HORN

V.1.0.18062025

2025

Industrial staircase system

Customized FRP structures

Fixed Vertical Ladder | Product Portfolio

www.hornfrp.com.co

HORN®

About us

We are CAVAR S.A., an industrial company with 40 years of expertise. Our dedication to the job, commitment to innovation, and the drive to generate systemic value for both the industry and society define who we are.

We are in search of

We are proactively harnessing the skills and capabilities of our employees to cultivate a customer service culture. This commitment allows us to deliver a broad range of offerings to various industrial sectors, including telecommunications.

Future direction

At HORN, our vision is to revolutionize the construction industry by applying innovative solutions through the use of composite materials. Our goal is to strengthen our organization globally, emphasizing the promotion of both aesthetic and functional value through design.

Content

Fiber Reinforced Polyester
FRP

What is FRP?

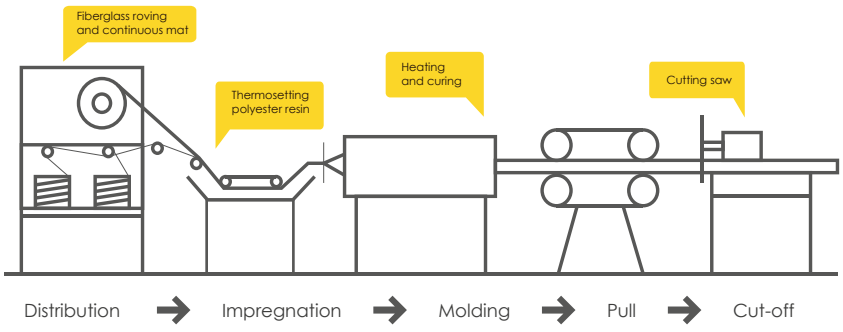
> Fiber Reinforced Polyester (FRP) is a composite material formed by combining thermosetting polyester resin with glass fibers, yielding a product with enhanced mechanical properties.

Features of Fiberglass Composites

	FRP	STEEL	ALUMINUM	WOOD
Corrosion resistance	**Highest**	Low	Medium	High
Mechanical strength	**High**	High	Medium	Low
Weight	**Low**	High	Low	Medium
Electrical conductivity	**Lowest**	High	High	Low
Thermal conductivity	**Lowest**	High	Highest	Low
Electromagnetic Transparency	**Highest**	Low	Medium	High
Maintenance Costs	**Low**	High	Medium	High

Manufacturing Process

Pultrusion
Process



Chemical Resistance

The following table shows the maximum operating temperatures that chemically resistant FRP elements can withstand, manufactured with Polyester and Vinylester resin. Some chemical agents are listed with their respective concentrations.

Chemical Resistance Table			
Chemical Agent	**Concentration %**	**Polyester resin**	**Vinyl ester resin**
		Max Temperature °C	**Max Temperature °C**
Hydrochloric Acid	20	35	70
Chromic Acid	10	45	45
Hydrofluoric Acid	20	25	35
Nitric Acid	10	25	60
Sulfuric Acid	65	30	70
Ammonia	5	25	60
Mercury	100	60	100
Sodium hydroxide	<1	NR	75
Calcium oxide	***	35	60
Hydrochloric Acid	GAS 100	65	100
Sodium Bicarbonate	SAT	50	95
Aluminum Nitrate	10	40	70
Potassium Permanganate	SAT	NR	60
Copper Sulfate	SAT	50	95
Sea Water	***	50	95
Chlorine	Gas	65	100
Carbon Monoxide	Gas	70	110
Hydrogen Sulfide (Gas)	100	60	65
Citric Acid	SAT	50	95
Stearic Acid	***	45	90
Ethyl Alcohol	95	25	30
Brake Fluid	***	30	35
Glycerin	100	60	90
Diesel Oil	100	35	50
Lubricating Oil	100	50	70
Mineral Oil	100	50	100
Transformer Oil	100	50	100
Naphtha	100	25	40
Paraffin	100	30	60
Tallow	100	70	110
Urea	2	40	90

Physical and Mechanical Properties

The profiles are manufactured using the pultrusion process (hot polymerization of a continuously pulled profile through a heated die), and contain up to 70% fiberglass, ensuring high mechanical strength. Their structure, composed of continuous directional fiberglass strands, provides excellent impact resistance and strength (no permanent deformation occurs under overload conditions).

Our FRP (Fiberglass Reinforced Plastic) profiles offer multiple advantages, such as exceptional stiffness, corrosion resistance, electrical insulation, and lightweight properties. HORN® profiles are engineered for use as structural support elements, offering full safety and reliability in demanding industrial applications.

