ANSWERS. SOLUTIONS. RESULTS. CORRE

Madison Office
6510 Grand Teton Plaza
Suite 314
Madison, WI 53719
608.828.1011 P

STRUCTURAL CALCULATIONS

Anchorage of Dental Equipment to Interior Wall:

CDX Backing over Steel Studs

Prepared for: Henry Schein Dental

February 4, 2022

Digitally signed by Eric Price,PE
Reason: I attest to the accuracy and integrity of this document
Contact Info: eprice@correinc.com/608.826.6146
Date: 2022.02.04 11:54:25-06'00'

TABLE OF CONTENTS

SUMMARY OF RESULTS

- (2) 3/4" plies of CDX plywood shall be secured to existing cold-formed steel (CFS) stud framing using 2½" Simpson Strong-Tie #10 Self-Drilling Bugle-Head Screws (or approved equal) spaced at 12" maximum centers *per stud*. Specific Simpson Strong-Tie screw model number = F10T250BD.
- To adequately secure the KAVO Orthopantomograph OP 3D unit to wall/backing, use (2) 3/8" diameter x 2" long lag screws.
- To adequately secure the Planmeca Viso unit to wall/backing, use (4) 3/8" diameter x 2½" long lag screws.
- Refer to attached Backing Installation Detail for additional information.

CDX ATTACHMENT ANALYSIS

CORRE

CORRE, INC.
Transportation & Municipal Engineering
6510 Grand Teton Plaza, Ste 314
Madison, WI 53719
www.correinc.com

JOB HENRY SCHEIN DENTAL
SHEET NO. CFS BACKING DETAILS OF
CALCULATED BY ETP DATE 1/4/22
CHECKED BY DATE
SCALE NTS

CALCULATE WITHDRAWAL CAPACITY OF CDX BACKING:

- RECOMMEND USING #10 SCREWS AT 12" CENTERS
  → PULL-OUT CAPACITY = 84 LBS/SCREW (SEE ATTACHED REFERENCE)

- CONSERVATIVELY ASSUME STUD SPACING = 24" [MAX SPACING PER 2018 INTERNATIONAL BUILDING CODE]

∴ PULL-OUT CAPACITY = $\left(9 \frac{\text{SCREWS}}{\text{STUD}}\right)\left(\frac{48\text{" BACKING WIDTH}}{24\text{" STUD SPACING}} + 1\right)\left(84 \frac{\text{LBS}}{\text{SCREW}}\right)$

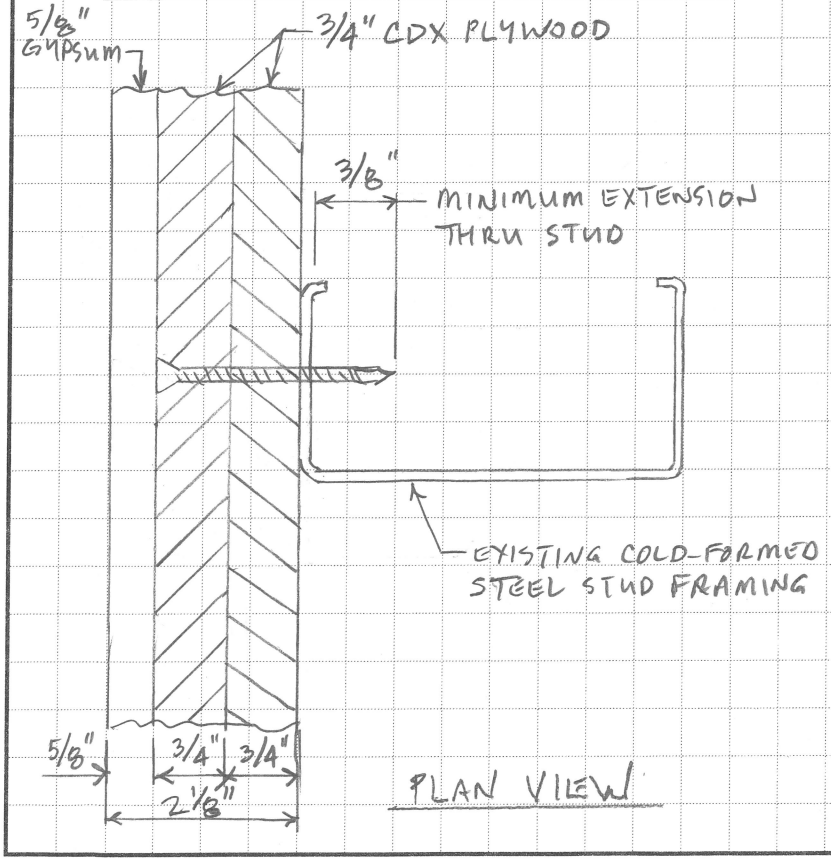
(ASSUMES 8' WALL HT)

