MTC SOLUTIONS

Rigging Design Guide

info@mtcsolutions.com | 1.866.899.4090

Disclaimer

The information in this document is provided on an “as is” basis and for general information purposes only. While MTC Solutions aims to keep the information provided in this document complete, accurate, and in line with state-of-the-art design methods, MTC Solutions, its affiliates, employees, agents, or licensors do not make any representations or warranties of any kind, including, but not limited to, express or implied warranties of fitness for a particular purpose or regarding the content or information in this document, to the full extent permitted by applicable law.

The information in this document does not constitute engineering or other professional advice, and any reliance users place on such information is therefore strictly at their own risk. Images and drawings provided within this document are for reference only and may not apply to all possible conditions. MTC Solutions shall not be liable for any loss or damage of any kind, including indirect, direct, incidental, punitive, or consequential loss or damage arising out of, or in connection with, the information, content, materials referenced, or the use of any of the systems described in this document. Users may derive other applications which are beyond MTC Solutions’ control. The inclusion of the systems or the implied use of this document for other applications is beyond the scope of MTC Solutions’ responsibility.

TABLE OF CONTENTS

Mass Timber Hardware Specialist

At MTC Solutions, our core focus is to supply structural hardware for modern mass timber applications in commercial, industrial, and residential projects. We are proud to partner with leading industry experts, providing solutions and tools to design code-compliant buildings that are pushing the boundaries of the North American construction industry.

Our in-house team of mass timber specialists support professionals in designing connections that are tailored to the specific needs of each project, resulting in truly innovative and cost-efficient solutions. We are recognized as experts, moving the industry forward with tested and proven solutions.

Expertise

We provide the knowledge and tools to help our customers build cutting-edge and code-compliant mass timber projects while pushing the boundaries of the North American construction industry.

Commitment

We are dedicated to making your project a success, from design and installation support to delivering high quality products with speed and accuracy.

North American Tailored Products

We partner with leading research facilities across North America to ensure our products are tested and customized to fit the unique needs of the market, from seismic considerations to solutions for large post and beam structures in various climates.

Find Your Connection Solution

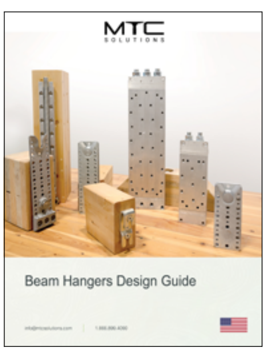
MTC Solutions provide the right tools to design code-compliant buildings, educating the mass timber industry on connection solutions.

Structural Screw Catalog

Structural Screw Connection Design Guide

Structural Fasteners

Accessories



Beam Hangers Design Guide

Beam Hangers

Connector Design Guide

Connectors

Rigging Design Guide

Rigging Devices

Fall Arrest Anchor Design Guide

Fall Arrest

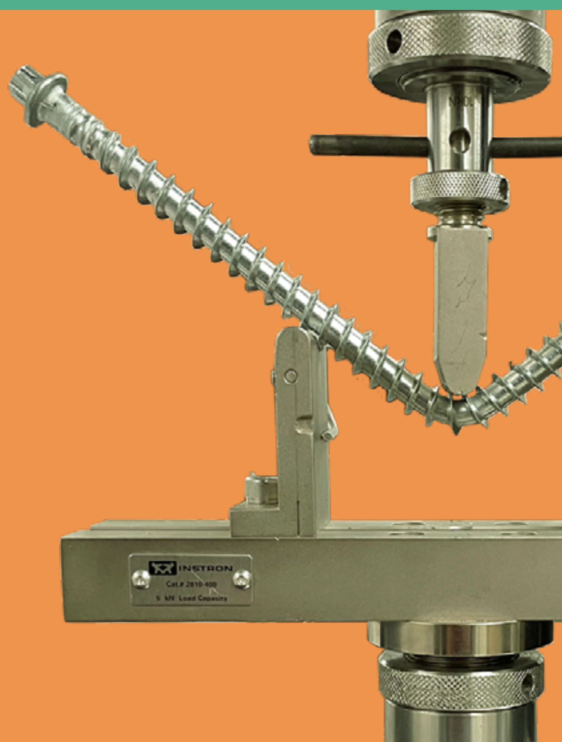
WHO ARE WE?

YOUR MASS TIMBER HARDWARE SUPPLIER

Rely on our distribution team to deliver your North American projects with speed and accuracy.

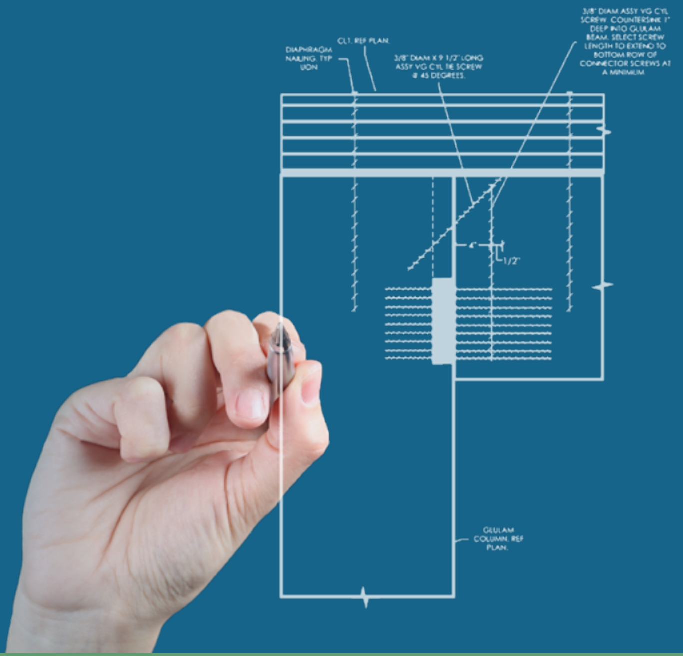
LEADING WITH INNOVATION & RESEARCH

We are leading the mass timber industry with cutting edge connection solutions and partnering with renowned research facilities.



WE MAKE YOU THE EXPERT

Learn about the right solutions for your projects and Mass Timber connections with our technical resources & support team!



CONNECTIONS DESIGN SUPPORT

Reach out to the technical team for design support, from early design stages to ongoing iterative changes. We help find the most efficient connection solutions.

MANUFACTURERS' HELP DESK

Use our comprehensive & practical resources to find the most cost-effective solutions for your structural elements.

TESTED & PROVEN SOLUTIONS

Count on MTC Solutions' 10+ years of expertise, providing tested & proven ICC approved solutions, support, and resources.

Brock Commons

Vancouver, British Columbia

General Information

The MTC Solutions Rigging Systems

The MTC Solutions Rigging Systems are one-of-a-kind rigging solutions designed to lift timber elements of various weights, dimensions, and materials. These lab-tested solutions utilize high-quality code-approved ASSY self-tapping screw fasteners to provide reliable lifting capacities. The anchor configurations and fast installation of the self-tapping screws allow these systems to be some of the most efficient mass timber rigging systems on the market.

Transport Anchor

Mini Yoke

Yoke 1T

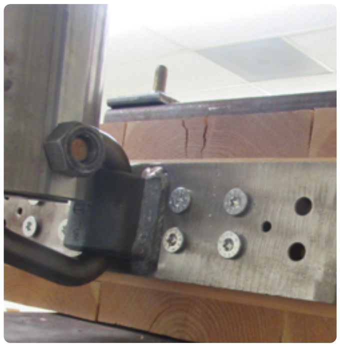
Yoke 5T

Yoke XL

Lab-Tested Solutions

The MTC Solutions Rigging Systems are lab-tested solutions for mass timber rigging, meeting the ISHA safety standards for hoisting and rigging products. Additionally, the screw fasteners used with MTC Solutions Rigging Systems hold an ICC-ES and CCMC approval. All systems have undergone testing up to the ultimate failure using North American timber materials and have been used in many prominent mass timber projects across North America.

OSHA Compliant



Rigging System - Selection Tool

The following pre-selection table is intended to give the reader an overview of different rigging scenarios and MTC Solutions Rigging Systems by listing allowable lifting capacities for common lifting applications. The appropriate sections should be consulted for more information on specific rigging scenarios. When lifting construction elements, other lifting requirements such as anchor end and edge distances and potential rigging hazards must be considered.

Table 1, Yoke Rigging Anchor Selection Tool





	Transport Anchor	Mini Yoke	Yoke 1T	Yoke 5T	Yoke XL
Option A: Light Frame Panel Rigging					
Structural Insulated Panel		✓			
Prefabricated I-Joist Floor		✓			
Prefabricated Stud Wall			✓		
Option B: Mass Timber Floor / Roof Panel Rigging					
CLT Panel up to 2,500 lbs[1]	✓		✓	✓	✓
CLT Panel up to 12,900 lbs[1]				✓	✓
CLT Panel up to 18,500 lbs[1]					✓
MPP Panel up to 16,000 lbs[1]					✓
Option C: Mass Timber Wall Panel Tilting					
CLT Panel up to 6,500 lbs[2]					✓
MPP Panel up to 7,200 lbs[2]					✓
Option D: Glulam Beam & Log Rigging					
Glulam Beam Rigging	✓		✓		✓
Log Rigging	✓				

Notes:
1. Unfactored weight for CLT floor or roof panel rigging with 4 anchors and standard rigging scenario
2. Unfactored weight for CLT wall panel rigging with 2 anchors and standard rigging scenario

How to Use This Guide

Preparing a Rigging Plan

Step 1: Factoring Total Load

Determine the total factored load (W_f) based on the weight of the panel and rigging conditions.

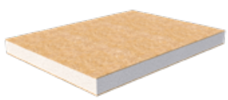
Step 2: Rigging System Selection

Determine the type of rigging needed;

Option A Light Frame Panel Rigging

Solution for

Pre-fabricated I-Joist floor



SIP roof panel

Pre-fabricated stud wall

Option B Mass Timber Floor/Roof Panel Rigging

Solution for

CLT floor and roof panel

MPP floor and roof panel

Option C Mass Timber Wall Panel Rigging

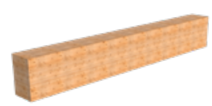
Solution for

CLT wall panel

MPP wall panel

Option D Glulam Beam & Log Rigging

Solution for



Glulam Beam

Log

Step 3: Safety Checks

- **Check A** Screw Penetration
- **Check B** System Capacity
- **Check C** Sling Angle Loading
- **Check D** On-site Safety Inspection

Step 4: Installation Instructions

- **Check A** Sling Angle Installation
- **Check B** Load Spreading
- **Check C** Transport Anchor Housing

Notes:
1. The basic procedures proposed above contain the steps recommended for the licenced design professional to prepare a rigging plan.

General Notes To The Designer

All rigging elements shall be approved by a licensed design professional. All rigging shall be done by qualified personnel only. It is the responsibility of the rigger to ensure a safe work environment and verify the condition of all equipment. All suggestions and details shown in this guide are to be treated as general and cannot be assumed to be valid for all construction requirements and specific site conditions.

Rigging Capacity

1. Listed basic factored resistance values (N'_r) are only valid with their accompanying ASSY screws.
2. Listed basic factored resistance values (N'_r) shall be factored with appropriate reduction factors as described on page 30.
3. Listed basic factored resistance values (N'_r) consider the capacity of the screws and rigging device.
4. Total rigging capacity of the anchoring devices (N_r) must be greater than the summation of all sling forces (S_T).
5. The terms "anchor" and "anchoring device" refer to the rigging device and screws as a system.
6. To ensure full connection capacity in flat panel lifting, fasteners must penetrate panel plies to the largest extent possible, with a minimum of three plies penetrated.
7. In all rigging applications, the minimum penetration and wood panel thickness must be respected.

Anchor Placement

1. All anchor end and edge distance requirements are minimum requirements and must be respected during installation.
2. To ensure stable rigging with appropriate load sharing, the center of gravity shall be determined, and locations of the anchors shall be chosen accordingly.
3. Additional moment equilibrium calculations are required to determine the proportion of the total factored load shared by each anchor for situations where anchors are not spaced equidistant around the center of gravity.