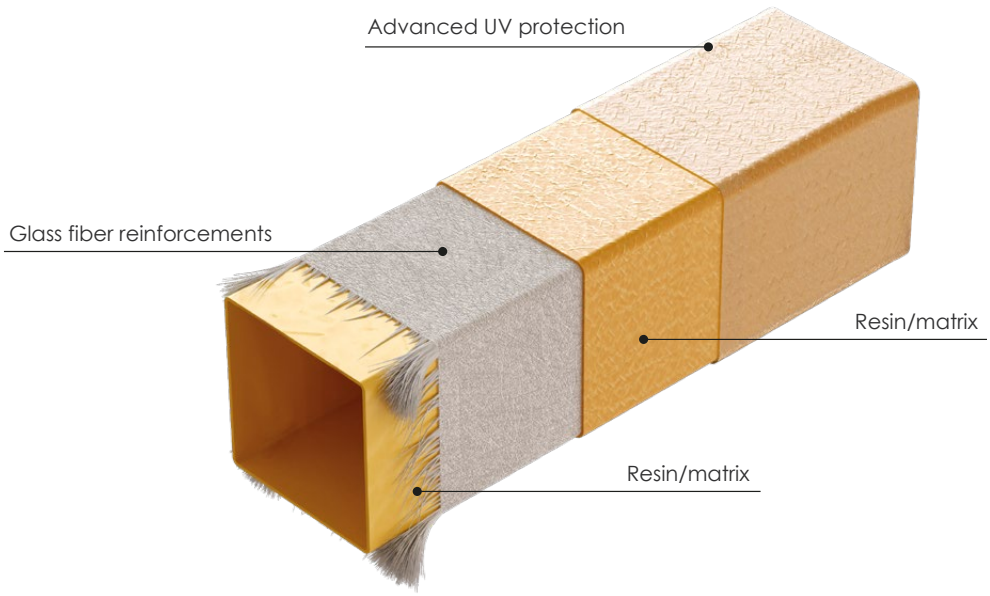
FRP Material Properties			
Mechanical Properties	**Test Standard**	**Units**	**Value**
Longitudinal Tensile Strength	ASTM D638	MPa	600
Longitudinal Tensile Modulus	ASTM D638	GPa	30
Longitudinal Flexural Strength	ASTM D790	MPa	700
Longitudinal Flexural Modulus	ASTM D790	GPa	20
Transverse Flexural Strength	ASTM D790	MPa	150
Transverse Flexural Modulus	ASTM D790	GPa	7
Longitudinal Compressive Strength	ASTM D695	MPa	500
Longitudinal Compressive Modulus	ASTM D695	GPa	20
Transverse Compressive Strength	ASTM D695	MPa	100
Transverse Compressive Modulus	ASTM D695	GPa	4
Interlaminar Shear Strength	ASTM D 5379	MPa	60
Longitudinal Poisson's Ratio	ASTM 3039	mm/mm	0,25
IZOD Impact Strength	ASTM D256	J/m	2960
Physical Properties	**Test Standard**	**Units**	**Value**
Barcol Hardness	ASTM D2583		45
Water Absorption	ASTM D570	% Max	0,6
Density	ASTM D792	kg/cm3	2,0 -2,2
Specific Weight	ASTM D792	N/cm3	20 - 22
Dielectric Strength (AC)	ASTM D149	KV/mm	13
Leakage Current	ASTM D149	uA	88
Flammability Classification	UL-94		V0
Flame Spread Index	ASTM E-84		25 Max

Information about the components of FRP profiles

Material	% by weight
Polymerized polyester resin	*30% al 40%*
Glass fibers	*70% al 60%*
Calcium carbonate and other components	*10 al 20%*

Technical Characteristics of the Materials

Fixed Vertical Ladder



Advanced UV Protection

Our fiberglass profiles incorporate three layers of UV protection. First, the fiberglass reinforcements—which form the structural core of the ladders—are encapsulated with a polyester surface veil. This veil creates a resin-rich outer layer that protects the fibers from blooming. Additionally, UV absorbers are formulated into the resin to prevent ultraviolet light from degrading the polymer matrix.
Finally, the profiles are coated with a high-performance aliphatic polyurethane topcoat, which provides long-lasting protection against harmful sun exposure.
UV testing, which involved alternating cycles of light and humidity every four hours for 2,500 hours, showed no reduction in flexural strength.

Resin/Matrix

FRP profiles are manufactured using a thermoset resin system that offers superior hardness and mechanical strength. Once cured, thermoset resins are highly durable and resistant to moisture and harsh environments.