(2 SPACES = 3 STUDS)

$= 2{,}268^{\text{LBS}} >> 1{,}400^{\text{LBS}}$

OK ✓

DETERMINE MINIMUM SCREW LENGTH:



PLAN VIEW

MIN SCREW LENGTH:

1.500"	CDX PLIES
0.120	STUD THICKNESS
0.125	SURFACE INCONSISTENCIES
0.375	MIN EXTENSION THRU STUD
Σ = 2.120"	

∴ SAY 2 1/2" LENGTH

Fastening Options

Conservatively assume lightest gauge steel studs

Calculated withdrawal/pull-out capacity = 84 lbs/screw (Factor of Safety = 3.0)

Recommend using #10 screws to secure (2) 3/4" CDX plies to the steel studs/framing.

Connections can be made using a variety of fastening options. It is critical to specify the proper fastener to ensure the proper performance of the connections in cold-formed steel construction. The most common and widely used connection methods are screw connections and weld connections. Each type of connection method has various advantages and disadvantages. Therefore, we provide data for both types so you can choose your preferred connection method.

Self-Drilling Screws—externally threaded fasteners with the ability to drill their own hole and form, or "tap," their own internal threads without deforming their thread and without breaking during installation. These screws are high-strength, one-piece fasteners and are used if the connection of multiple thicknesses of 33mil steel or thicker. One of the more common self-drilling screws is a #10-16 x 5/8 HWH SD, which indicates a #10 diameter shaft, 16 threads per inch, 5/8 length, hex washer head self-drilling screw.

Fillet Welds—used to make lap joints, corner joints and T-joint connections. As the illustration suggests, the fillet weld is roughly triangular in cross-section, although its shape is not always a right triangle or an isosceles triangle. Weld metal is deposited in a corner formed by the fit-up of the two members and penetrates and fuses with the base metal to form the joint.

Flare Welds—used to join rounded or curved pieces.

- A Flare Bevel groove weld is commonly used to join a rounded or curved piece to a flat piece.
- A Flare V groove weld is commonly used to join two rounded or curved parts.

ALLOWABLE SCREW DESIGN VALUES (LBS/SCREW)

Mils (Gauge)	Design thickness (in)	Fy (ksi)	Fu (ksi)	#8 Screw 0.164" Dia, 0.272" Head Pss = 1000 lbs; Pts = 1545 lbs			#10 Screw 0.190" Dia, 0.340" Head Pss = 1400 lbs; Pts = 1936 lbs			#12 Screw 0.216" Dia, 0.340" Head Pss = 2000 lbs; Pts = 2778 lbs			1/4" Screw 0.250" Dia, 0.409" Head Pss = 2600 lbs; Pts = 4060 lbs		
				Shear	Tension		Shear	Tension		Shear	Tension		Shear	Tension	
					Pull-Over	Pull-Out		Pull-Over	Pull-Out		Pull-Over	Pull-Out		Pull-Over	Pull-Out
33 (20g)	0.0346	33	45	164	212	72	177	265	84	188	265	95	203	318	110
43 (18g)	0.0451	33	45	244	276	94	263	345	109	280	345	124	302	415	144
54 (16g)	0.0566	33	45	333	346	118	370	433	137	394	433	156	424	521	180
		50	65	333	500	171	467	625	198	569	625	225	613	752	261
68 (14g)	0.0713	33	45	333	436	149	467	545	173	557	545	196	600	656	227
		50	65	333	515	215	467	645	249	667	788	284	866	948	328
97 (12g)	0.1017	33	45	333	515	213	467	645	246	667	778	280	867	936	324
		50	65	333	515	307	467	645	356	667	926	405	867	1352	468
118 (10g)	0.1242	33	45	333	515	260	467	645	301	667	926	342	867	1143	396
		50	65	333	515	375	467	645	435	667	926	494	867	1353	572