Rigging Slings and Load Spreader

1. The resultant forces in each sling must be calculated separately and must not exceed the basic factored resistance values (N'_r) of the anchoring devices.
2. Slings must lift elements at a minimum angle of 60° measured between the sling and the panel surface (β). Otherwise, the capacity of the anchors shall be adjusted with the appropriate anchor resistance reduction factor (R_{AR}) given in Table 22.
3. The anchor resistance reduction factor (R_{AR}) accounts for the reduced capacity of the Yoke anchors at sling angles lower than 60° measured between the sling and the panel surface.
4. A load spreader/compensation system should be used for lifts using more than two anchors. Otherwise, the capacity of the anchors shall be adjusted with the appropriate load spreader reduction factor (R_{LS}) or other appropriate engineering judgment.
5. It is the responsibility of the rigging professional to ensure the working limits of the slings are respected.

Rigging Condition Requirements

1. To ensure safety and proper capacity, the fasteners used for panel rigging must only be used once.
2. Proper inspection should be performed frequently on the anchoring devices to ensure their structural integrity. If damages are found on the anchors, the device must not be used and must be taken out of circulation immediately.
3. Before each lift, check proper sling attachment
4. The load line should be transferred over to the element's center of gravity before the lift.
5. No object or person should be present on the element during rigging (no live load).
6. Suspended loads must be securely attached and properly balanced before they are set in motion
7. The load must always be kept under control. The use of taglines is recommended to prevent uncontrolled motion.
8. Loads must land safely and properly blocked before the element is unhooked and unslung
9. No overhead lifting at anytime.
10. Maximum installation torque of rigging screws is shown in Table 2.

Table 2, Fastener Torsional Strength

Screw Diameter [D]	**1/4"** *[6 mm]*	**5/16"** *[8 mm]*	**3/8"** *[10 mm]*	**1/2"** *[12 mm]*
Maximum Torque	**5.9 ft·lbf** *[7.3 N·m]*	**13.6 ft·lbf** *[16.7 N·m]*	**26.6 ft·lbf** *[32.7 N·m]*	**38.5 ft·lbf** *[47.3 N·m]*

Step 1: Factoring Total Load

Determining the total factored load (W_f) of the rigged element is essential. Actual loads must be factored up. The proposed method incorporates a dead load factor (1.4), a dynamic acceleration factor, and an optional safety factor to consider in each rigging scenario. In all cases, the total factored load (W_f) shall be specified and approved by a licensed design professional.

$$W_f = 1.4 \cdot W \cdot K_{OS} \cdot K_v \qquad \text{(eq.1)}$$

W Unfactored weight of the rigged element [kN or lbs]

- Provided in shop drawings or manufacturer's specifications

K_{OS} Optional safety factor :

- For rig mat rigging **1**
- For open space rigging **1.2**
- For tight space rigging **1.3**

K_v Dynamic acceleration factor :

Table 3 provides recommended dynamic acceleration factors (K_v) subject to approval by the licensed design professional.

Table 3, Proposed Dynamic Acceleration Factor, K_v

Crane Type	Dynamic Acceleration Factor [K_v]
Fixed crane	1.1 to 1.3
Mobile crane	1.3 to 1.4
Bridge crane	1.2 to 1.6
Rigging and moving on flat terrain	2 to 2.5
Rigging and moving on rough terrain	3 to 4

Sources:
1. Pfeifer, Snaam, Halfen, Peikko, Arteon

In cases where information on weight is not provided, a calculation based on the dimensions and the wood species may be done to estimate the unfactored weight in pounds:

$$W = (h \cdot b \cdot l) \cdot G \cdot C' \qquad \text{(eq.2)}$$

h Element thickness [mm]

b Element width [m]

l Element length [m]

G Assigned relative densities :

- For SPF **0.42**
- For D-Fir **0.49**

C' Unit conversion factor [1] :

For pounds (lbs) **2.54**
For kilonewtons (kN) **$11.3 \cdot 10^{-3}$**

Notes:
[1] The unit conversion factor contains adjustments from oven dry to standard dry service condition moisture content.

Brock Commons

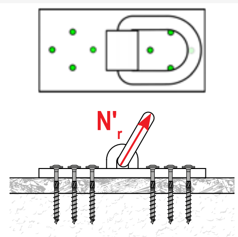
Vancouver, British Columbia

Step 2: Rigging System Selection

Step 2, Option A: Light Frame Panel Rigging

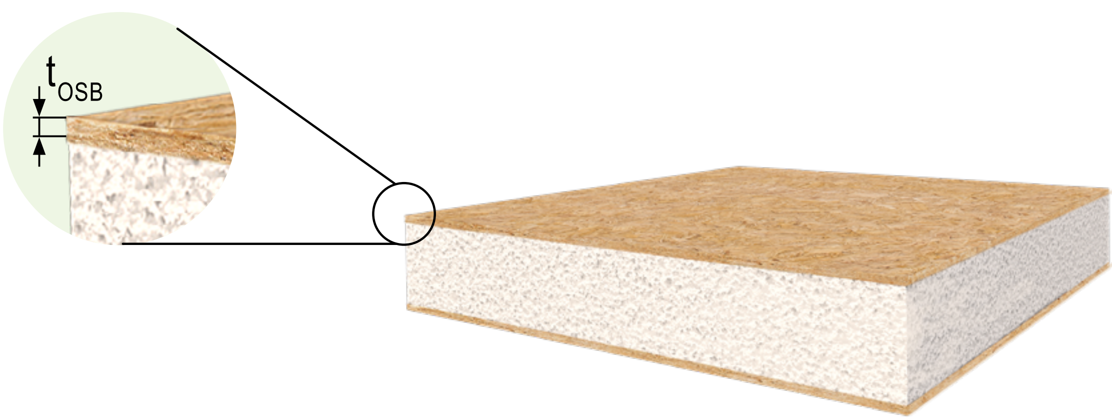
Structural Insulated Roof Panels Using Yoke Systems

Table 4, Basic Factored Resistance Values for SIP Flat Panel Rigging Using Mini Yoke (N'_r)

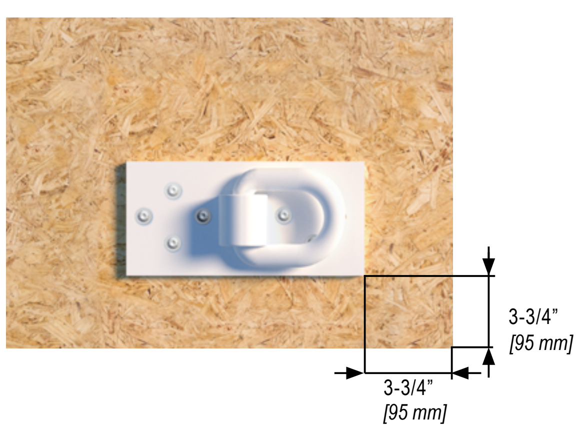
Lifting Device	Relative Density [G]	Minimum OSB Panel Thickness [t_{OSB}]		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		**in**	*[mm]*	**lbs**	*[KN]*
Mini Yoke ; 8 Screws 	0.42 *[SPF]*	**0.43”**	*[11]*	SK	**1/4” x 2”**	*[6 x 50]*	**141**	*[0.63]*
	0.49 *[D.Fir]*							

Notes:

1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift

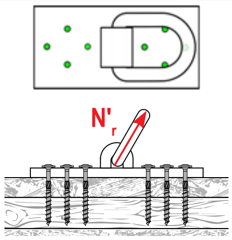


End And Edge Distance Requirements



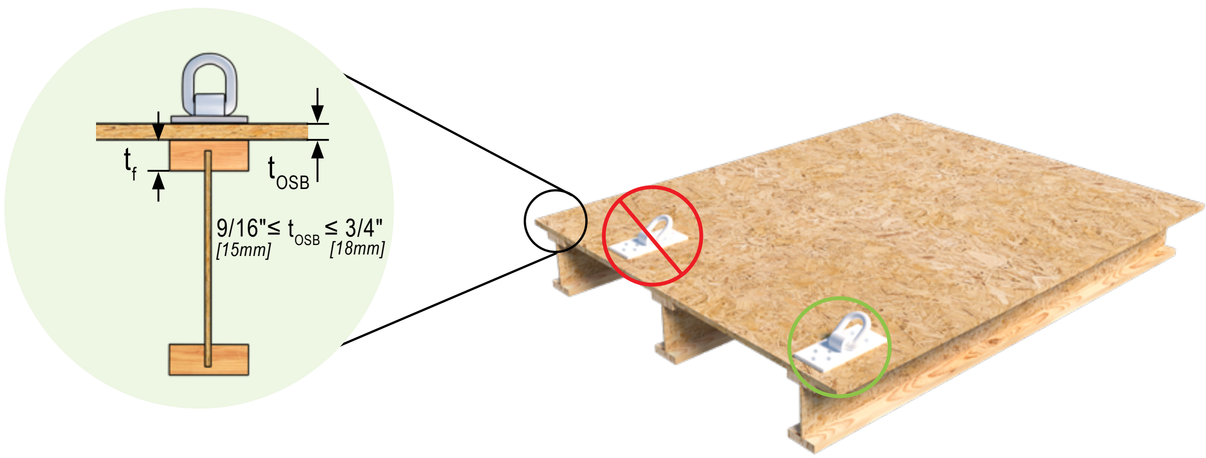
Prefabricated I-Joist Floor Panels Using Yoke Systems

Table 5, Basic Factored Resistance Values for Prefab.I-Joist Floor Rigging Using Mini Yoke (N'_r)

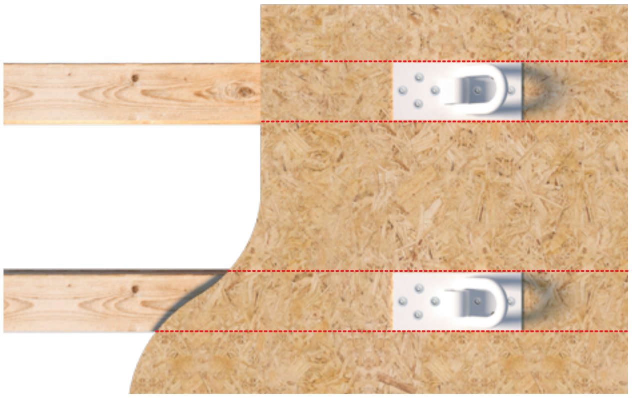
Lifting Device	Relative Density [G]	Minimum Flange Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		in	*[mm]*	lbs	*[KN]*
Mini Yoke ; 8 Screws 	0.42 *[SPF]*	**1.5”**	*[38]*	SK	**1/4” x 2-3/8”**	*[6 x 60]*	**715**	*[3.18]*
	0.49 *[D.Fir]*							

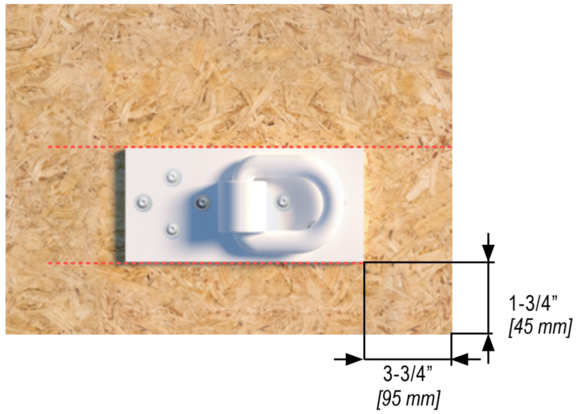
Notes:

1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. The Mini Yoke must only be placed so that screws properly penetrate both panel and I-joist flange, as the capacity of the Mini Yoke cannot be guaranteed in other configurations



