
- Remove and dispose of the pallets, boxes, and trash during and after the installation.

SYSTEM OVERVIEW

STRUCTURE OVERVIEW

Figure 1: Overall Boom Structure

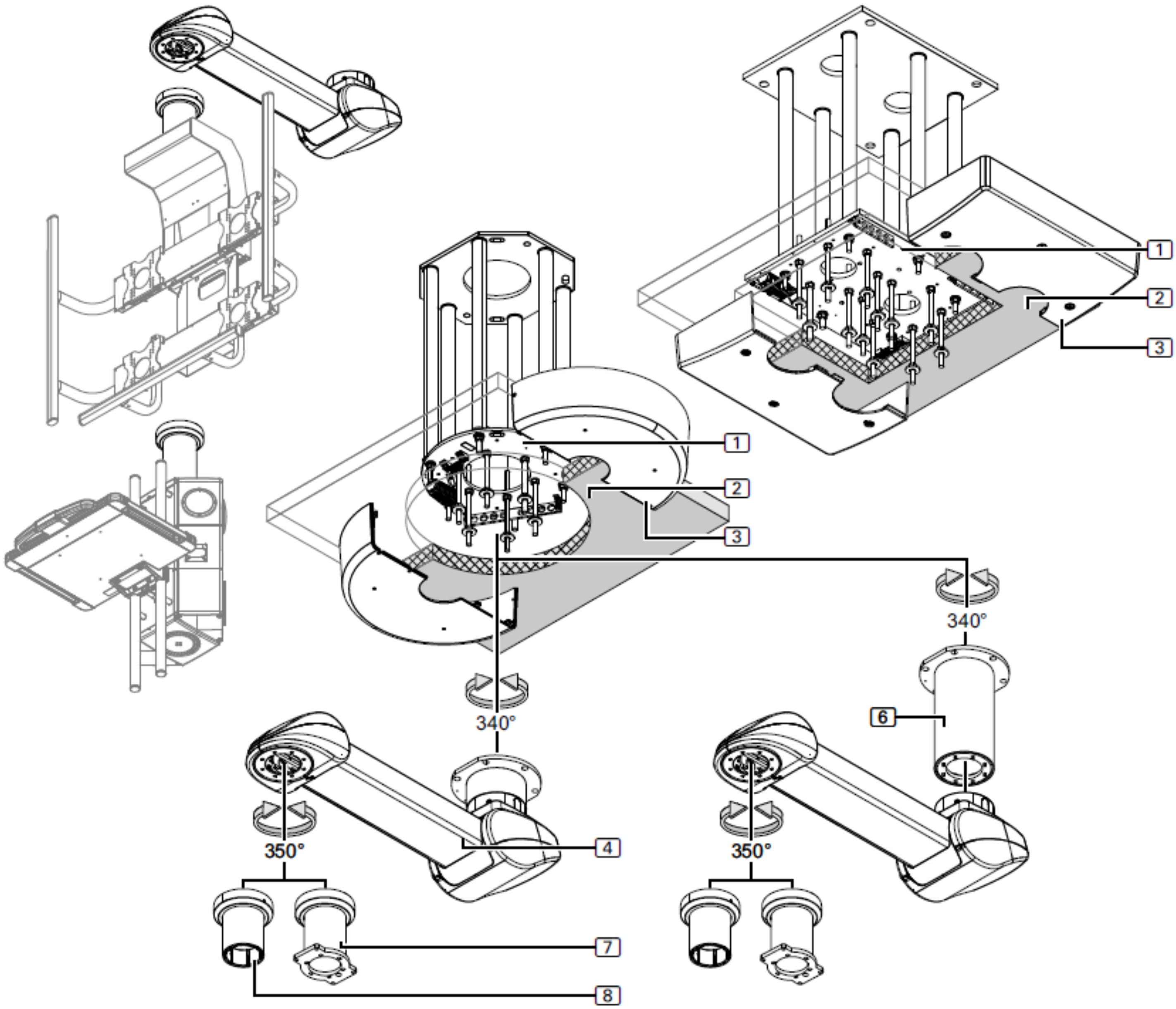


Figure 2: Ceiling Mount

- Interface plate on the raw ceiling
- Intermediate ceiling set and interface plate

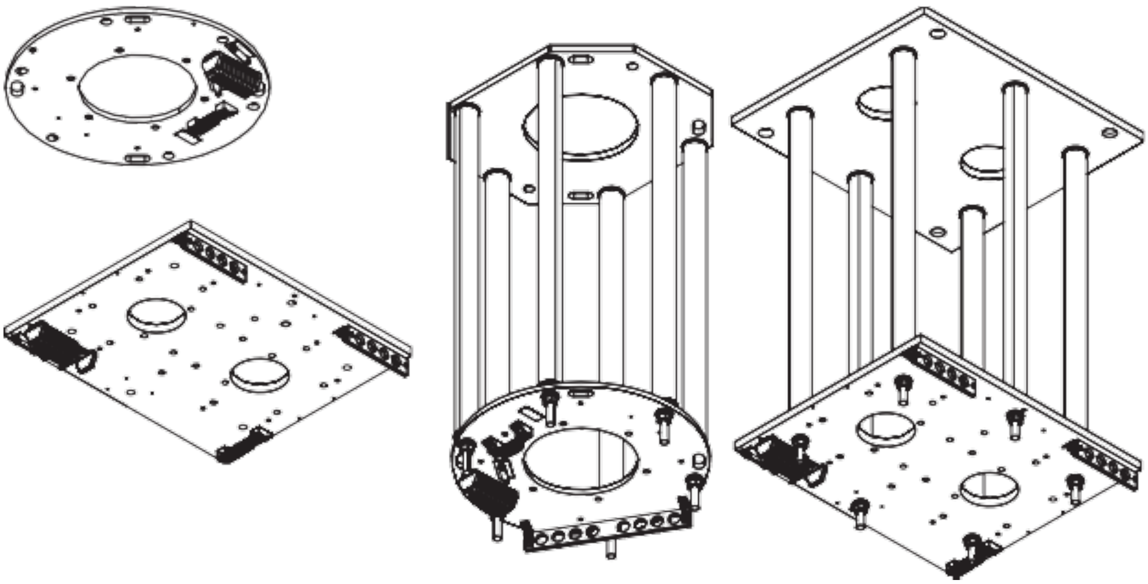


Figure 3: Boom System

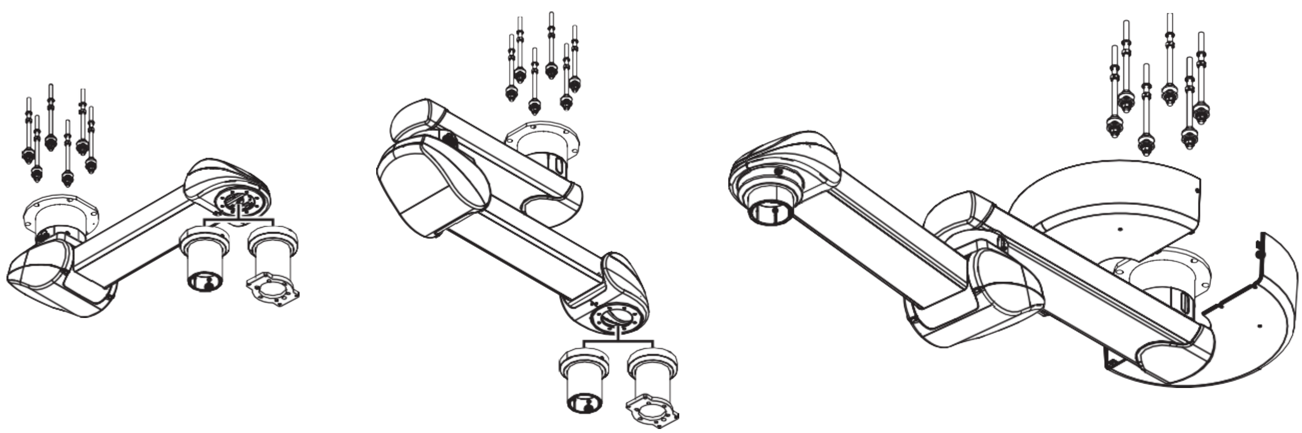
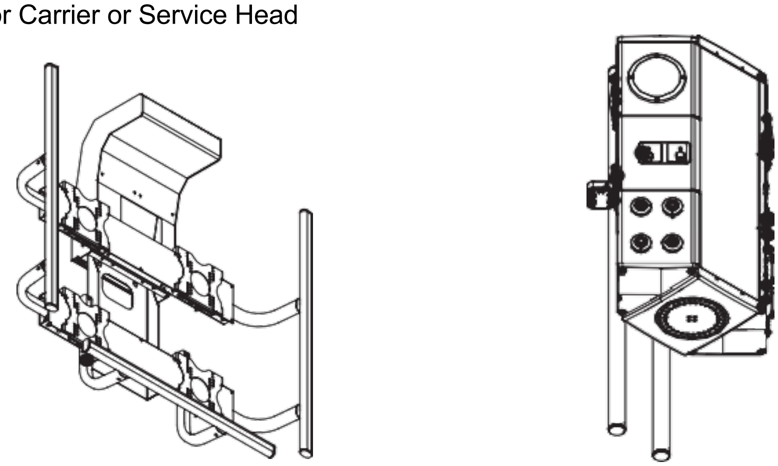