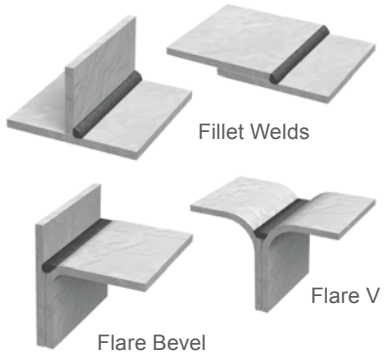
Shear and Pull-Over loading conditions not applicable.

Screw Value Notes:

1 Capacities are based on Section J4 of the NASPEC AISI S100-16 Calculations.
2 When connecting materials of different steel thickness or tensile strengths, use the lowest values. Tabulated capacities assume two sheets of equal thickness are connected.
3 Calculated capacities are based on Allowable Strength Design (ASD) and include appropriate safety factors.
4 When multiple fasteners are used, screwss are assumed to have a center-to-center spacing of atleast 3 times the nominal diameter.
5 Screws are assumed to have a center-of-screw to edge-of-steel dimension of at least 1.5 times the nominal diameter of the screw.
6 Pullout capacity is based on the lesser of pull-out capacity in sheet closest to screw tip or tension strength of screw.
7 Pullover capacity is based on the lesser of pullover capacity for sheet closest to screw header, or tension strength of screw.
8 Listed capacities are for pure shear or tension loads only. For combined shear and pullover, see AISI Section J4.5.
9 Shear strength for #8, #10, #12, and 1/4" screws shall be greater than or equal to 1000 lbs, 1400 lbs, 2000 lbs, and 2600 lbs respectively.
10 Tension strength for #8, #10, #12, and 1/4" screws shall be greater than or equal to 1545 lbs, 1936 lbs, 2778 lbs, and 4060 lbs respectively.

ALLOWABLE WELD VALUES (LBS/IN)

Mils (Gauge)	Design thickness (in)	Fy (ksi)	Fu (ksi)	Weld (1 inch)	
				Fillet	Flare Groove
43 (18)	0.0451	33	45	619	544
54 (16)	0.0566	33	45	822	682
		50	65	1188	985
68 (14)	0.0713	33	45	1082	859
		50	65	1563	1241
97 (12)	0.1017	33	45	1269	1226
		50	65	1269	1402
118 (10)	0.1242	33	45	1550	1497
		50	65	1550	1712



Weld Value Notes:

1 Capacities are based on Sections J2.5, and J2.6 of the NASPEC AISI S100-16 Calculations.
2 When connecting materials of different steel thickness or tensile strengths, use the lowest values. Tabulated capacities assume two sheets of equal thickness are connected.
3 Calculated capacities are based on Allowable Strength Design (ASD) and include appropriate safety factors.
4 Weld strengths are given in lbs/in and are based on E60XX electrodes.
5 For flare groove welds when t > 0.1", tw = (5/16)*R when weld filled flush to surface.

LAG SCREW ANALYSIS

Client: Henry Schein Dental
Project Description: CDX Backing Analysis (OP 3D unit)
Designed By: ETP
Date: 1/3/2022

CORRE ANSWERS. SOLUTIONS. RESULTS.