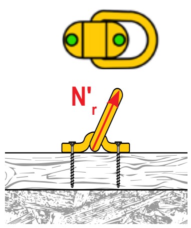
End And Edge Distance Requirements





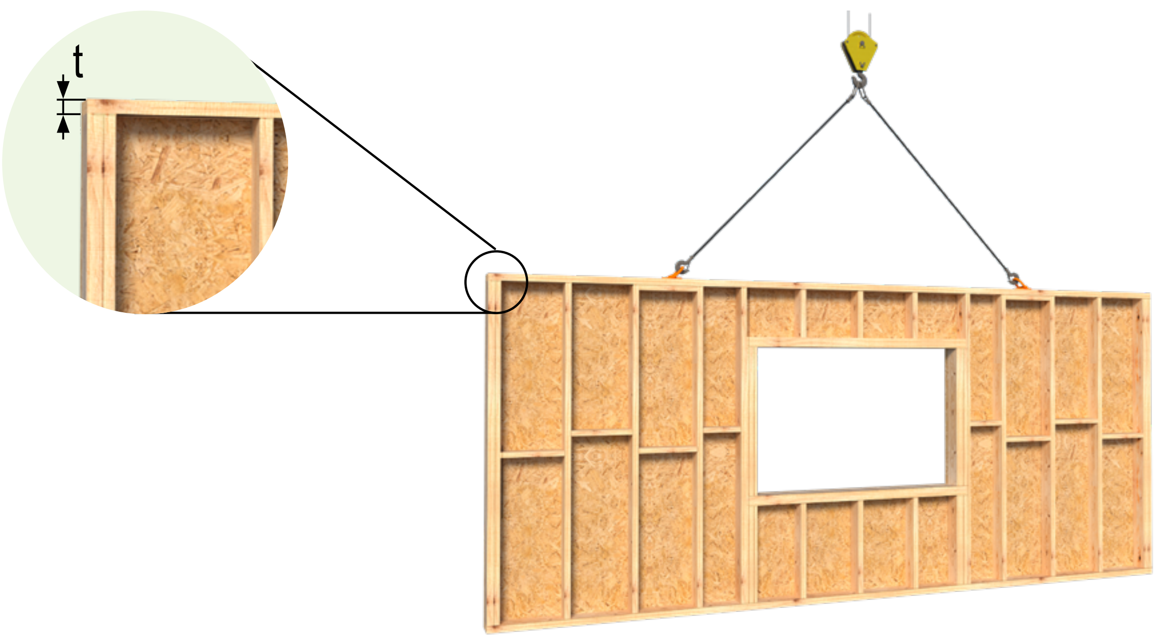
Prefabricated Stud Walls Using Yoke Systems

Table 6, Basic Factored Resistance Values for Prefab.Stud Wall Rigging Using Yoke 1T (N'_r)

Lifting Device	Relative Density [G]	Minimum Penetration Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	[mm]		in	[mm]	lbs	[KN]
Yoke 1T ; 2 Screws	0.42 *[SPF]*	**3"**	*[76]*	VG CSK	**3/8" x 4"**	*[10 x 100]*	**1,245**	*[5.54]*
	0.49 *[D.Fir]*							

Notes:

1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. The minimum member thickness for proper fastener penetration as stated in Table 6 must be respected
8. All sheathing, blocking, sill, and top plates should be nailed or screwed appropriately for continuous load path
9. The capacity of this system is not guaranteed for panel tilt up

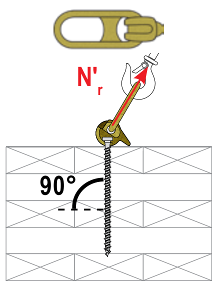
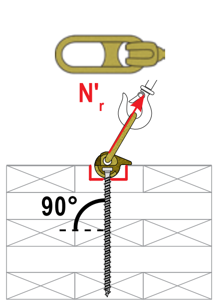


End And Edge Distance Requirements

Step 2, Option B: Mass Timber, Floor / Roof Panel Rigging

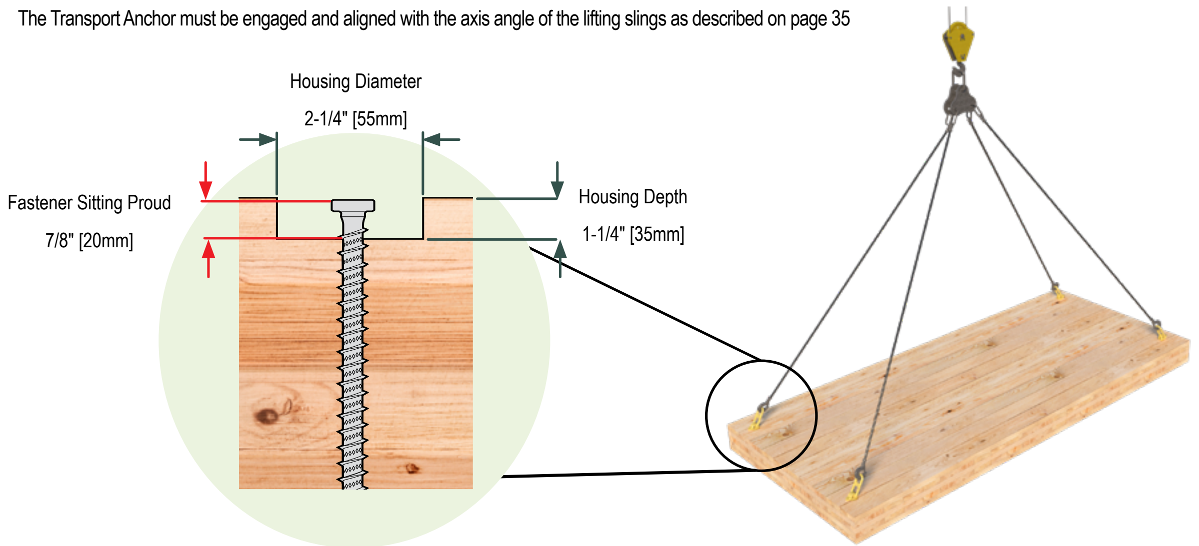
CLT Panel Rigging Using Transport Anchor

Table 7, Basic Factored Resistance Values for Flat CLT Panel Rigging Using Transport Anchor (TA) (N'_r)

Lifting Device	Relative Density [G]	Minimum Penetration Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		**in**	*[mm]*	**lbs**	*[KN]*
TA ; 1 Screw	0.42 *[SPF]*	**3-1/8”**	*[78]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x 80]*	**630**	*[2.8]*
		**4-3/4”**	*[120]*	Kombi	**1/2” x 4-3/4”**	*[12 x 120]*	**1,050**	*[4.6]*
		6-1/4”	*[160]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**1,350**	*[6.0]*
	0.49 *[D.Fir]*	**3-1/8”**	*[78]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x 80]*	**630**	*[2.8]*
		4-3/4”	*[120]*	Kombi	**1/2” x 4-3/4”**	*[12 x 120]*	**1,050**	*[4.6]*
		6-1/4”	*[160]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**1,350**	*[6.0]*
Housed TA ; 1 Screw	0.42 *[SPF]*	**5-1/2”**	*[139]*	Kombi	**1/2” x 4-3/4”**	*[12 x 120]*	**1,050**	*[4.6]*
		**7-1/8”**	*[180]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**1,350**	*[6.0]*
	0.49 *[D.Fir]*	**5-1/2”**	*[139]*	Kombi	**1/2” x 4-3/4”**	*[12 x 120]*	**1,050**	*[4.6]*
		7-1/8”	*[180]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**1,350**	*[6.0]*

Notes:

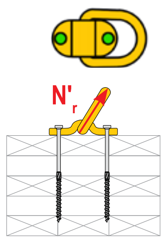
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. Fastener head must sit proud 7/8” [20mm] from the surface of the panel for proper engagement of the anchor
8. Proper housing dimensions must be used as described on page 35
9. The Transport Anchor must be engaged and aligned with the axis angle of the lifting slings as described on page 35



Drawings Not to Scale

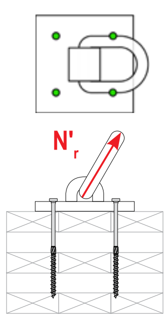
CLT Panel Rigging Using Yoke Systems

Table 8, Basic Factored Resistance Values for Flat CLT Panel Rigging Using Yoke 1T (N'_r)

Lifting Device	Relative Density [G]	Minimum Penetration Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		**in**	*[mm]*	**lbs**	*[KN]*
Yoke 1T ; 2 Screws	0.42 *[SPF]*	**3-1/8”**	*[78]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x 80]*	**1,600**	*[7.1]*
		**4”**	*[100]*	Kombi	**1/2” x 4”**	*[12 x 100]*		
		4-3/4”	*[120]*		**1/2” x 4-3/4”**	*[12 x 120]*	**1,900**	*[8.5]*
		6-1/4”	*[160]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**2,200**	*[9.8]*
	0.49 *[D.Fir]*	**3-1/8”**	*[78]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x 80]*	**2,100**	*[9.3]*
		4”	*[100]*	Kombi	**1/2” x 4”**	*[12 x 100]*		
		4-3/4”	*[120]*		**1/2” x 4-3/4”**	*[12 x 120]*	**2,150**	*[9.6]*
		6-1/4”	*[160]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**2,200**	*[9.8]*

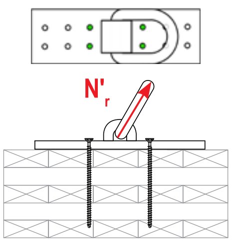
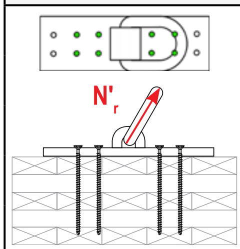
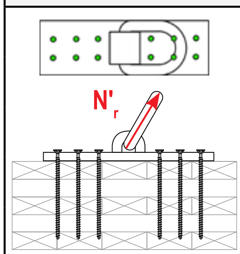
Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift

Table 9, Basic Factored Resistance Values for Flat CLT Panel Rigging Using Yoke 5T (N'_r)

Lifting Device	Relative Density [G]	Minimum Panel Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		**in**	*[mm]*	**lbs**	*[KN]*
Yoke 5T ; 4 Screws	0.42 *[SPF]*	**3-1/8”**	*[78]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x 80]*	**2,800**	*[12.5]*
		**4”**	*[100]*	Kombi	**1/2” x 4”**	*[12 x 100]*		
		4-3/4”	*[120]*		**1/2” x 4-3/4”**	*[12 x 120]*	**3,900**	*[17.3]*
		6-1/4”	*[160]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**7,000**	*[31.1]*
	0.49 *[D.Fir]*	**3-1/8”**	*[78]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x 80]*	**3,100**	*[13.7]*
		4”	*[100]*	Kombi	**1/2” x 4”**	*[12 x 100]*		
		4-3/4”	*[120]*		**1/2” x 4-3/4”**	*[12 x 120]*	**4,300**	*[19.1]*
		6-1/4”	*[160]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**7,700**	*[34.2]*