Figure 4: Monitor Carrier or Service Head



SITE PREP REQUIREMENTS

SITE PREP REQUIREMENTS

Power

- All electrical circuits and wiring must be installed by a certified electrician contracted through the hospital. The electrician must be available for final electrical wiring during installation.
- All electrical services must meet national and local building and electrical codes and be routed to junction boxes. Junction box will need a single branch circuit with 20 Amp, 120V AC, 60Hz or equivalent per local electrical codes.
- All electrical circuits will be called out in each individual site-specific elevation drawing.
- Test connections before commissioning in accordance with all IEC, NEC, NFPA 99 or local codes.

Video and Data

- All video and data connection must be available prior to installation. See Zimmer Biomet OmniSuite Systems Pre-Installation Manual for requirements and conduit schedule.
- If using non-Zimmer Biomet video and data systems, it is the responsibility of the hospital to arrange installation of the video and data components for installation.

Conduit

- All conduit runs should include insulated bushings on all open ends.
- All conduit runs must include pull strings.
- All conduit should have minimum bends and / or curves and not exceed four (4) 90-degree bends.

Gas and Air Lines

- All gas and air lines must be terminated by the hospital within 18' from the center of the boom interface plate. Each gas or air line must have the appropriate connectors for interfacing with the hoses of the boom.
- All gas and air requirements will be called out in each individual site-specific elevation drawing.
- It is the hospital's responsibility for terminating and preparing the line (bleeding) prior to install and connection by Zimmer Biomet.

Ceiling Mount / Support Structure

- Design of support structure lies entirely with the hospital / contractor. Zimmer Biomet will not review or approve the customer support structures. This is the responsibility of the customer's architect and designated structural engineer.
- A cut out in the ceiling for the mounting plate is required for installation of the boom assembly. The cut out should match the outline of the mounting plate and be aligned with the center of the mounting interface plate. The cut out will be concealed by the Volar Boom cover plate.

Retrofit Ceiling Mount

- In the case of retrofits to an already installed ceiling mount, the fixing elements used must be inspected by an architect and designated structural engineer, and approved prior to installation.
- Retrofits are NOT permitted if this approval has not been granted.

Ceiling Access

- A 24" x 24" ceiling access panel with direct access to the mounting interface structure is required. The ceiling access panel must be separate from the mounting structure cut out. Access is required to allow for power and data connections for installation and servicing the Volar Boom System.

EQUIPMENT / TECHNICAL SPECIFICATIONS

WEIGHTS

Dead Weight of Boom System

Volar 180 – Single Arm	Weight (kg)
Spring arm 1015mm	71 kg
Volar 180 – Dual Arm	**Weight (kg)**
Extension arm 600mm / spring arm 1015mm	96 kg
Extension arm 800mm / spring arm 1015mm	99 kg
Extension arm 1000mm / spring arm 1015mm	102 kg
Extension arm 1200mm / spring arm 1015mm	105 kg
Volar 180 – Dual Arm with XL Extension Arm	**Weight (kg)**
XL extension arm 600mm / spring arm 1015mm	112 kg
XL extension arm 800mm / spring arm 1015mm	117 kg
XL extension arm 1000mm / spring arm 1015mm	122 kg
XL extension arm 1200mm / spring arm 1015mm	127 kg
XL extension arm 1400mm / spring arm 1015mm	132 kg
XL extension arm 1600mm / spring arm 1015mm	137 kg

Dead Weight of Ceiling Tub Extension Arm

	Weight (kg)
Flange	6 kg
Steel Tube	24 kg / m

Dead weight of the ceiling tube for the XL extension arm

	Weight (kg)
Flange	7.5 kg
Steel Tube	31.7 kg / m

Dead weight of console tube

	Weight (kg)
Bearing Unit	5 kg
Console Tube	8 kg / m

Max Load Bearing Capacity of Boom System

Volar 180 – Single Arm	Weight (kg)
Spring arm 1015mm	180 kg
Volar 180 – Dual Arm	Weight (kg)
Extension arm 600mm / spring arm 1015mm	180 kg
Extension arm 800mm / spring arm 1015mm	170 kg
Extension arm 1000mm / spring arm 1015mm	150 kg
Extension arm 1200mm / spring arm 1015mm	130 kg
Volar 180 – Dual Arm with XL Extension Arm	Weight (kg)
XL extension arm 600mm / spring arm 1015mm	180 kg
XL extension arm 800mm / spring arm 1015mm	180 kg
XL extension arm 1000mm / spring arm 1015mm	180 kg
XL extension arm 1200mm / spring arm 1015mm	180 kg
XL extension arm 1400mm / spring arm 1015mm	180 kg
XL extension arm 1600mm / spring arm 1015mm	180 kg

LOAD DATA

WARNING: The safety factors prescribed in the individual regions must be taken into account for calculating the maximum load data.

Table 1: Volar 180 Load Data

Volar 180 – Single Arm	Vertical weight force F_G in N	Vertical weight force of the Intermediate ceiling set F_G in N	Maximum bending moment M_B in Nm	Carrying loads G in kg
Spring arm 1015mm	2578	1300	1900	180
Volar 180 – Dual Arm	Vertical weight force F_G in N	Vertical weight force of the Intermediate ceiling set F_G in N	Maximum bending moment M_B in Nm	Carrying loads G in kg
Extension arm 600mm / spring arm 1015mm	2770	1300	3450	180
Extension arm 800mm / spring arm 1015mm	2701	1300	3800	170
Extension arm 1000mm / spring arm 1015mm	2535	1300	3900	150
Extension arm 1200mm / spring arm 1015mm	2368	1300	3950	130
Volar 180 – Dual Arm with XL Extension Arm	Vertical weight force F_G in N	Vertical weight force of the Intermediate ceiling set F_G in N	Maximum bending moment M_B in Nm	Carrying loads G in kg
XL extension arm 600mm / spring arm 1015mm	2948	1300	3450	180

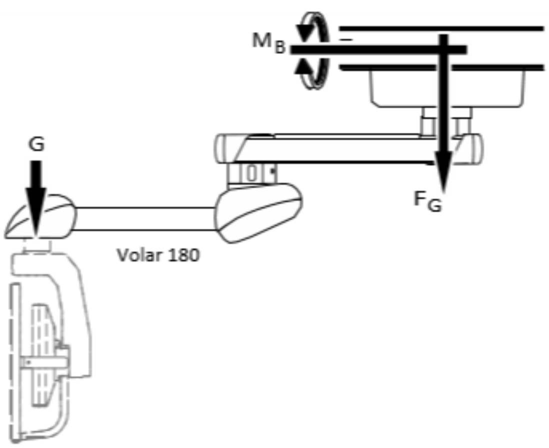
XL extension arm 800mm / spring arm 1015mm	2997	1300	4000	180
XL extension arm 1000mm / spring arm 1015mm	3046	1300	4550	180
XL extension arm 1200mm / spring arm 1015mm	3095	1300	5100	180
XL extension arm 1400mm / spring arm 1015mm	3144	1300	5650	180
XL extension arm 1600mm / spring arm 1015mm	3193	1300	6250	180

LOAD DATA – SINGLE ARM

The data required for calculating the ceiling load is indicated in the tables below. When mounting the pendant system to the Intermediate ceiling set, the vertical weight force of the Intermediate ceiling set (the values correspond to the maximum load) must be added to the corresponding values of the pendant system in order to determine the ceiling load.

The table indicates the values for the maximum permissible load bearing capacity of the pendant system single version. The load data of a duo version can be added.