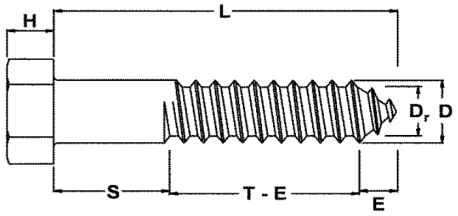
LAG SCREW WITHDRAWAL ANALYSIS

Analyzed in Accordance with the 2018 NDS Design Specifications (ASD & LRFD)

LOADING INFORMATION:

Withdrawal Load (ASD), P =	note: 1500N = 337 lbs	340	lbs.	*per Viso manual (p18)*
Factored Withdrawal Load (LRFD), P =	= 340 x 1.4	476	lbs.	*Factored as noted*
Load Duration Factor, C_D (ASD) =	*Dead Load*	0.90		*Table 2.3.2*
Time Effect Factor, λ (LRFD) =	*1.4D*	0.60		*Appendix N; N.3.3*

LAG SCREW INFORMATION:



Lag Screw Diameter, D =	3/8"		
Selected Length, L =	2"		
Root Diameter, D_r =	0.265	in.	*Appendix A; Table L2*
Overall Thread Length, T =	1.500	in.	*Appendix A; Table L2*
Unthreaded Length, S =	0.500	in.	*Appendix A; Table L2*
Tapered Tip Length, E =	0.219	in.	*Appendix A; Table L2*
Maximum Effective Thread Length = L - S - E =	1.281	in.	
Standard Washer Thickness =	0.083	in.	*override*
No. of Lag Screws Provided =	2		

MEMBER GEOMETRY:

Side Member/Sheathing Thickness =		1.000	in.	*bracket + wall thickness*
Actual Thread Length Embedment Into Member, p_t =		0.698	in.	
Specific Gravity of Member, G =	*Average SG for plywood*	0.50		*Table 12.3.3A*

ANALYSIS:

Unadjusted Withdrawal Value, $W = 1800\ G^{3/2}\ D^{3/4}$ = 305 lbs/in. *(12.2-1)*

Adjusted Withdrawal Values:

For ASD: $W' = W\ C_D$ =	274	lbs/in.
For LRFD: W' = W 3.32 0.65 λ =	395	lbs/in.

No. Lag Screws Req'd:

			Check:
ASD = $P_{ASD}/(p_t \times W'_{ASD})$ =	1.8	lags	OK
LRFD = $P_{LRFD}/(p_t \times W'_{LRFD})$ =	1.7	lags	OK

RESULTS:

Use a minimum of (2) 3/8" dia. x 2" lag screws to properly secure the OP 3D unit to the 2-ply 3/4" CDX plywood backing.

Client: Henry Schein Dental
Project Description: CDX Backing Analysis (Viso unit)
Designed By: ETP
Date: 1/3/2022

CORRE ANSWERS. SOLUTIONS. RESULTS.

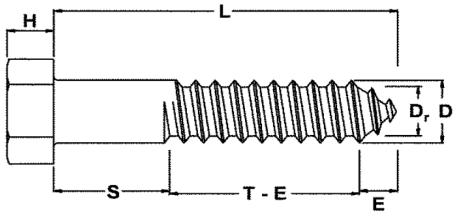
LAG SCREW WITHDRAWAL ANALYSIS

Analyzed in Accordance with the 2018 NDS Design Specifications (ASD & LRFD)

LOADING INFORMATION:

Withdrawal Load (ASD), P =		1,400	lbs.	*per Viso manual (p18)*
Factored Withdrawal Load (LRFD), P =	= 1,400 x 1.4	1,960	lbs.	*Factored as noted*
Load Duration Factor, C_D (ASD) =	*Dead Load*	0.90		*Table 2.3.2*
Time Effect Factor, λ (LRFD) =	*1.4D*	0.60		*Appendix N; N.3.3*

LAG SCREW INFORMATION:



Lag Screw Diameter, D =	3/8"		
Selected Length, L =	2-1/2"		
Root Diameter, D_r =	0.265	in.	*Appendix A; Table L2*
Overall Thread Length, T =	1.750	in.	*Appendix A; Table L2*
Unthreaded Length, S =	0.750	in.	*Appendix A; Table L2*
Tapered Tip Length, E =	0.219	in.	*Appendix A; Table L2*
Maximum Effective Thread Length = L - S - E =	1.531	in.	
Standard Washer Thickness =	0.083	in.	*override*
No. of Lag Screws Provided =	4		