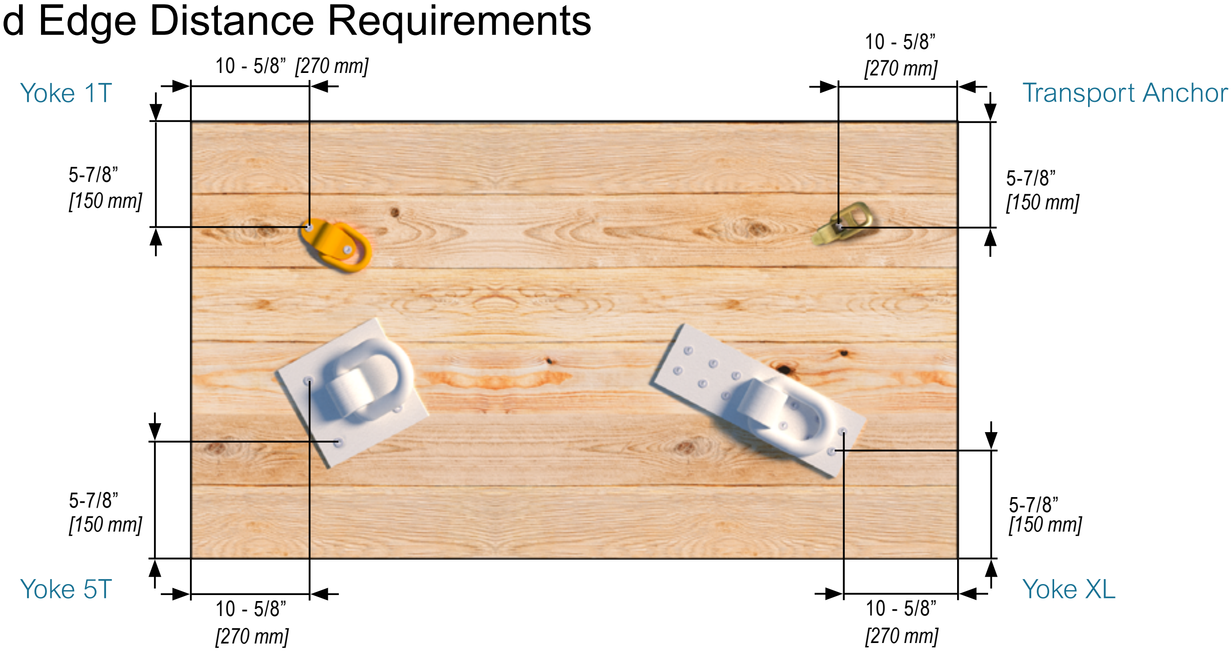
Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift

Table 10, Basic Factored Resistance Values for Flat CLT Panel Rigging Using Yoke XL (N'_r)

Lifting Device	Relative Density [G]	Minimum Panel Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	[mm]		in	[mm]	lbs	[KN]
Yoke XL ; 4 Screws	0.42 [SPF]	3-1/8”	[78]	Ecofast	3/8” x 3-1/8”	[10 x 80]	1,800	[8.0]
		4”	[100]	VG CSK	3/8” x 4”	[10 x 100]	3,500	[15.6]
		6-1/4”	[160]		3/8” x 6-1/4”	[10 x 160]	6,300	[28.0]
	0.49 [D.Fir]	3-1/8”	[78]	Ecofast	3/8” x 3-1/8”	[10 x 80]	1,900	[8.4]
		4”	[100]	VG CSK	3/8” x 4”	[10 x 100]	4,000	[17.8]
		6-1/4”	[160]		3/8” x 6-1/4”	[10 x 160]	7,000	[31.1]
Yoke XL ; 8 Screws	0.42 [SPF]	3-1/8”	[78]	Ecofast	3/8” x 3-1/8”	[10 x 80]	3,700	[16.4]
		4”	[100]	VG CSK	3/8” x 4”	[10 x 100]	6,700	[29.8]
		6-1/4”	[160]		3/8” x 6-1/4”	[10 x 160]	10,100	[44.9]
	0.49 [D.Fir]	3-1/8”	[78]	Ecofast	3/8” x 3-1/8”	[10 x 80]	4,100	[18.2]
		4”	[100]	VG CSK	3/8” x 4”	[10 x 100]	7,600	[33.8]
		6-1/4”	[160]		3/8” x 6-1/4”	[10 x 160]	10,500	[46.7]
Yoke XL ; 12 Screws	0.42 [SPF]	3-1/8”	[78]	Ecofast	3/8” x 3-1/8”	[10 x 80]	5,500	[24.4]
		4”	[100]	VG CSK	3/8” x 4”	[10 x 100]	10,400	[46.3]
		6-1/4”	[160]		3/8” x 6-1/4”	[10 x 160]	10,900	[48.5]
	0.49 [D.Fir]	3-1/8”	[78]	Ecofast	3/8” x 3-1/8”	[10 x 80]	5,800	[25.8]
		4”	[100]	VG CSK	3/8” x 4”	[10 x 100]	10,600	[47.2]
		6-1/4”	[160]		3/8” x 6-1/4”	[10 x 160]	11,000	[48.9]

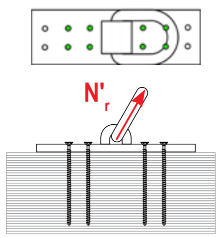
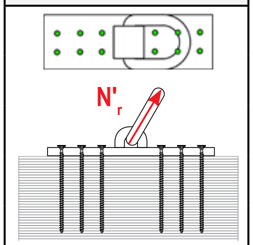
Notes:
1. See notes under table 9
2. For the different screw options of the Yoke XL system, the screws must be placed in the holes as specified in table 10

End and Edge Distance Requirements



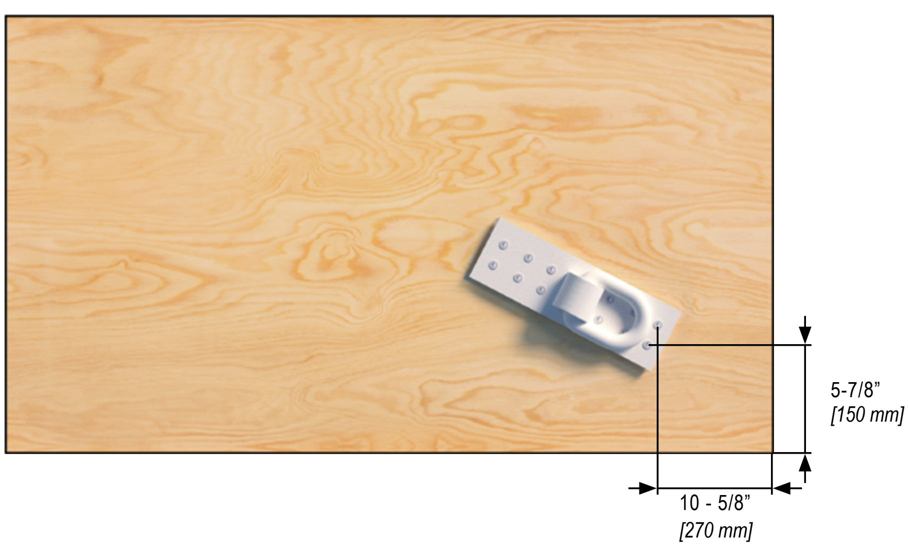
MPP Panel Rigging Using Yoke Systems

Table 11, Basic Factored Resistance Values for Flat MPP Panel Rigging Using Yoke XL (N'_r)

Lifting Device	Relative Density [G]	Minimum Panel Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	[mm]		in	[mm]	lbs	[KN]
Yoke XL ; 8 Screws 	0.42 *[SPF]*	2”	*[51]*	SK	**5/16” x 2-3/8”**	*[8 x 60]*	**1,820**	*[8.1]*
		4”	*[100]*	VG CSK	**3/8” x 4”**	*[10 x 120]*	**4,620**	*[20.6]*
		6”	*[152]*	VG CSK	**3/8” x 6-1/4”**	*[10 x 160]*	**7,000**	*[31.2]*
Yoke XL ; 12 Screws 	0.42 *[SPF]*	2”	*[51]*	SK	**5/16” x 2-3/8”**	*[8 x 60]*	**2,800**	*[12.5]*
		4”	*[100]*	VG CSK	**3/8” x 4”**	*[10 x 120]*	**7,000**	*[31.1]*
		6”	*[152]*	VG CSK	**3/8” x 6-1/4”**	*[10 x 160]*	**9,800**	*[42.6]*

Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. For the different screw options of the Yoke XL system, the screws must be placed in the indicated holes in table 11

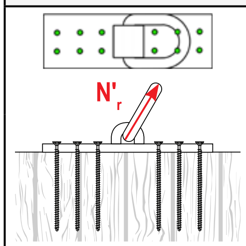
End and Edge Distance Requirements



Step 2, Option C: Mass Timber, Wall Panel Rigging

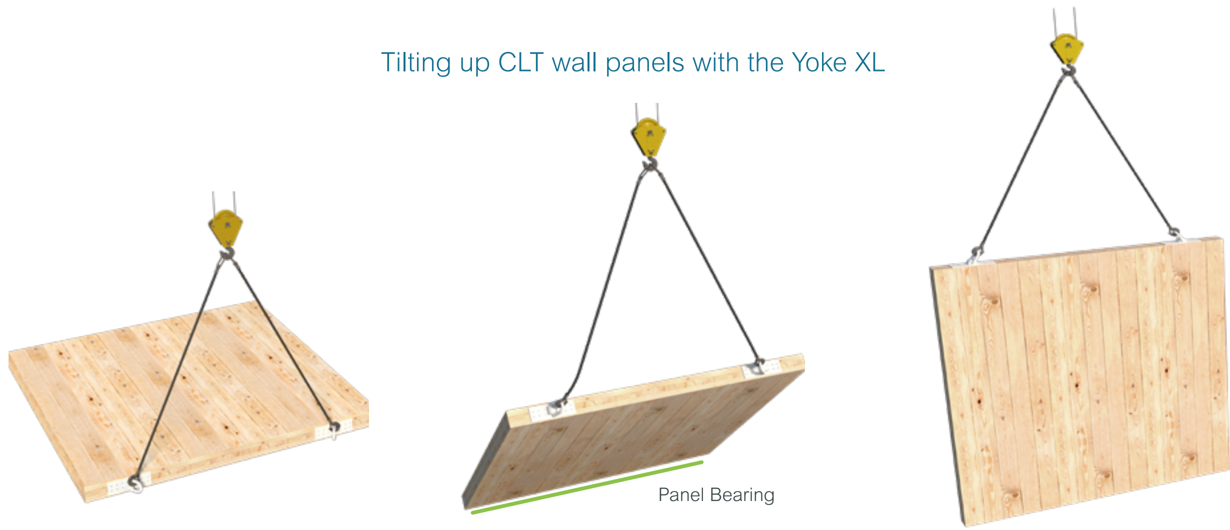
CLT Wall Panel Tilting From Edge Using Yoke Systems

Table 12, Basic Factored Resistance Values for CLT Wall Panel Tilting Using Yoke XL on Panel Edge (N'_r)

Lifting Device	Relative Density [G]	Minimum Panel Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	[mm]		in	[mm]	lbs	[KN]
Yoke XL ; 12 Screws 	0.42 *[SPF]*	**3-1/2”**	*[87]*	VG CSK	**3/8” x 6-1/4”**	*[10 x 160]*	**2,800**	*[12.4]*
	0.49 *[D.Fir]*	**3-1/2”**	*[87]*	VG CSK	**3/8” x 6-1/4”**	*[10 x 160]*	**3,100**	*[13.8]*

Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. Listed basic factored resistance values (N'_r) assume the panel is tilted while one end is bearing on a stable surface

Tilting up CLT wall panels with the Yoke XL

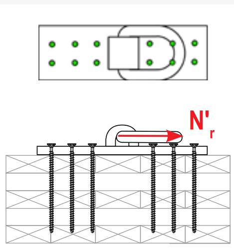


End And Edge Distance Requirements

For wall panel rigging on the narrow edge of CLT panels, only the Yoke XL is used since it uses small diameter fasteners. The reduced edge distance requirements below are a minimum and apply to the Yoke XL only.