Figure 5: Volar 180 Single Arm



LOAD DATA – DUAL ARM SUPPORT COMBINATION

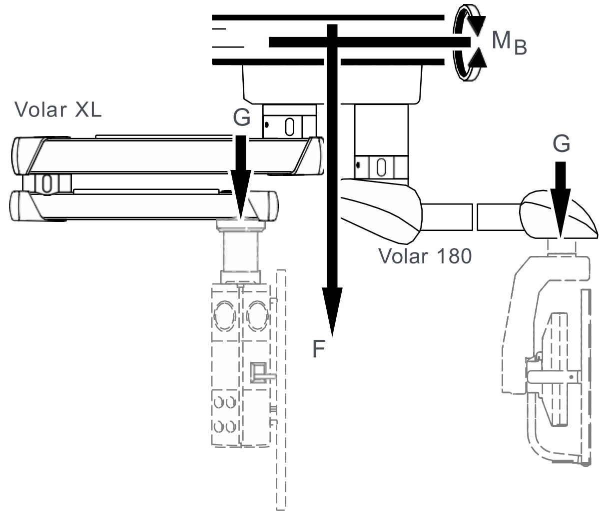
The vertical weight forces and bending moments of the various pendant systems of duo versions can be added.

Example:

Volar 180 (spring arm 1015mm) on the intermediate ceiling set combined with Volar XL (extension arm 1200 / 1000mm).

Sum of weight forces: 2578 N + 3599 N + 1300 N = 8478 N.
Sum of bending moments: 1900 Nm + 6502 Nm = 8402 Nm.

Figure 6: Support Arm Combination



CEILING STRUCTURE AND INTERFACE PLATE MOUNTING

NOTE: The below drawings are reference only. The design of the support structure is the hospitals responsibility.
NOTE: Design of support structure lies entirely with the hospital / contractor. Zimmer Biomet will not review or approve the customer support structures. This is the responsibility of the customer's architect and designated structural engineer.

Figures 7 and 8 show possible installation substructures for the installation of the boom system. Check the strength and stability of the mounting structure.

- It should be fabricated of steel and welded or bolted to the structural ceiling.
- It should be braced to allow no twisting or lateral motion.
- In standard installations, a steel stiffener plate and threaded support rods should be used (determined by an engineer).
- Structure should be 3.15" – 6.7" (80 – 170mm) above the finished ceiling line measured from the bottom of the plate

Figure 7: Example of support structure and ceiling mount

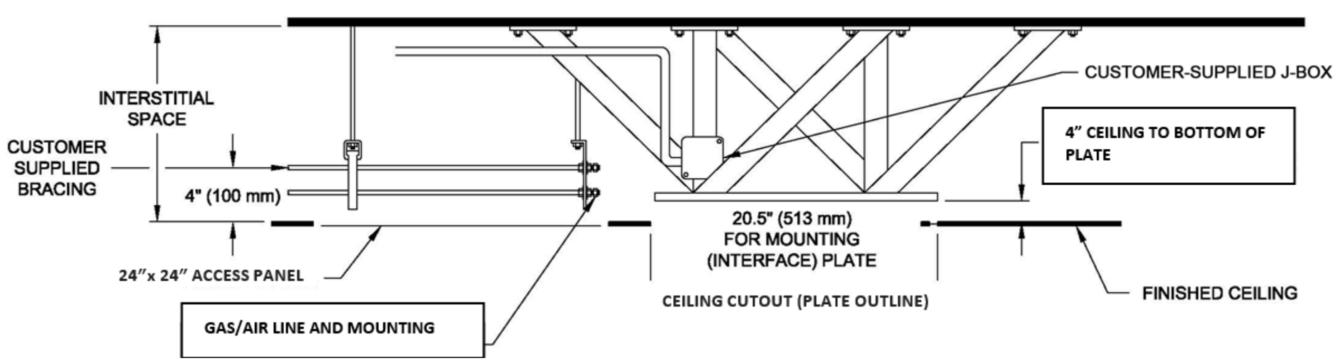
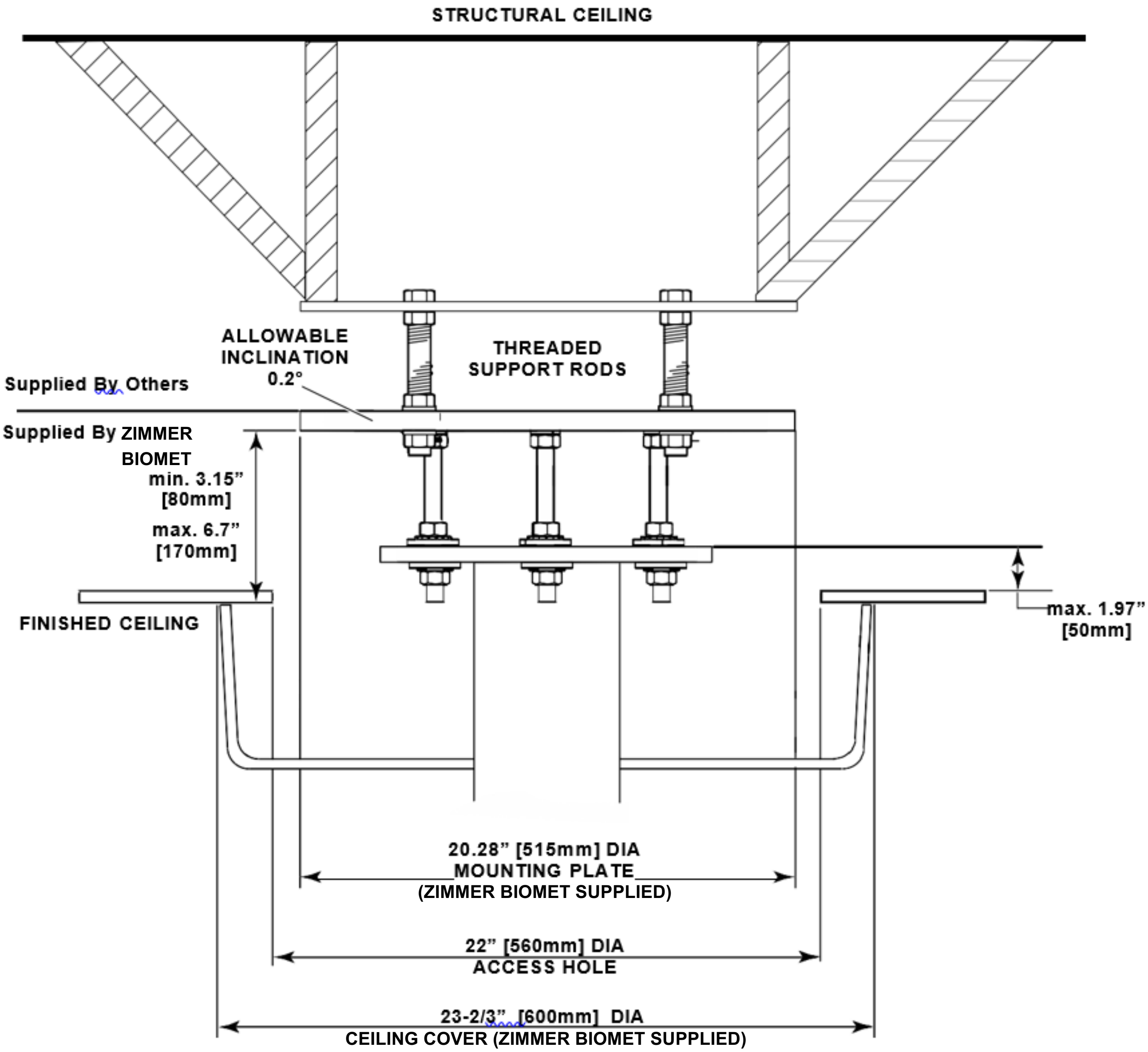