MEMBER GEOMETRY:

Side Member/Sheathing Thickness =		0.875	in.	*bracket + wall thickness*
Actual Thread Length Embedment Into Member, p_t =		1.323	in.	*CDX plies fully engaged*
Specific Gravity of Member, G =	*Average SG for plywood*	0.50		*Table 12.3.3A*

ANALYSIS:

Unadjusted Withdrawal Value, $W = 1800\ G^{3/2}\ D^{3/4}$ = 305 lbs/in. *(12.2-1)*

Adjusted Withdrawal Values:

For ASD: W' = W C_D =	274	lbs/in.
For LRFD: W' = W 3.32 0.65 λ =	395	lbs/in.

No. Lag Screws Req'd:

		Check:
ASD = $P_{ASD}/(p_t \times W'_{ASD})$ =	3.9 lags	OK
LRFD = $P_{LRFD}/(p_t \times W'_{LRFD})$ =	3.8 lags	OK

RESULTS:

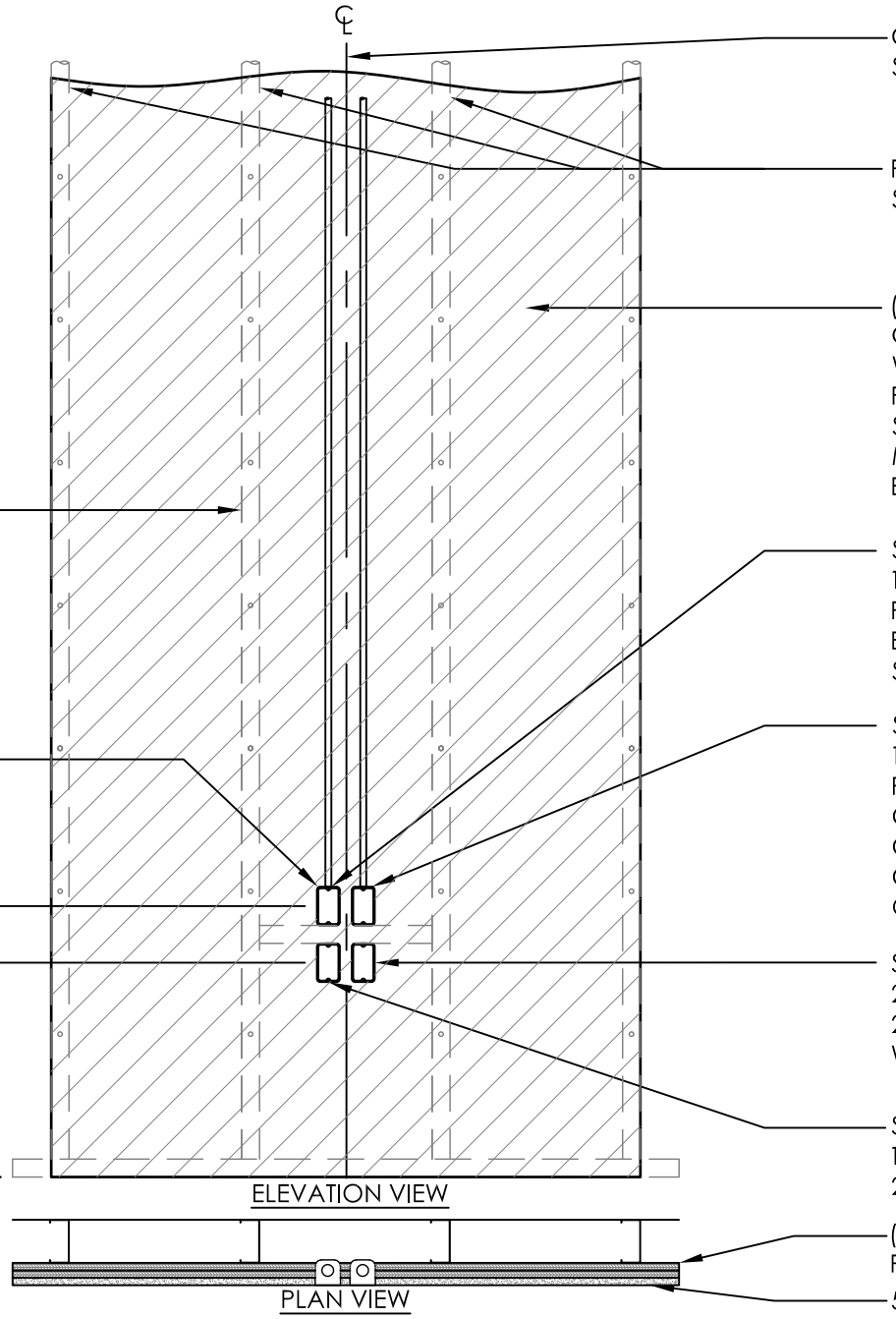
Use a minimum of (4) 3/8" dia. x 2-1/2" lag screws to properly secure the Viso unit to the 2-ply 3/4" CDX plywood backing.