CLT Wall Panel Tilting From Face Using Yoke Systems

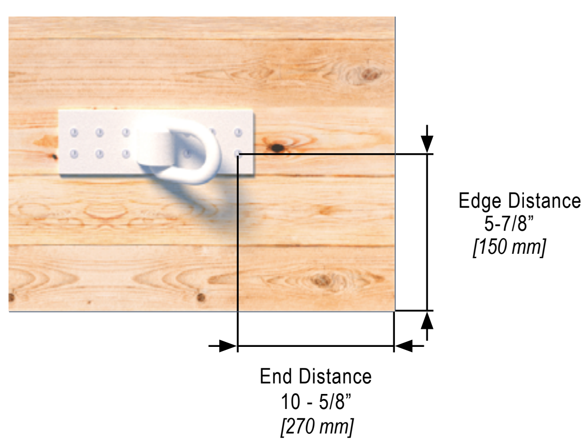
Table 13, Basic Factored Resistance Values for Lifting CLT Wall Panels with Yoke XL on Panel Face (N'_r)

Lifting Device	Relative Density [G]	Minimum Panel Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	[mm]		in	[mm]	lbs	[KN]
Yoke XL ; 12 Screws	0.42 [SPF]	**4”**	[100]	VG CSK	**3/8” x 4”**	[10 x 100]	**3,570**	[15.9]
		**6-1/4”**	[160]		**3/8” x 6-1/4”**	[10 x 160]		
	0.49 [D.Fir]	**4”**	[100]	VG CSK	**3/8” x 4”**	[10 x 100]	**3,855**	[17.1]
		6-1/4”	[160]		**3/8” x 6-1/4”**	[10 x 160]		

Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. Listed basic factored resistance values (N'_r) assume the panel is tilted with the anchors placed on the panel face while one end is bearing on a stable surface
8. Screw length and panel thickness must be considered to prevent through penetration of the screw

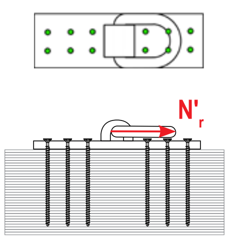
Tilting up CLT wall panels from side with the Yoke XL

End And Edge Distance Requirements



MPP Wall Panel Tilting From Side Using Yoke Systems

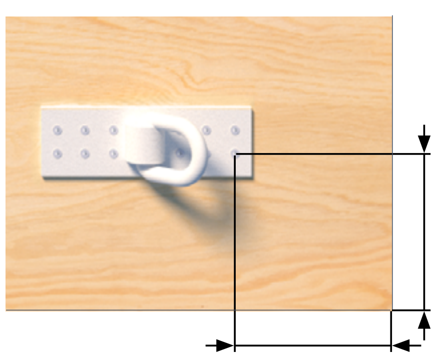
Table 14, Basic Factored Resistance Values for Lifting MPP Wall Panels with Yoke XL on Panel Face (N'_r)

Lifting Device	Relative Density [G]	Minimum Panel Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	[mm]		in	[mm]	lbs	[KN]
Yoke XL ; 12 Screws 	0.42 *[SPF]*	2”	*[51]*	SK	5/16” x 2-3/8”	*[8 x 60]*	3,220	*[14.3]*
		4”	*[100]*	VG CSK	3/8” x 4”	*[10x 100]*	4,300	*[19.1]*
		6”	*[152]*	VG CSK	3/8” x 6-1/ 4”	*[10 x 160]*	4,300	*[19.1]*

Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. Listed basic factored resistance values (N'_r) assume the panel is tilted with the anchors placed on the panel face while one end is bearing on a stable surface
8. Screw length and panel thickness must be considered to prevent through penetration of the screw

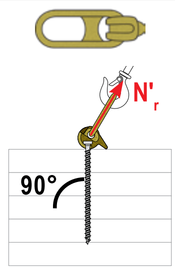
Tilting up MPP wall panels from side with the Yoke XL

End And Edge Distance Requirements

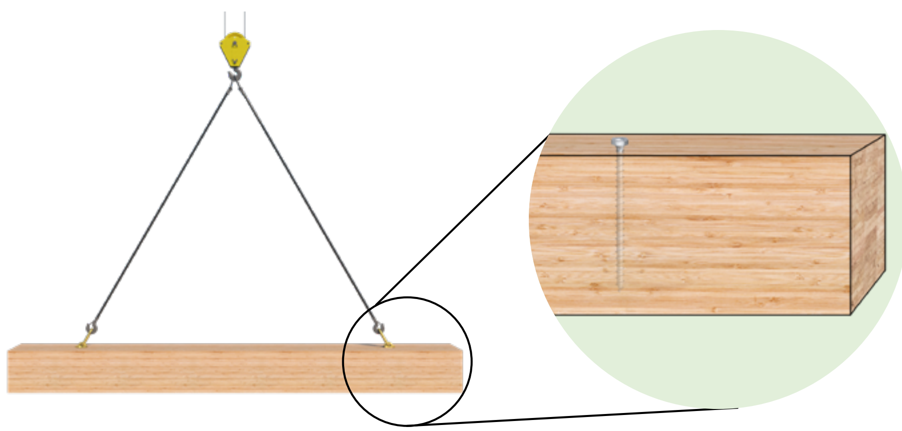


Step 2, Option D: Glulam Beam & Log Rigging

Table 15, Basic Factored Resistance Values for Glulam Beam & Log Rigging Using Transport Anchor (TA) Screws at 90 Degrees (N'_r)

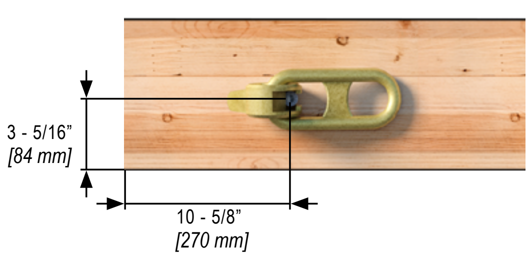
Lifting Device	Relative Density [G]	Minimum Element Thickness		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		in	*[mm]*	lbs	*[KN]*
TA ; 1 Screw 	0.42 *[SPF]*	**6-5/8"**	*[168]*	Kombi LT	**1/2" x 3-1/8"**	*[12 x 80]*	**630**	*[2.8]*
				Kombi	**1/2" x 4-3/4"**	*[12 x 120]*	**1,050**	*[4.7]*
				Kombi LT	**1/2" x 6-1/4"**	*[12 x 160]*	**1,400**	*[6.2]*
	0.49 *[D.Fir]*	**6-5/8"**	*[168]*	Kombi LT	**1/2" x 3-1/8"**	*[12 x 80]*	**630**	*[2.8]*
				Kombi	**1/2" x 4-3/4"**	*[12 x 120]*	**1,050**	*[4.7]*
				Kombi LT	**1/2" x 6-1/4"**	*[12 x 160]*	**1,400**	*[6.2]*

Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. Listed basic factored resistance values (N'_r) are valid for screws installed at 90° to the beam or log surface
8. Fastener head must sit proud 7/8" [20mm] from the surface of the rigging element for proper engagement of the anchor
9. The Transport Anchor must be engaged and aligned with the axis angle of the lifting slings as described on page 35
10. Listed basic factored resistance values (N'_r) are valid for logs with a minimum 10" diameter



End and Edge Distance Requirements

Glulam Members



Log Members

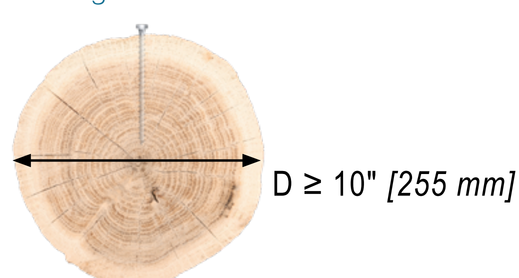
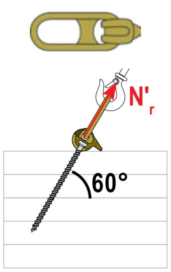
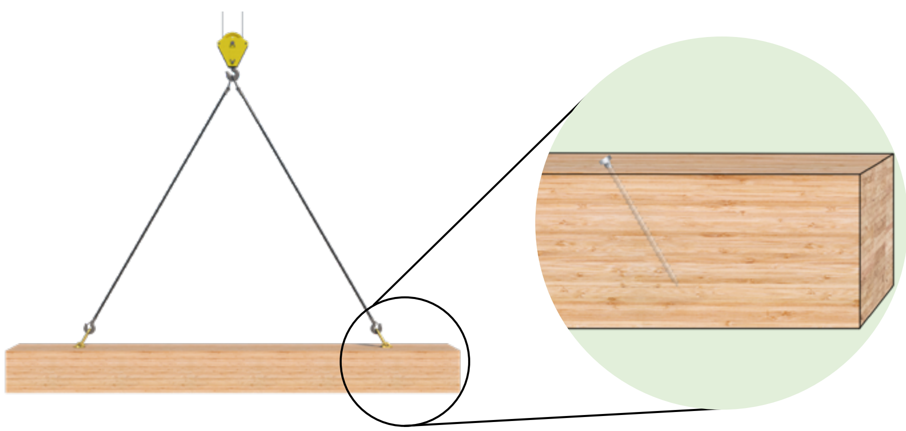


Table 16, Basic Factored Resistance Values for Glulam Beam & Log Rigging Using Transport Anchor (TA) Screw at 60 Degrees (N'_r)

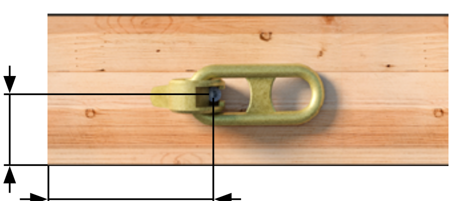
Lifting Device	Relative Density [G]	Minimum Element Thickness in	[mm]	Fastener Options	in	[mm]	Basic Factored Resistance Value [N'_r] lbs	[KN]
TA ; 1 Screw 	0.42 *[SPF]*	**6-5/8"**	*[168]*	Kombi	**1/2" x 4-3/4"**	*[12 x 120]*	**1,150**	*[5.1]*
				Kombi LT	**1/2" x 6-1/4"**	*[12 x 160]*	**1,620**	*[7.2]*
	0.49 *[D.Fir]*	**6-5/8"**	*[168]*	Kombi	**1/2" x 4-3/4"**	*[12 x 120]*	**1,150**	*[5.1]*
				Kombi LT	**1/2" x 6-1/4"**	*[12 x 160]*	**1,620**	*[7.2]*

Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. Listed basic factored resistance values (N'_r) are valid for screws installed at 60° to the beam or log surface
8. Fastener head must sit proud 7/8" [20mm] from the surface of the rigging element for proper engagement of the anchor
9. The Transport Anchor must be engaged and aligned with the axis angle of the lifting slings as described on page 32
10. Listed basic factored resistance values (N'_r) are valid for logs with a minimum 10" diameter



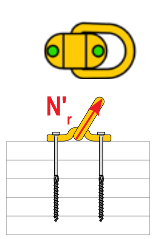
End and Edge Distance Requirements

Glulam Members



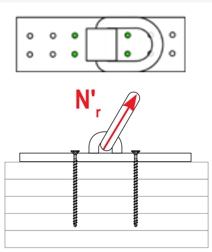
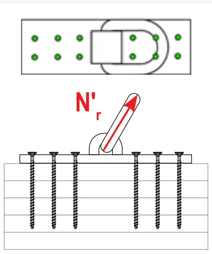
Log Members

Table 17, Basic Factored Resistance Values for Glulam Beam Rigging Using Yoke 1T (N'_r)

Lifting Device	Relative Density [G]	Minimum Beam Width		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		in	*[mm]*	lbs	*[KN]*
Yoke 1T ; 2 Screws 	0.42 *[SPF]*	**6-5/8”**	*[168]*	Kombi	**1/2” x 4-3/4”**	*[12 x 120]*	**1,900**	*[8.5]*
				Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**2,200**	*[9.8]*
	0.49 *[D.Fir]*	**6-5/8”**	*[168]*	Kombi	**1/2” x 4-3/4”**	*[12 x 120]*	**2,150**	*[9.6]*
				Kombi LT	**1/2” x 6-1/4”**	*[12 x 160]*	**2,200**	*[9.8]*

Notes:
1. See notes under table 18

Table 18, Basic Factored Resistance Values for Glulam Beam Rigging Using Yoke XL (N'_r)