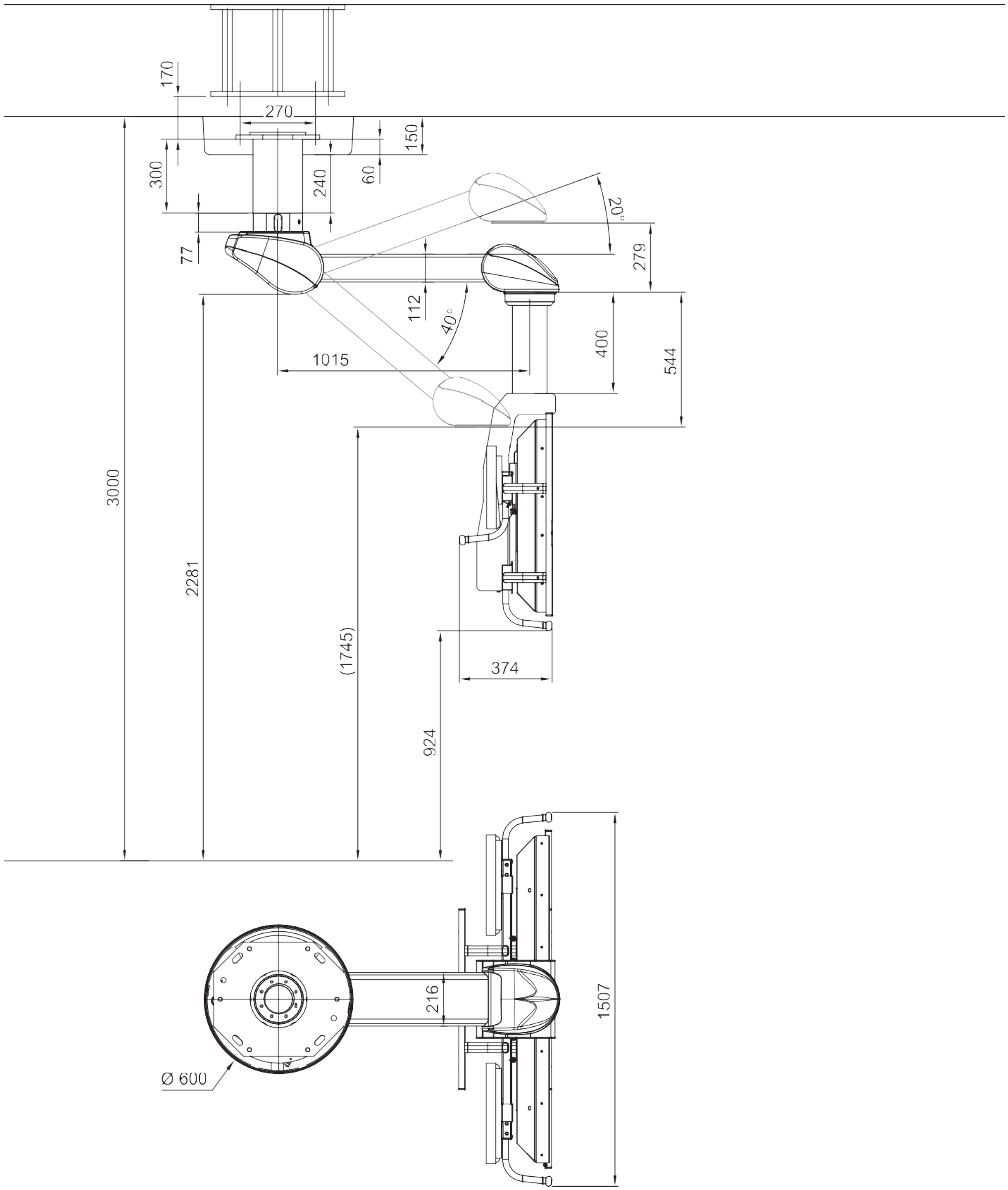
Figure 8: Typical Mounting Structure



CONFIGURATIONS

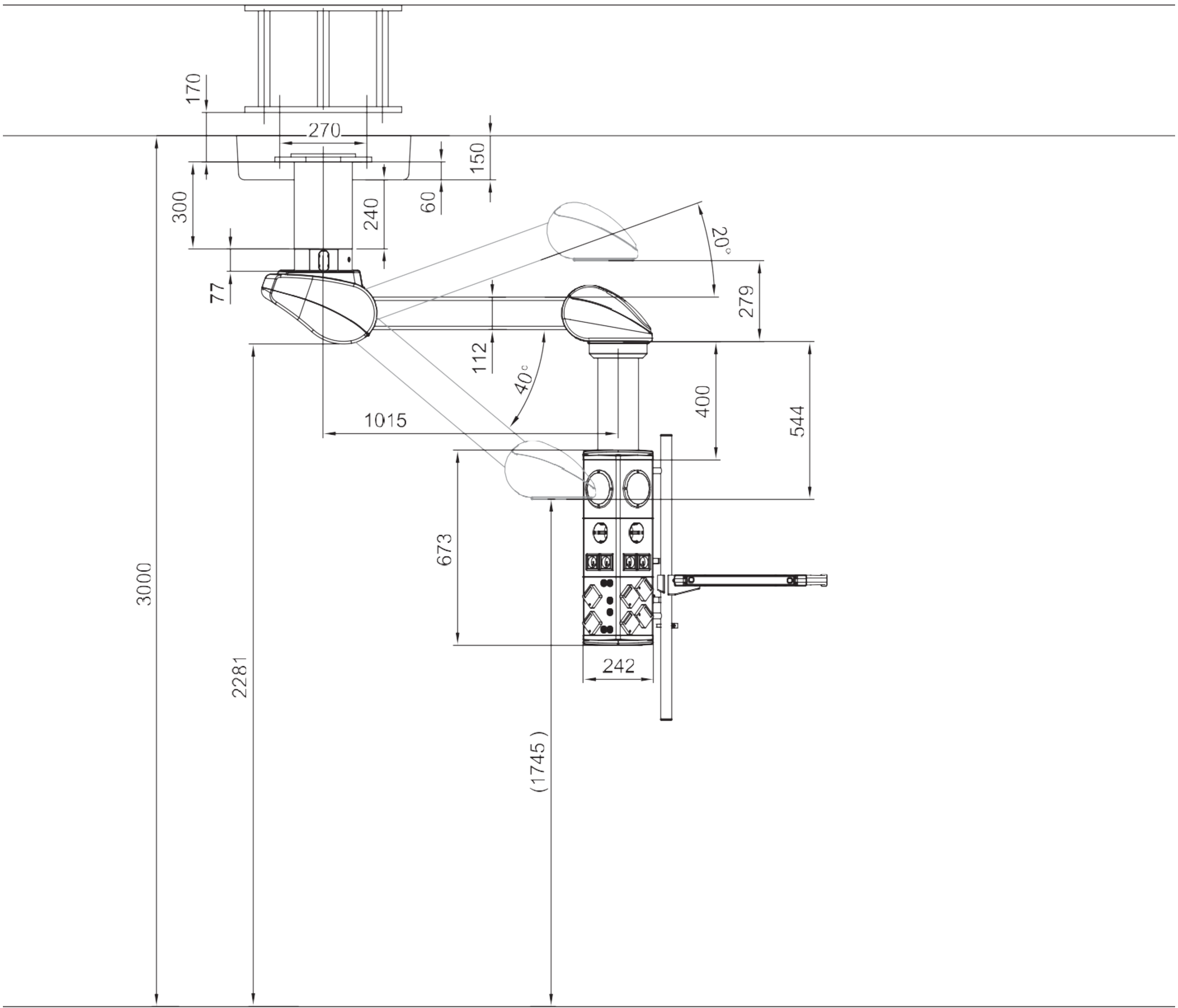
VOLAR 180 SINGLE ARM WITH MONITOR ARM

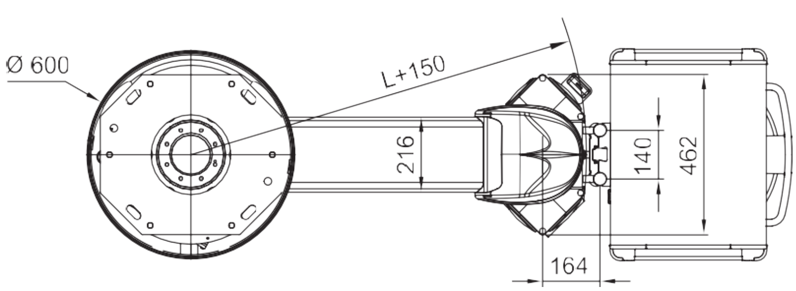
This subchapter presents configuration examples for the Volar 180 product family. The schematic representation on this page differs from the individually configured Volar 180. The round canopy can only be mounted with the round interface plate. The rectangular canopy 700 x 700mm can only be mounted with the rectangular interface plate.