BACKING INSTALLATION DETAIL

FOLLOW LOCAL CODES FOR ALL WORK.

DETAIL PROVIDED FOR BLOCKING & UTILITY REQUIREMENTS. REFER TO MANUFACTURER'S INSTALLATION GUIDE FOR ADDITIONAL INFORMATION.

MOUNTING MATERIALS SUPPLIED AND INSTALLED BY CONTRACTOR.



CENTERLINE OF X-RAY COLUMN. SEE SHEET SA.1 FOR LOCATION.

PROPERLY SECURE FRAMING TO STRUCTURE ABOVE.

(2) LAYERS OF 3/4" CDX PLYWOOD, GLUED AND SCREWED TOGETHER WITH SIMPSON STRONG-TIE F10T250BD #10X2-1/2" BUGLE HEAD SELF-DRILLING SCREWS EVERY 12". MOUNT DIRECTLY TO STUDS. GYP. BRD. OVER AT FINISH.

COLD-FORMED STEEL (CFS) WALL FRAMING. TYP.

SINGLE-GANG JUNCTION BOX AND 1" CONDUIT TO ABOVE CEILING (OR PER CODE) WITH PULL-STRING BY ELECTRICIAN TO 9B LOCATION. SEE SHEET SE.1.

CONFIRM HEIGHTS WILL NOT CONFLICT WITH X-RAY BRACKET HEIGHTS. SEE HENRY SCHEIN REP.

SINGLE-GANG JUNCTION BOX AND 1" CONDUIT TO ABOVE CEILING (OR PER CODE) BY ELECTRICIAN FOR CONNECTION TO DEDICATED COMPUTER OR SERVER. DATA CABLING & RJ45 OUTLET BY OWNER'S I.T. COMPANY.

SINGLE-GANG JUNCTION BOX W/ 230V SIMPLEX OUTLET ON DEDICATED 25A CIRCUIT BY ELECTRICIAN (VERIFY WITH HENRY SCHEIN EQUIPMENT REP).

SINGLE-GANG JUNCTION BOX W/ 115V SIMPLEX OUTLET ON DEDICATED 20A CIRCUIT BY ELECTRICIAN.

(2) LAYERS OF 3/4" CDX PLYWOOD

5/8" GYP. BRD. AT FINISH

February 4, 2022

9C PANORAMIC X-RAY

NOT TO SCALE

SUPPORTING DOCUMENTATION

- Ensure the proper tightness and attachment of all of the screws and bolts when installing the device.
- All device covers must be properly installed before handing the device to the user.
- Ensure the electrical safety of the device by inspecting the proper grounding of user touchable metallic parts before handing the dev

1500 newtons (N)
= 337.2 lbs

2.5.2 Device installation requirements

2.5.2.1 Installation location requirements

WARNING! *Ensure that each of the wall mount fixing screws and the wall can withstand pull-out force of at least 1500 N.*

- The place where the device is to be installed and the position from where the user takes images must be correctly shielded from the radiation that is generated when the device is operated. Follow the local radiation and safety requirements.
- The device must be fixed to the wall and the floor.