Lifting Device	Relative Density [G]	Minimum Beam Width		Fastener Options			Basic Factored Resistance Value [N'_r]	
		in	*[mm]*		in	*[mm]*	lbs	*[KN]*
Yoke XL ; 4 Screws 	0.42 *[SPF]*	**5-1/8”**	*[130]*	VG CSK	**3/8” x 4”**	*[10 x 100]*	**3,500**	*[15.8]*
					3/8” x 6-1/4”	*[10 x 160]*	**6,300**	*[28.0]*
	0.49 *[D.Fir]*	**5-1/8”**	*[130]*	VG CSK	**3/8” x 4”**	*[10 x 100]*	**4,000**	*[17.8]*
					3/8” x 6-1/4”	*[10 x 160]*	**7,000**	*[31.1]*
Yoke XL ; 12 Screws 	0.42 *[SPF]*	**5-1/8”**	*[130]*	VG CSK	**3/8” x 4”**	*[10 x 100]*	**10,400**	*[46.3]*
					3/8” x 6-1/4”	*[10 x 160]*	**10,900**	*[48.5]*
	0.49 *[D.Fir]*	**5-1/8”**	*[130]*	VG CSK	**3/8” x 4”**	*[10 x 100]*	**10,600**	*[47.2]*
					3/8” x 6-1/4”	*[10 x 160]*	**11,000**	*[48.9]*

Notes:
1. All rigging design must meet relevant requirements of the General Notes to Designer section, page 10
2. Listed basic factored resistance values (N'_r) are only valid for limit state design in Canada
3. Listed basic factored resistance values (N'_r) must be factored with appropriate reduction factors as described on page 30
4. Listed basic factored resistance values (N'_r) are valid for sling angle to the panel (β) of 60 °
5. Listed basic factored resistance values (N'_r) valid only with listed ASSY screws
6. The resistance of ASSY screws is only assured for a single use. New screws must be used for each lift
7. For the different screw options of the Yoke XL system, the screws must be placed in the holes as specified in table 18

End and Edge Distance Requirements

Fair Heaven Homes

Vancouver, British Columbia

Step 3: Safety Checks

Step 3, Check A: Screw Penetration

Fastener length is often limited by the thickness of the rigged element. While it is recommended that the screws should penetrate as many plies as possible, a minimum clearance of 10mm is recommended to avoid through penetration of the screw. The following tables provide suggested fastener lengths for most common North American MPP and CLT thicknesses.

Table 19, ASSY Screw Length Suggestion According to MPP Panel Thickness With Yoke XL Anchor

MPP Panel Type		**Rigging Device**		
Thickness		**Yoke XL**		
in	*[mm]*	**Fastener**	**in**	*[mm]*
2”	*[51]*	SK	**5/16” x 2-3/8”**	*[8 x 60]*
4”	*[100]*	VG CSK	**3/8” x 4”**	*[10 x 100]*
6”	*[152]*		**3/8” x 6-1/4”**	*[10 x 160]*

Notes:
1. Fastener lengths are suggestions only and can be adapted to fit certain site conditions and rigging needs
2. The thread embedment length on the fastener determines the capacity of each system

Table 20, ASSY Screw Length Suggestion According to CLT Panel Thickness With Transport Anchor

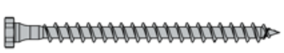
CLT Panel Type			**Rigging Device**					
Thickness			**Transport Anchor**			**Transport Anchor - With Housing**		
	in	*[mm]*	**Fastener**	**in**	*[mm]*	**Fastener**	**in**	*[mm]*
3 PLY	**3-1/8”**	*[78]*						
	3-3/8”	*[87]*						
	3-1/2”	*[89]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x80]*			
	4”	*[100]*				N/A		
	4-1/8”	*[105]*						
	4-3/4”	*[120]*	Kombi	**1/2” x 4-3/4”**	*[12 x120]*			
5 PLY	**4”**	*[100]*	Kombi LT	**1/2” x 3-1/8”**	*[12 x80]*	N/A		
	4-3/4”	*[120]*				Kombi	**1/2” x 4”**	*[12 x100]*
	5-1/8”	*[131]*	Kombi	**1/2” x 4-3/4”**	*[12 x120]*			
	5-1/2”	*[139]*				Kombi	**1/2” x 4-3/4”**	*[12 x120]*
	5-5/8”	*[143]*						
	6-1/4”	*[160]*						
	6-7/8”	*[175]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x160]*	Kombi LT	**1/2” x 6-1/4”**	*[12 x160]*
	7-1/8”	*[180]*						

Notes:
1. Fastener lengths are suggestions only and can be adapted to fit certain site conditions and rigging needs
2. The thread embedment length on the fastener determines the capacity of each system

Table 21, ASSY Screw Length Suggestion According to CLT Panel Thickness With Yoke Anchors

CLT Panel Type			Rigging Device								
Thickness			Yoke 1T			Yoke 5T			Yoke XL		
	in	[mm]	Fastener	in	[mm]	Fastener	in	[mm]	Fastener	in	[mm]
3 PLY	3-1/8”	[78]	Kombi LT	1/2” x 3-1/8”	[12 x80]	Kombi LT	1/2” x 3-1/8”	[12 x80]	Ecofast	3/8” x 3-1/8”	[10 x 80]
	3-3/8”	[87]									
	3-1/2”	[89]							VG CSK	3/8” x 4”	[10 x 100]
	4”	[100]	Kombi	1/2” x 4”	[12 x100]	Kombi	1/2” x 4”	[12 x100]			
	4-1/8”	[105]									
	4-3/4”	[120]	Kombi	1/2” x 4-3/4”	[12 x120]	Kombi	1/2” x 4-3/4”	[12 x120]			
5 PLY	4”	[100]	Kombi	1/2” x 4”	[12 x100]	Kombi	1/2” x 4”	[12 x100]	VG CSK	3/8” x 4”	[10 x 100]
	4-3/4”	[120]	Kombi	1/2” x 4-3/4”	[12 x120]	Kombi	1/2” x 4-3/4”	[12 x120]			
	5-1/8”	[131]									
	5-1/2”	[139]									
	5-5/8”	[143]									
	6-1/4”	[160]	Kombi LT	1/2” x 6-1/4”	[12 x160]	Kombi LT	1/2” x 6-1/4”	[12 x160]	VG CSK	3/8” x 6-1/4”	[10 x 160]
	6-7/8”	[175]									
	7-1/8”	[180]									
	7-7/8”	[200]									
7 PLY	4-3/8”	[111]	Kombi	1/2” x 4”	[12 x100]	Kombi	1/2” x 4”	[12 x100]	VG CSK	3/8” x 4”	[10 x 100]
	7-1/2”	[191]	Kombi LT	1/2” x 6-1/4”	[12 x160]	Kombi LT	1/2” x 6-1/4”	[12 x160]	VG CSK	3/8” x 6-1/4”	[10 x 160]
	7-3/4”	[197]									
	8-3/8”	[213]									
	8-5/8”	[220]									
	9-5/8”	[245]									

Notes:
1. Fastener lengths are suggestions only and can be adapted to fit certain site conditions and rigging needs
2. The thread embedment length on the fastener determines the capacity of each system


Kombi LT 1/2" x 6-1/4"


Kombi 1/2" x 4-3/4"


Kombi 1/2" x 4"


Kombi LT 1/2" x 3-1/8"


VG CSK 3/8" x 6-1/4"


VG CSK 3/8" x 4"


Ecofast 3/8" x 3-1/8"


SK 5/16" x 2-3/8"


SK 1/4" x 2-3/8"

Step 3, Check B: System Capacity

$$N_r = N'_r \cdot n \cdot R_{AR} \cdot R_{LS} \cdot R_D \qquad \text{(eq.3)}$$

N_r	Anchor(s) capacity
N'_r	Basic factored resistance per anchor (provided in design tables)
n	Number of anchors used
R_{AR}	Anchor resistance reduction factor:

- For sling angles ≥60° to the panel surface **1.0**
- For one [or more] sling angles <60° to the panel surface

Table 22, Anchor Resistance Reduction Factor for Sling Angles β<60°

β	50°	40°	30°	20°	10°	20°
R_{AR}	0.8	0.65	0.55	0.45	0.35	0.3

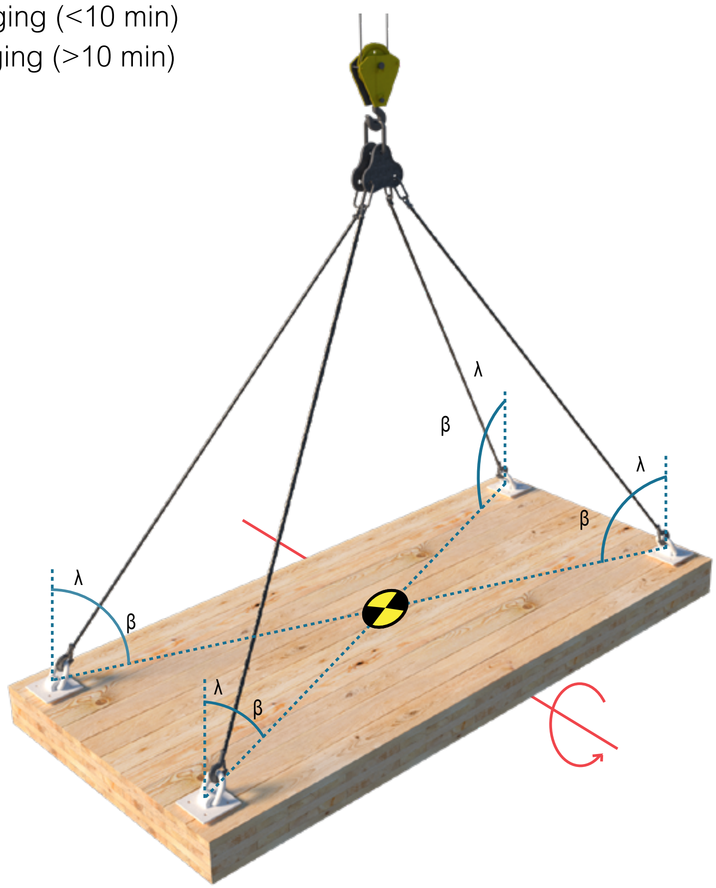
Notes:
1. Not applicable for the Transport Anchor

R_{LS} Load spreader reduction factor:

- For n = 2 **1.0**
- For n = 4, with adequate load spreader/compensation device **1.0**
- For n = 4, without adequate load spreader/conpensation device **0.5**

R_D Load duration reduction factor:

- Short term rigging (<10 min) **1.0**
- Long term rigging (>10 min) **0.86**



Step 3, Check C: Sling Angle Loading (S)

The values listed for the rigging devices account for the forces applied on the anchors themselves and are valid for rigging scenarios with a minimum sling angle (β) of 60°, where (β) is measured between the sling and the panel surface. The working limits of common sling configurations can be estimated using simple geometry of the rigged element. The simplified modification factor based on the sling angle loading (S) is shown in Table 23.

Table 23, Modification Factor for Sling Angles Loading (S)

Sling Angle (β)	Modification Factor Per Leg of Sling
90°	1.00
75°	1.03
60°	1.15
45°	1.43
30°	2.00

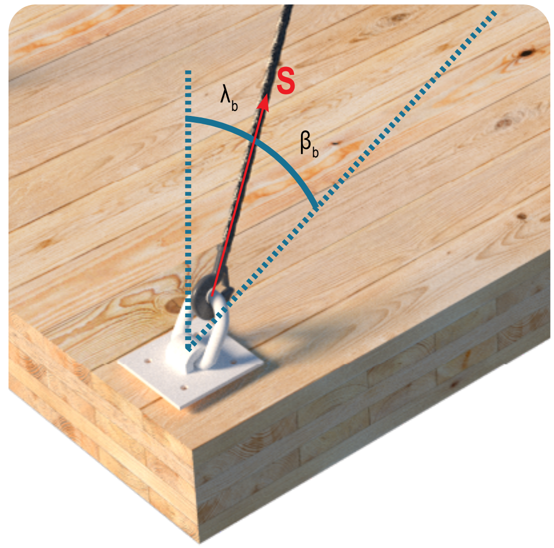
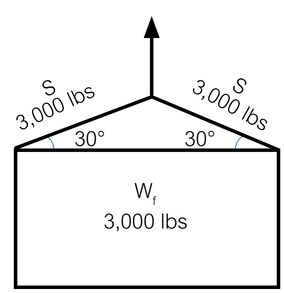


Table 24 demonstrates sling angle working limits when lifting an assumed 3,000lbs wall panel on the narrow edge using two anchors. The load per one leg of sling for an angle of 60° is calculated using half of the panel weight divided by the sine of 60°. It is clear from Table 24 that slings with an angle to the surface of less than 60° have smaller sling working limits and exceed the total element weight. Therefore, usage of sling angles less than 60° must be avoided and is not recommended for safe rigging applications.