SPRING ARM, VOLAR 180 SINGLE ARM WITH SERVICE HEAD M6

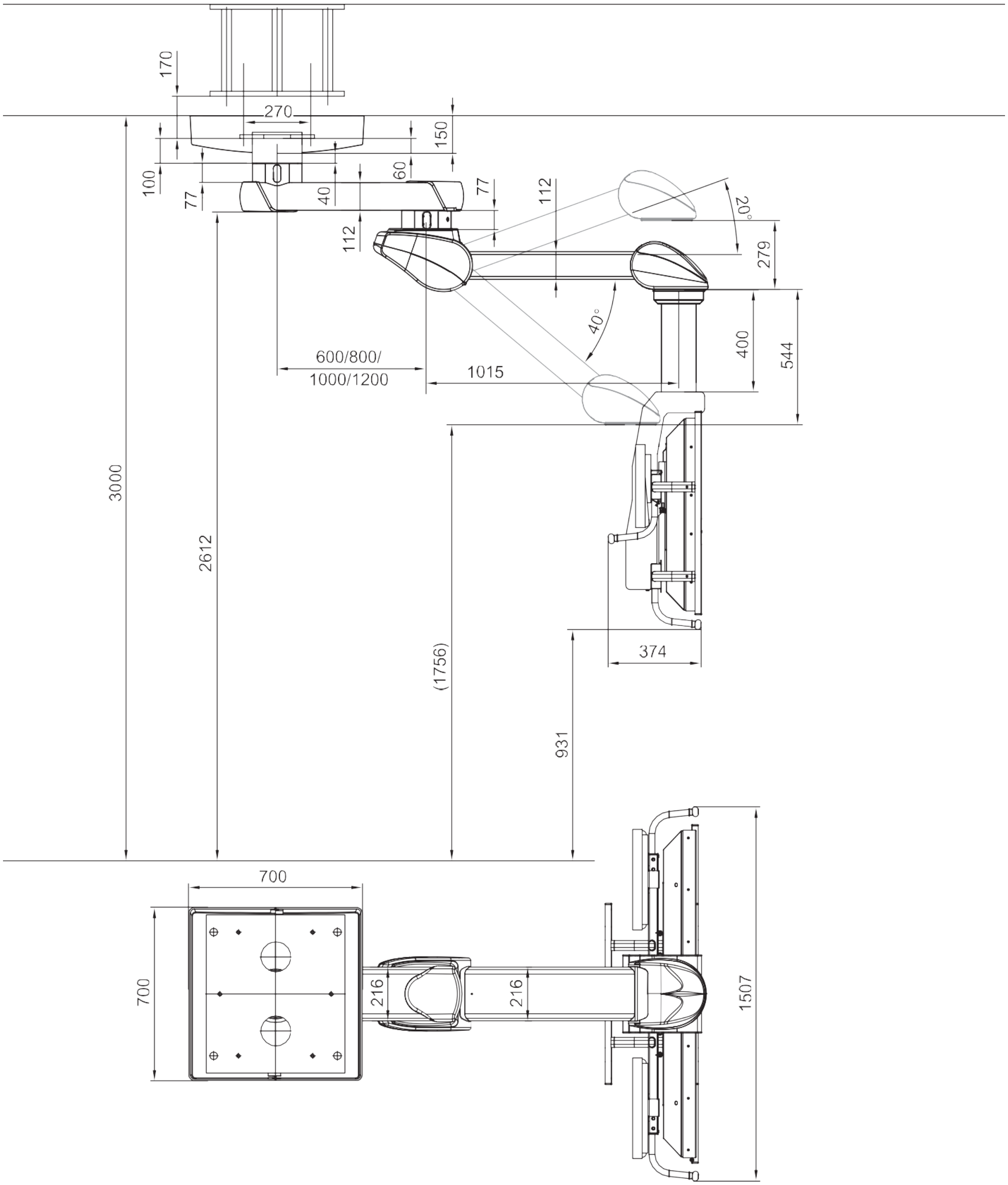
This subchapter presents configuration examples for the Volar 180 product family. The schematic representation on this page differs from the individually configured Volar 180. The round canopy can only be mounted with the round interface plate. The rectangular canopy 700 x 700mm can only be mounted with the rectangular interface plate.





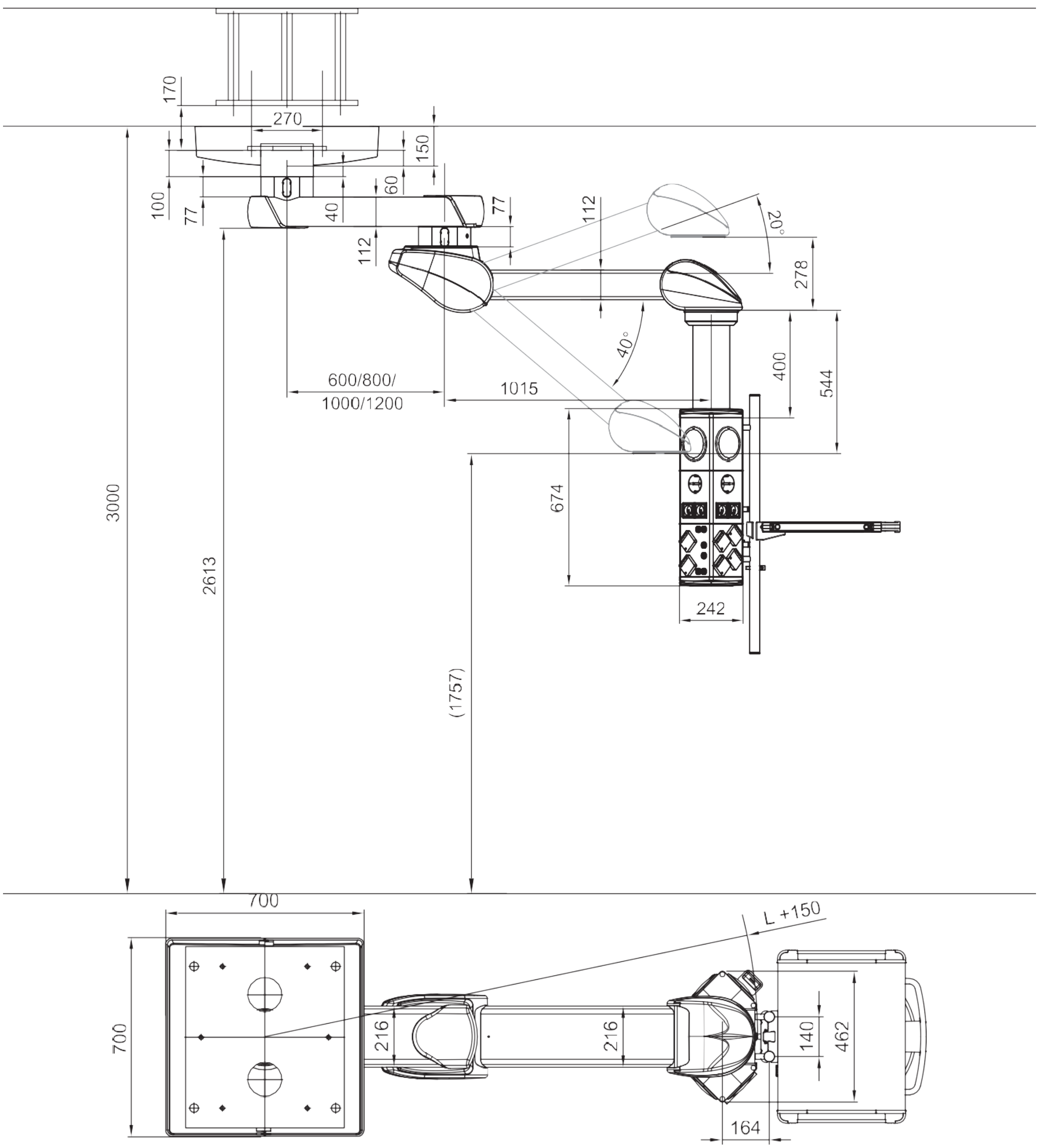
EXTENSION ARM WITH SPRING ARM, VOLAR 180 DUAL ARM WITH CEMOR

This subchapter presents configuration examples for the Volar 180 product family. The schematic representation on this page differs from the individually configured Volar 180. The round canopy can only be mounted with the round interface plate. The rectangular canopy 700 x 700mm can only be mounted with the rectangular interface plate.