  NOTICE! *If the device cannot be fixed to the floor, install the device to an exhibition stand. See chapter Exhibition stand installation on page 108 for instructions.*

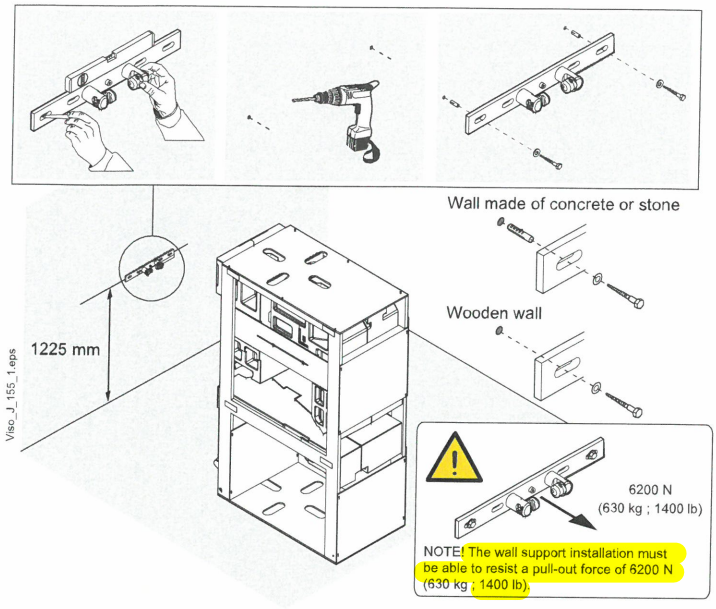
- The wall material should be suitable for fixing the device. If the wall is made of a weak material, you may have to use a reinforcing plate on the rear side of the wall to hold the fixing hardware.
- Make sure that the floor, where the device is to be installed, can support its weight. To avoid the device from tipping over, fix the device with floor bolts appropriate to the floor material. The floor bolts and the floor material must withstand pull-out force of at least 1500 N.
- The device must be installed on a hard floor surface. All soft and elastic material, such as a carpet, must be removed from under the column floor plate.
- Do not install the device in environments where corrosive or explosive vapours or flammable anaesthics are present.
- Special steps regarding EMC need to be taken when installing the device. For more information, refer to the chapter *Electromagnetic Compatibility (EMC) tables* on page 149.
- The device is supplied with a 3 m (10 ft) long power cord. Ensure that the connected power cord and Ethernet cables are long enough, as they need to move along with the device's up/down movements.

  NOTICE! *It's recommended to route the power feed and Ethernet connection to behind the device to ensure unobstructed movement of the cables.*

- It's recommended to use a max. 30 A circuit breaker with the device.
- Maximum allowed mains line impedance is 0.2 Ω.
- For permanent installation, a separate lockable mains switch (not supplied) is required to be installed to the mains feed.
- Recommended mains over-current releases:

  100-120 V: 16 A

  220-240 V: 10 A



1.b. Drill the holes to the wall.

Note the following requirements.

- If the wall is made of concrete or brick, use the M10x70 DIN 571 screws and the 14x70 expansion anchors to secure the wall bracket in position. Drill securing holes ø14 mm (0.55 in.), 85 mm (3.3 in.) in depth, and insert the expansion anchors into the holes.
- If the wall is made of wood, use the M10x70 DIN 571 screws. Do not use expansion anchors with wooden wall. Drill securing holes ø7 mm (0.3 in.), 70-75 mm (2.75-3 in.) in depth, for the mounting screws.

NOTE

Use four mounting screws (instead of two) if you use smaller anchors and/or screws than recommended.

CAUTION

The wall support installation must be able to resist a pull-out force of 6200 N (630 kg; 1400 lb).

1.c. Attach the wall support and tighten the screws firmly.