Table 24, Example Sling Angle Loading

Sling Angle (β)	Assumed Factored Total Load [W_f]	Load Per Leg of Sling [S]
	lbs	lbs
90°	**3,000**	1,500
75°		1,553
60°		1,732
45°		2,124
30°		3,000



Example Sling Angle Simplified

It is crucial for the designer to ensure the anchor capacity (N_r) found in Step 3, Check B exceeds the total summation of all sling forces (S_T):

$$S_T = \Sigma S$$

$$N_r > S_T$$

Step 3, Check D: On-site Safety Inspection

General

All rigging devices must be examined frequently by a trained safety professional. Additional inspection of devices prior to each lift is suggested to ensure a safe lifting procedure and proper quality control. Anchors must be inspected for any damages (external wear, cuts, cracks, etc.). If the anchor is deemed to be damaged, the device must be taken out of circulation immediately.

Anchors must be safely transferred between lifts to prevent damages or micro cracks that can compromise the overall anchor capacity and cause potential safety hazards. If proper inspection is done, anchors can be re-used on multiple rigging projects. However, the fasteners used for panel rigging must only be used once to ensure safety and proper system capacity.

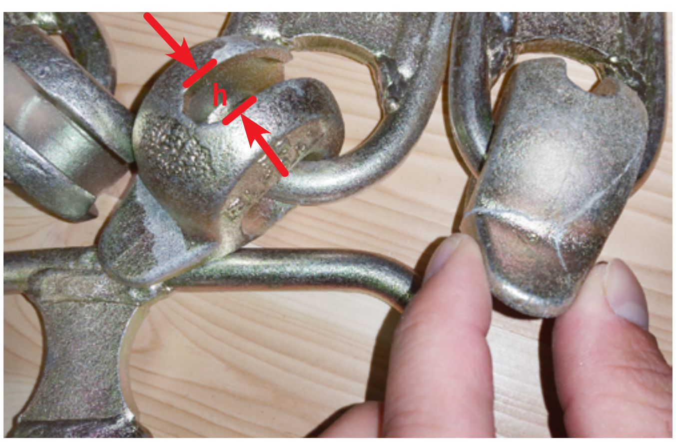
Yoke System

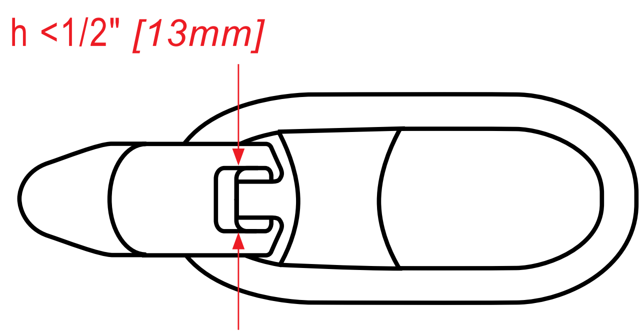
Yoke anchors must be inspected for any damages to the powder-coated finish and for any corrosion that may affect system capacity. Repair or modification of any kind to the Yoke systems, particularly welding, is not permitted.

Transport Anchor System

The Transport Anchor must be inspected for any damages to the galvanized finish and for any corrosion that may affect system capacity. Repair or modification of any kind to the Transport Anchor, particularly welding, is not permitted.

The Transport Anchor receiver mouth width “h” must not exceed 1/2” (13mm). If inspection concludes that the width of the receiver mouth is greater than 1/2” (13mm), the Transport Anchor must be taken out of circulation immediately. A larger receiver mouth cannot properly engage the screw during rigging and can cause potential safety hazards. The following image of damaged Transport Anchors highlights this concept.





Meadows Community Recreation Centre

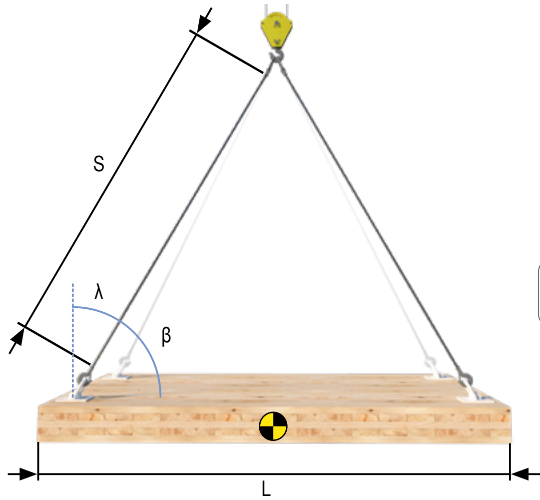
Edmonton, Alberta

Courtesy of Swinerton

Step 4: Installation Instructions

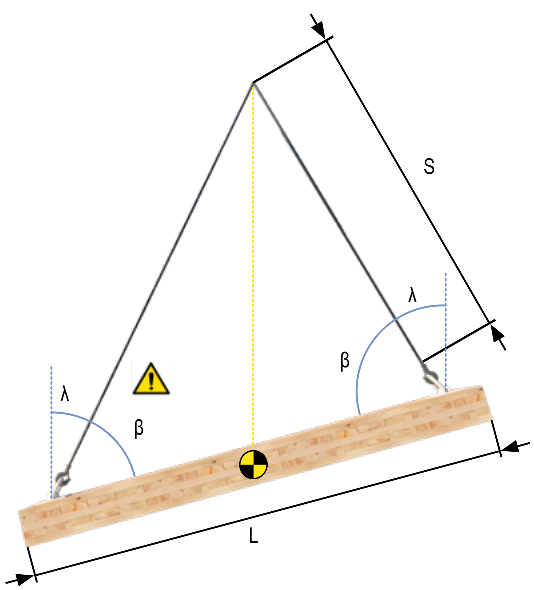
Step 4, Check A: Sling Angle Installation

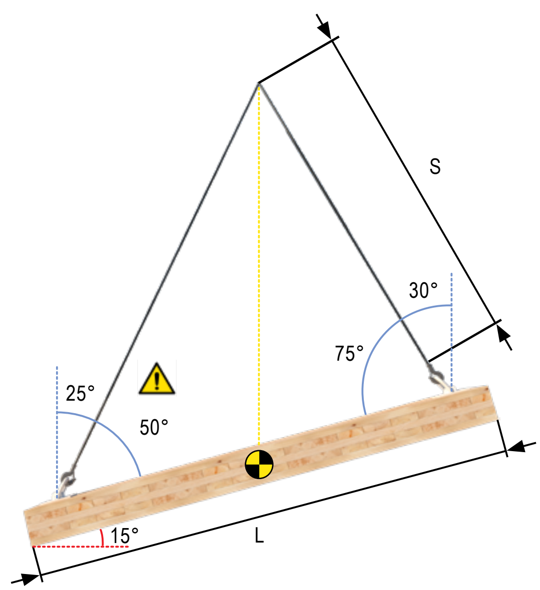
Tabulated basic factored resistance (N'_r) values are valid for rigging scenarios with a minimum sling angle (β) measured between the sling and the panel surface of 60°. If length S is greater than L as illustrated in the figure below, β angles bigger than 60° will be achieved.



Check β > 60° if S>L

For cases where the sling angle (β) is less than 60°, an appropriate reduction factor (R_{AR}) must be applied to the capacity of the anchors (N_r).





Example of Panel Angled at 15°

Step 4, Check B: Load Spreading

When using more than two anchors, it is important to avoid uneven load sharing. Without an adequate load spreader/compensation system, load may be unevenly distributed forcing the entire load into two slings while the remainder hang slack. In such cases, a reduction factor R_{LS} = 0.5 will need to be applied to the basic factored resistance (N'_r) of the anchors.

Example of uneven load sharing

For Floor Panels

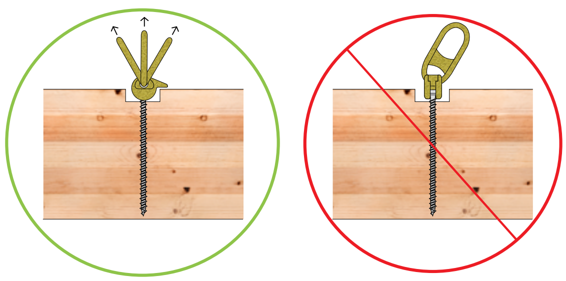
When lifting CLT floor panels using load spreader or compensation devices as seen below, even load share may be assumed.

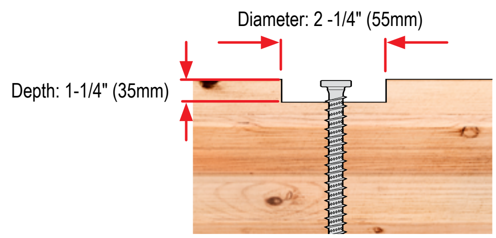
For Wall Panels

When lifting CLT wall panels, load spreaders can be used to further stabilize the load while increasing the sling angle (β).

Step 4, Check C: Transport Anchor Housing

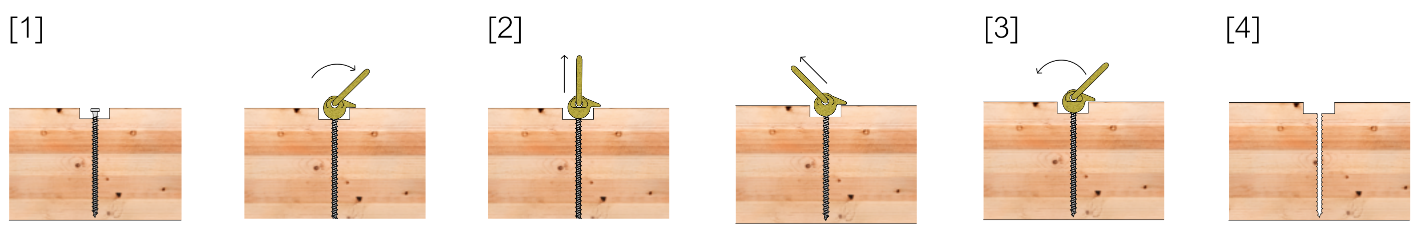
The Transport Anchor can be placed on the surface of the rigged element for a simple and easy installation. It can also be installed in a pre-cut circular housing for a flush finish. This allows the screw to be left installed but out of the way after lifting the element into place. A circular housing dimension of 1-1/4"” [30mm] deep and 2-1/4” [55mm] in diameter is suggested. In both cases (with housing or without housing) the anchor must always be engaged properly during lifting and any misalignment with the axis angle of the lifting slings must be avoided, as shown in the figure below. Additionally, the fastener head must sit proud 7/8" [20mm] from the surface of the panel for proper engagement of the anchor.