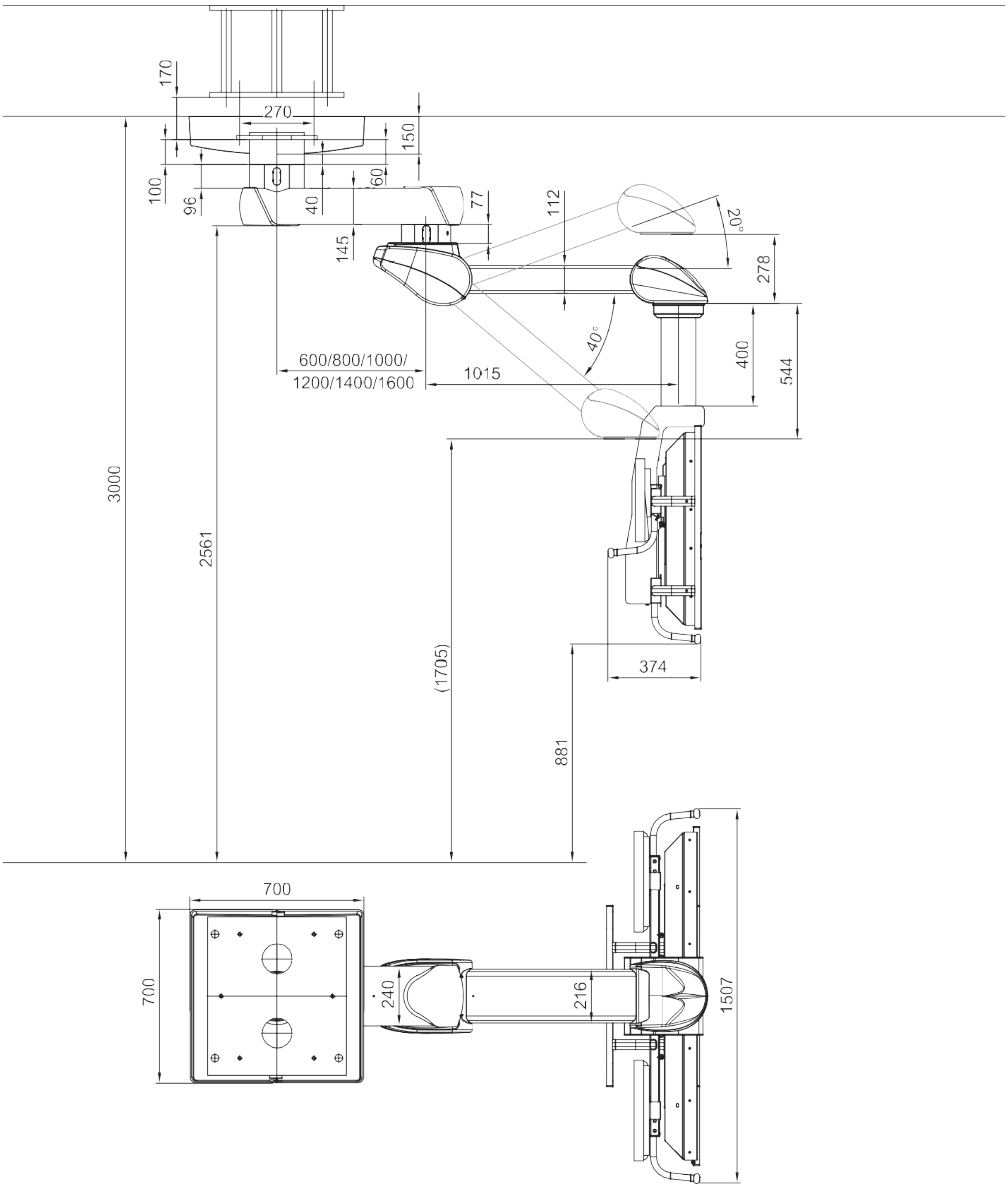
EXTENSION ARM WITH SPRING ARM, VOLAR 180 DUAL ARM WITH SERVICE HEAD M6

This subchapter presents configuration examples for the Volar 180 product family. The schematic representation on this page differs from the individually configured Volar 180. The round canopy can only be mounted with the round interface plate. The rectangular canopy 700 x 700mm can only be mounted with the rectangular interface plate.



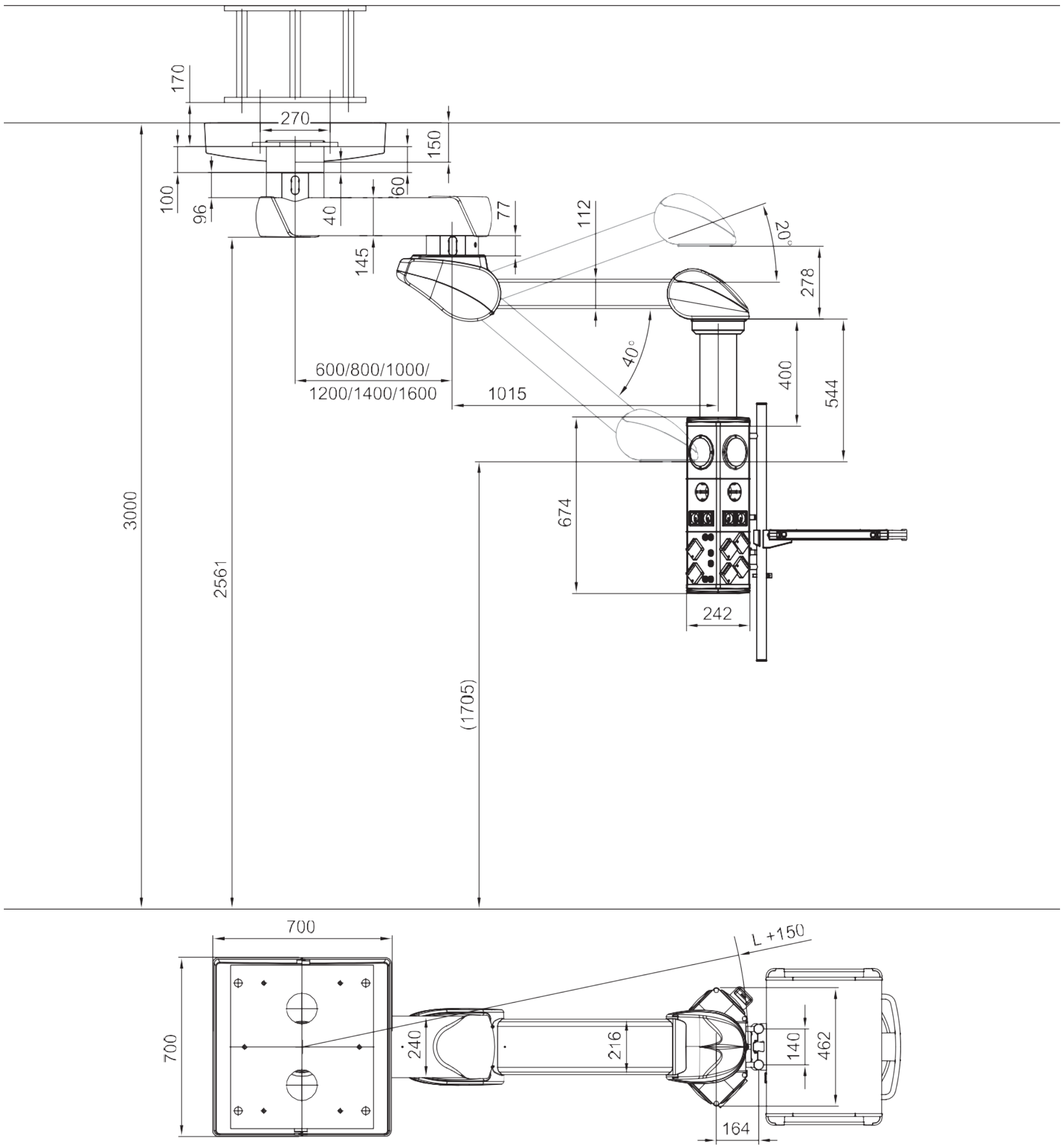
XL EXTENSION ARM WITH SPRING ARM, VOLAR XL 180 DUAL ARM WITH CEMOR

This subchapter presents configuration examples for the Volar 180 product family. The schematic representation on this page differs from the individually configured Volar 180. The round canopy can only be mounted with the round interface plate. The rectangular canopy 700 x 700mm can only be mounted with the rectangular interface plate



XL EXTENSION ARM WITH SPRING ARM, VOLAR XL 180 DUAL ARM WITH SERVICE HEAD M6

This subchapter presents configuration examples for the Volar 180 product family. The schematic representation on this page differs from the individually configured Volar 180. The round canopy can only be mounted with the round interface plate. The rectangular canopy 700 x 700mm can only be mounted with the rectangular interface plate.



SEISMIC DATA

VOLAR BOOM WITH SERVICE HEAD

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SEISMIC ANCHORAGE

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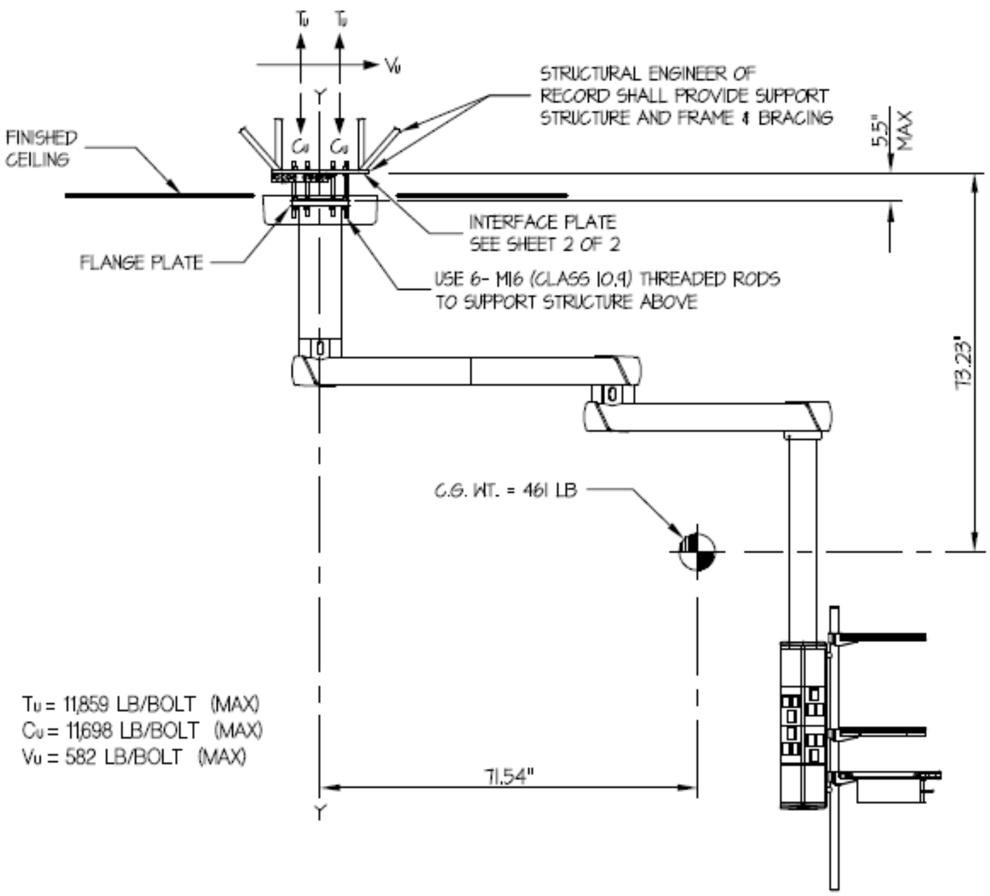

ELEVATION

NOTES:

1. FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10 STRENGTH DESIGN IS USED. (S_{DS} = 2.2, a_p = 2.5, I_p = 1.5, R_p = 2.5, $z/h \leq 1$)

    HORIZONTAL FORCE (E_h) = 3.96 W_p
    VERTICAL FORCE (E_v) = 0.44 W_p

2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATIONS ENCOMPASS ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

REGISTERED PROFESSIONAL ENGINEER JONATHAN ROBERSON No. 4197 EXP. 6-30-2016 9/3/15 STRUCTURAL STATE OF CALIFORNIA

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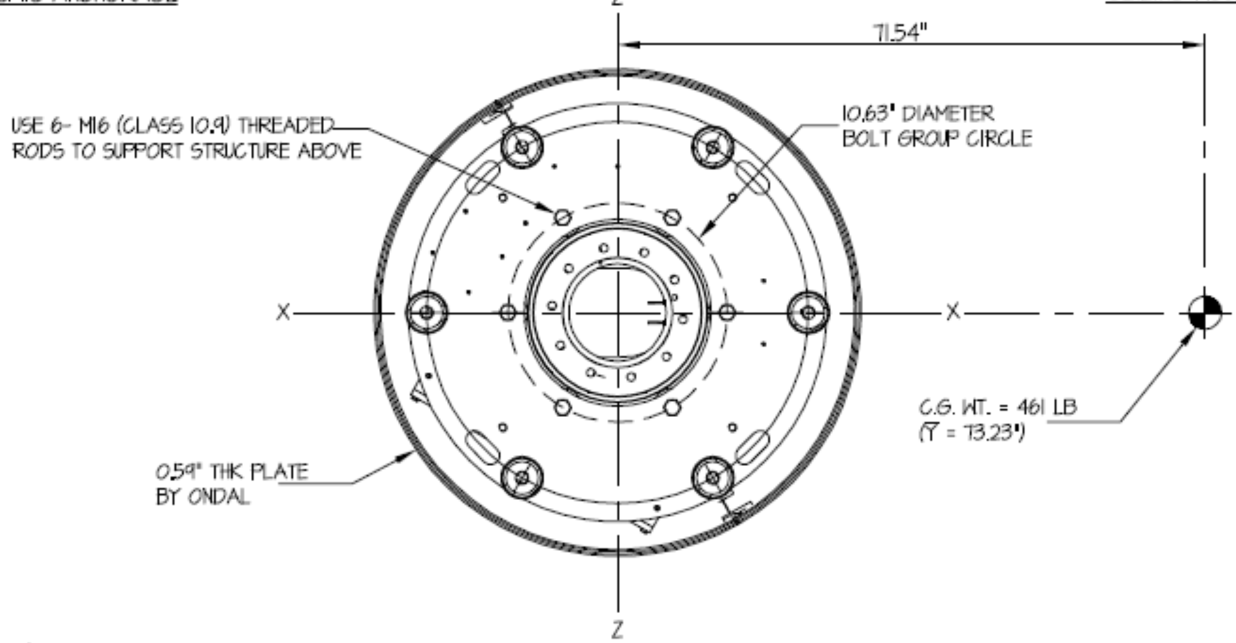

PLAN AT INTERFACE FLANGE

LOADS:

WEIGHT = 461 LB
HORIZONTAL FORCE (E_h) = 1826 LB
VERTICAL FORCE (E_v) = 203 LB

MOMENTS:

M_{XX} = 1826#(73.23") + (1.2(461#) + 203#)71.54" = 187,817"#
M_{ZZ} = 1826#(73.23") + (1.2(461#) + 203#)71.54" = 187,817"#
M_{YY} = 100#(71.54") = 7154"#

NOTE: UNIT IS FREE TO ROTATE 360 DEGREES ABOUT Y-Y AXIS. BRAKING SYSTEM RELEASES WITH APPLIED LOAD OF 25 LB. AT C.G. LOCATION. CALCULATION USES 100 LBS. FOR A SAFETY FACTOR OF 4.

BOLT FORCES:

TENSION (T)

$$T_u = \frac{187817"\#(5.315")}{85} + \frac{(1.2(461\#)\# + 203\#)}{6 \text{ BOLTS}} = 11{,}859 \text{ LB/BOLT (MAX)}$$

COMPRESSION (C)

$$C_u = \frac{187817"\#(5.315")}{85} - \frac{(461\#(0.9) - 203\#)}{6 \text{ BOLTS}} = 11{,}698 \text{ LB/BOLT (MAX)}$$

SHEAR (V)

$$V_u = \frac{1826\#}{6 \text{ BOLTS}} + \frac{7154\#(5.315")}{170} = 528 \text{ LB/BOLT (MAX)}$$

(PER AISC J3.7, LESS THAN 20% STRESS)

BENDING (M)

M_{act} = 528#(4.476"/2) = 1182"-#

BOLT GROUP PROPERTIES:

I_{X-X} = 85 $in.^4$
I_{Z-Z} = 85 $in.^4$
I_{Y-Y} = 170 $in.^4$

BOLT PROPERTIES:

F_y = 136 ksi ; F_u = 150 ksi, d = 0.533" ; ϕ = 0.90
Z = $d^3/6$ = $(0.533)^3/6$ = 0.0252 $in.^3$
A_g = 0.2231 $in.^2$, A_b = 0.312
r = 0.1333 In.
KL/r = 1.2(4.476")/0.1333 = 40.3
M_n = 136 ksi (0.0252 $in.^3$) = 3427"-#

$M_{STR} = \phi M_n$ = (0.9)(3427"-#) = 3084"-#
T_{STR} = 26,325 lb. (AISC Eq J3-2)
C_{STR} = 19,778 lb. (AISC Eq E3-1)

COMBINED STRESS CHECK:

COMPRESSION: $\frac{C}{C_{STR}} + \frac{8}{9}\left(\frac{M}{M_{STR}}\right) = 0.93 < 1.00 \therefore$ OK

TENSION: $\frac{T}{T_{STR}} + \frac{8}{9}\left(\frac{M}{M_{STR}}\right) = 0.79 < 1.00 \therefore$ OK