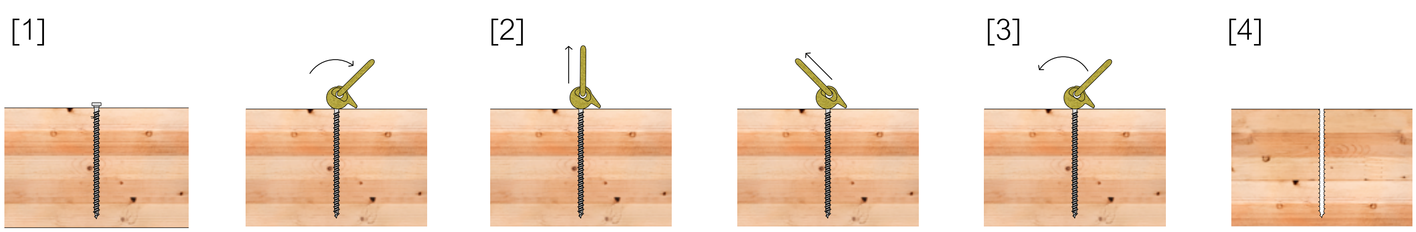


Installation of the Transport Anchor typically involves four general steps as shown below:
[1] The screw is installed 7/8" [20mm] proud of the panel surface and the anchor is engaged
[2] The anchor loop is aligned with the proper sling angle (perpendicular or inclined loading)
[3] After lifting, the Transport Anchor is unhooked from the screw for removal
[4] lifting screw is removed (optional)

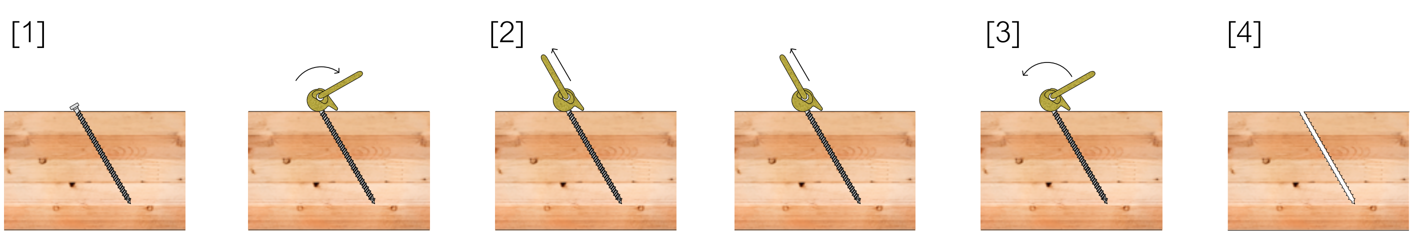
Transport Anchor Installation (With Housing)



Transport Anchor Installation (Without Housing)



Transport Anchor Installation With Inclined Screw (Without Housing)



Philip J. Currie Dinosaur Museum

Wembley, Alberta

Courtesy of Structurecraft

Recommended Workflow

The prefabrication of various mass timber elements allows for a fast and efficient installation on-site. Most mass timber manufacturers consider sequencing of material, with the trucks arriving in the sequence in which the elements are set to be installed. During rigging, it is advantageous to keep up with the material workflow by steadily unloading truck beds and maximizing crane efficiency. Considering this, it is recommended to follow a circular workflow using four sets of rigging hardware to reduce delays on-site.

1 One set is installed on the panel on the truck bed

2 One set is used for rigging the panel into place

3 One set is unmounted from the panel in place

4 One set is transported back to the truck

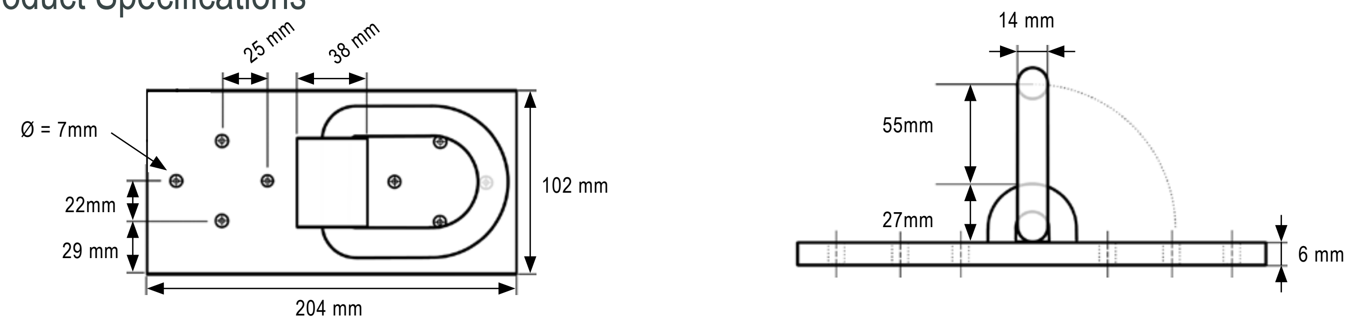
Magnetic Socket

The Magnetic Socket can be used for faster installation of the ASSY Kombi screws used with the Yoke 1T, Yoke 5T and the Transport Anchor rigging devices. The built-in magnet allows the screw head to be placed snug inside the socket for a more optimized installation of the self-tapping screw.

Pre-fabricated Jigs

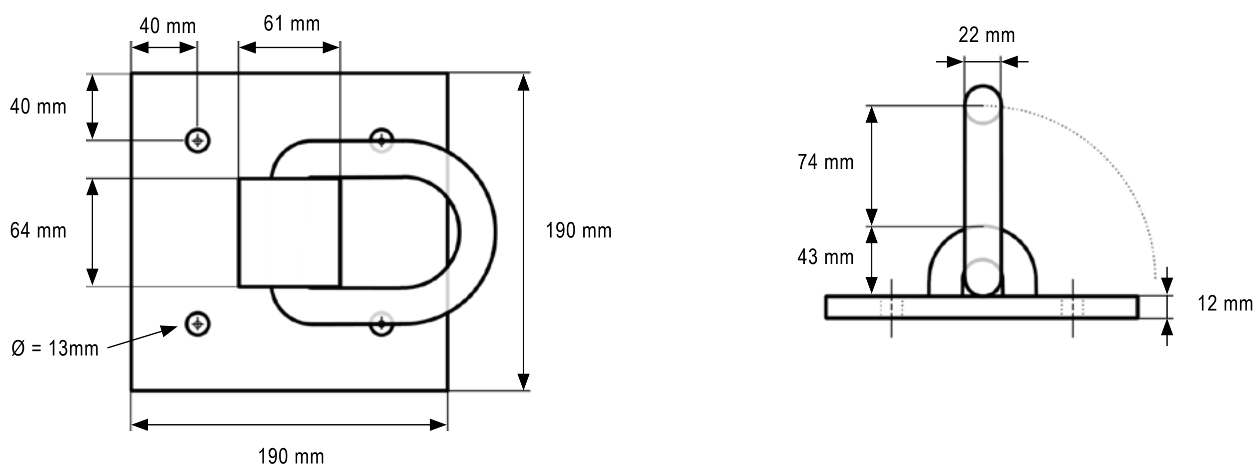
A jig can be prefabricated for repetitive lifts using the Yoke rigging systems as shown in the figure below. The jig can assist with the correct placement of the device on the element and ensure proper load sharing between all rigging devices. Additionally, faster workflow and installation may be accomplished on bigger projects with the use of a prefabricated jig.

Product Specifications

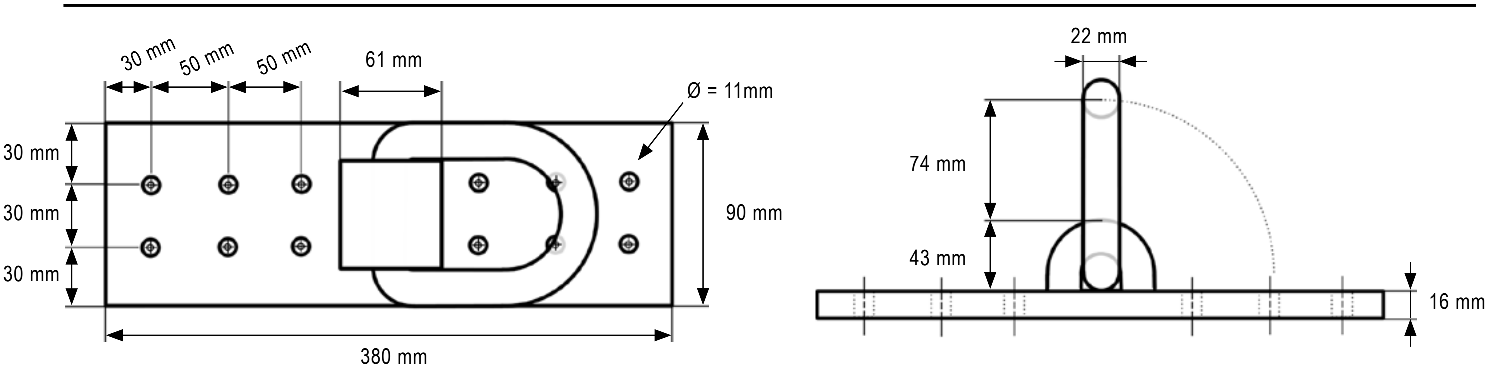


Mini Yoke Anchor Specifications

Yoke 1T Anchor Specifications



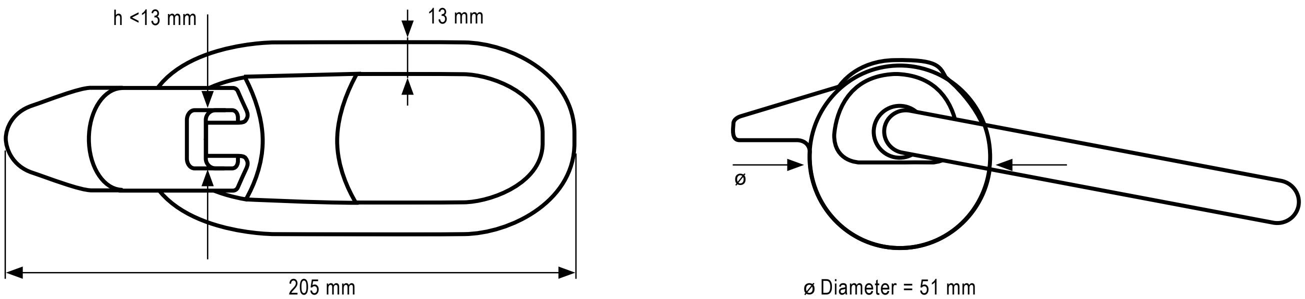
Yoke 5T Anchor Specifications



Yoke XL Anchor Specifications

Notes:

1. Drawings are not to scale



Transport Anchor Specifications

Notes:

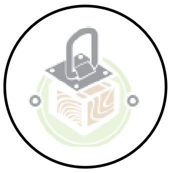
1. Drawings are not to scale

Checklist

Factoring Total Loads

- [ ] Identify unfactored element weight
- [ ] Is the weight factored up with correct modification factors?
- [ ] Apply dynamic acceleration factors
- [ ] Apply optional safety factors

Anchor Selection



- [ ] Is the capacity per anchor enough to lift the element?
- [ ] Is the correct fastener length and type used?
- [ ] Is the minimum element thickness for lifting respected?
- [ ] Are geometry requirements satisfied?

Safety Checks

- [ ] Is the correct number of anchors used?
- [ ] Is the angle (β) measured between the sling and the panel surface greater than 60°?
- [ ] Is the angle (λ) measured between the vertical and the sling smaller than 30°?
- [ ] Is the load rating of the slings greater than the angled force component?
- [ ] Is even load sharing between the anchors assured?
- [ ] Is the center of gravity below the upper pick point of the crane?

Rigging Hazards

- [ ] **Are the fasteners new? Fasteners must only be used once!**
- [ ] Are all rigging devices inspected for damages prior to each lift?
- [ ] Is all rigging hardware installed properly and double checked?
- [ ] Is the surrounding area clear and safe?
- [ ] Is the rigging element secured with tag lines?
- [ ] Does the current wind condition allow for safe rigging?
- [ ] Is the intended location prepared to accept the rigged material?
- [ ] Is the panel fully secured with no load on the rigging slings?
- [ ] Are the used fasteners disposed of correctly to avoid reuse in future rigging applications? (Fasteners must only be used once!)

Kwantlen Polytechnic University

Richmond, British Columbia

MTC Solutions provides sustainable, high quality mass timber connection solutions to a rapidly evolving and thriving industry. We drive innovation through certified research and development and contribute our part to the education of young talent and experienced professionals in the technology used in sustainable design.

Credit Stephane Groleau

MTC SOLUTIONS

info@mtcsolutions.com | 1.866.899.4090

mtcsolutions.com