VOLAR MOTORIZED WITH SERVICE HEAD

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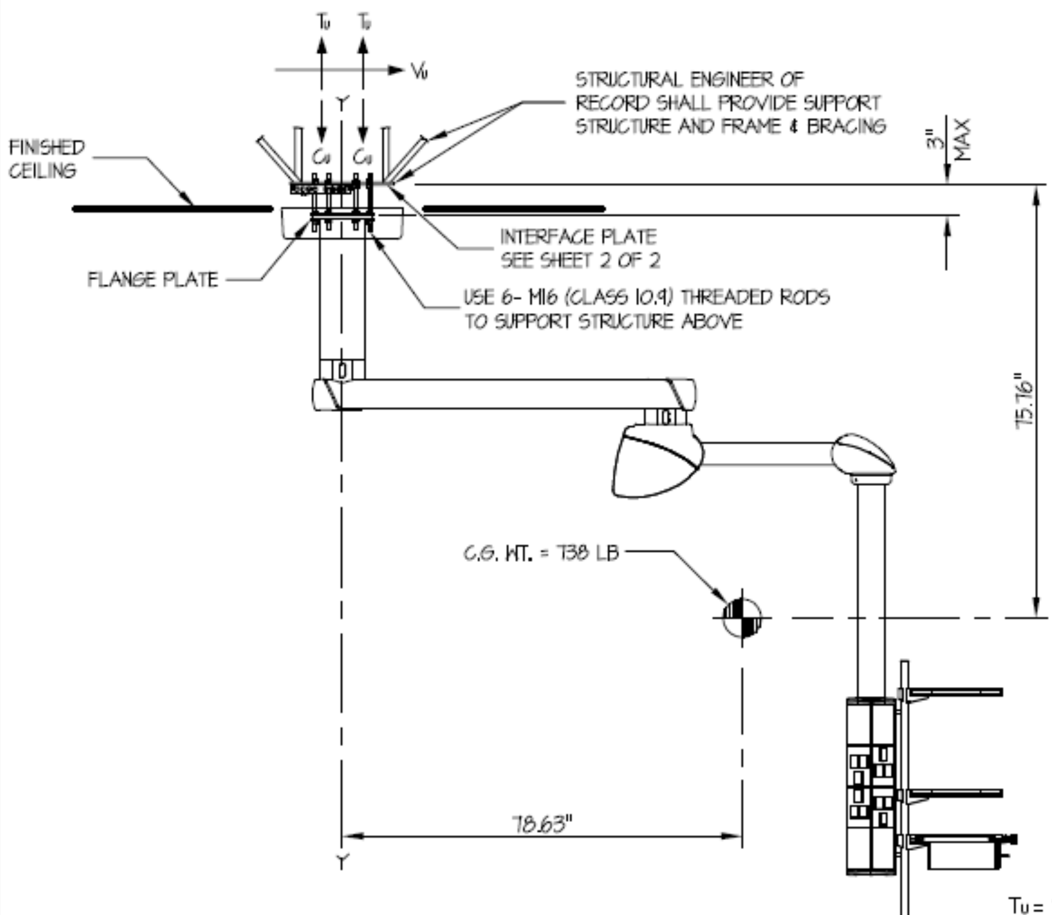

ELEVATION

T_u = 19,977 LB/BOLT (MAX)
C_u = 19,719 LB/BOLT (MAX)
V_u = 733 LB/BOLT (MAX)

NOTES:

1. FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10
   STRENGTH DESIGN IS USED. (S_{DS} = 2.20, a_p = 2.5, I_p = 1.5, R_p = 2.5, $z/h \leq 1$)

   HORIZONTAL FORCE (E_h) = 3.96 W_p
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SEISMIC ANCHORAGE

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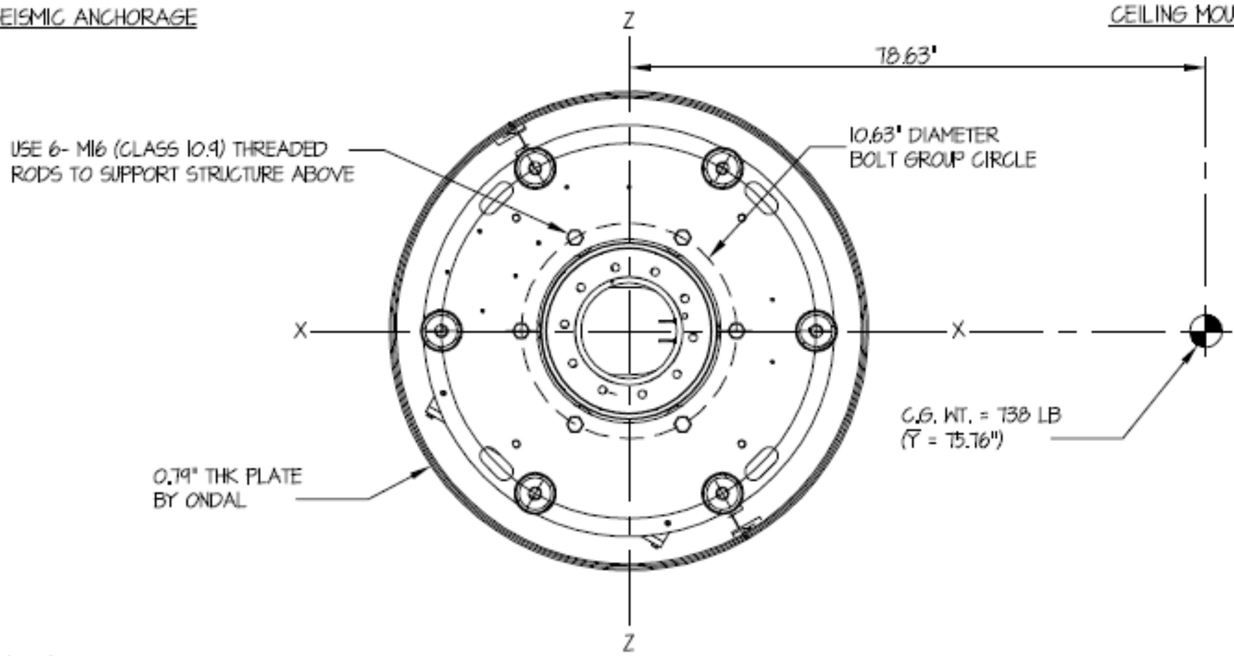

PLAN AT INTERFACE FLANGE

LOADS:

WEIGHT = 738 LB

HORIZONTAL FORCE (E_h) = 2922 LB

VERTICAL FORCE (E_v) = 325 LB

BOLT FORCES:

TENSION (T)

$$T_u = \frac{316560''\#(5.315'')}{85} + \frac{(1.2(738\#)\# + 325\#)}{6 \text{ BOLTS}} = 19{,}977 \text{ LB/BOLT (MAX)}$$

COMPRESSION (C)

$$C_u = \frac{316560''\#(5.315'')}{85} - \frac{(738\#(0.9) - 325\#)}{6 \text{ BOLTS}} = 19{,}719 \text{ LB/BOLT (MAX)}$$

SHEAR (V)

$$V_u = \frac{2922\#}{6 \text{ BOLTS}} + \frac{7863\#(5.315'')}{170} = 733 \text{ LB/BOLT (MAX)}$$

(PER AISC J3.7, LESS THAN 20% STRESS)

BENDING (M)

$$M_{act} = 733\#(1.976''/2) = 724''\text{-}\#$$

COMBINED STRESS CHECK:

$$\text{COMPRESSION: } \frac{C}{C_{STR}} + \frac{8}{9}\left(\frac{M}{M_{STR}}\right) = 0.98 < 1.00 \therefore \text{OK}$$

$$\text{TENSION: } \frac{T}{T_{STR}} + \frac{8}{9}\left(\frac{M}{M_{STR}}\right) = 0.97 < 1.00 \therefore \text{OK}$$

MOMENTS:

M_{XX} = 2922#(75.76") + (1.2(738#) + 325#)78.63" = 316,560"#

M_{ZZ} = 2922#(75.76") + (1.2(738#) + 325#)78.63" = 316,560"#

M_{YY} = 100#(78.63") = 7863"#

NOTE: UNIT IS FREE TO ROTATE 360 DEGREES ABOUT Y-Y AXIS. BRAKING SYSTEM RELEASES WITH APPLIED LOAD OF 25 LB. AT C.G. LOCATION. CALCULATION USES 100 LBS. FOR A SAFETY FACTOR OF 4.

BOLT GROUP PROPERTIES:

$I_{x\text{-}x}$ = 85 in.^{4}

$I_{z\text{-}z}$ = 85 in.^{4}

$I_{y\text{-}y}$ = 170 in.^{4}

BOLT PROPERTIES:

F_y = 136 ksi ; F_u = 150 ksi, d = 0.533" ; ϕ = 0.90

Z = $d^3/6$ = $(0.533)^3/6$ = 0.0252 in.^{3}

A_g = 0.2231 in.^{2}, A_b = 0.312

r = 0.1333 in.

KL/r = 1.2(1.976")/0.1333 = 17.8

M_n = 136 ksi (0.0252 in.^{3}) = 3427"-#

M_{STR} = ϕM_n = (0.9)(3427"-#) = 3084"-#

T_{STR} = 26,325 lb. (AISC Eq J3-2)

C_{STR} = 25,641 lb. (AISC Eq E3-1)

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