Glass Fiber Reinforcements

All profiles are manufactured using electrical-grade E-glass reinforcements in the form of rovings, continuous filament mat (CFM), or engineered E-glass fabrics. All E-glass reinforcements meet a minimum tensile strength of 290 ksi (2000 MPa) in accordance with ASTM D2343.

Key Advantages of FRP

Corrosion Resistance and Mechanical Strength

FRP profiles contain a high percentage of fiber-glass in their structural components, which provi-des outstanding strength-to-weight ratio and excellent longitudinal stiffness.

Lightweight

hanks to their weight—approximately half that of steel trays—transport and handling are simple and do not require heavy equipment, which results in significant energy savings.

Fixed Vertical Ladder

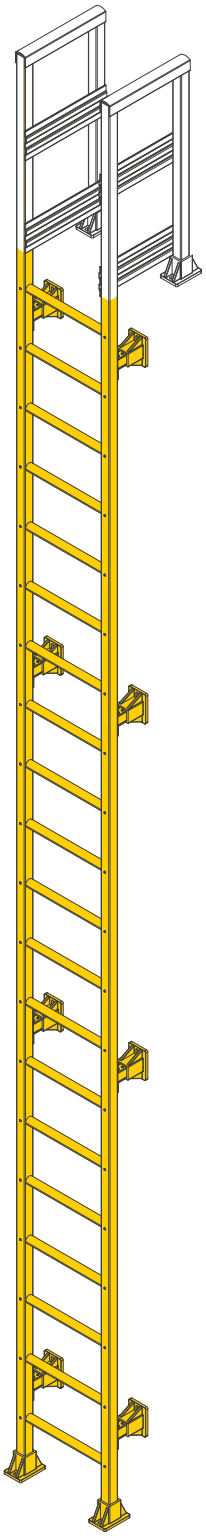
HORN® fixed vertical ladders are ideal access systems for great heights or areas requiring permanent installation with limited maneuvering space and high safety standards. They can be configured with safety cages and/or walk-through handrails as required.

HORN® ladders are manufactured using FRP (Fiberglass Reinforced Plastic) structural profiles, offering significant advantages over traditional materials ladders in terms of service life, reduced maintenance, electrical insulation, and design flexibility.

All HORN® ladders are engineered to meet the ANSI-ASC A14.3-2008 standard, ensuring a high-quality product that provides maximum safety for users.

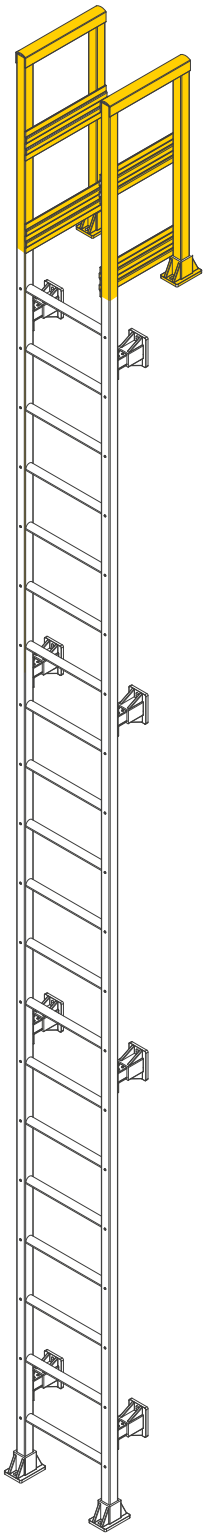
Product configuration

Fixed Vertical Ladder



Fixed vertical ladder

Section lengths may vary depending on customer requirements and installation conditions.

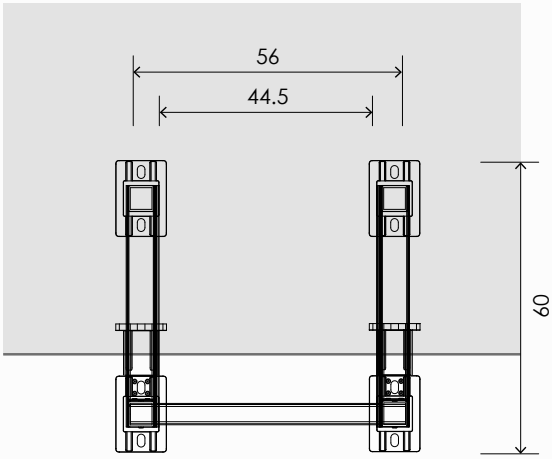


Walk-Through Handrail

Facilitates safe entry and exit from the ladder, enhancing user safety during use.

Dimensions

Fixed Vertical Ladder



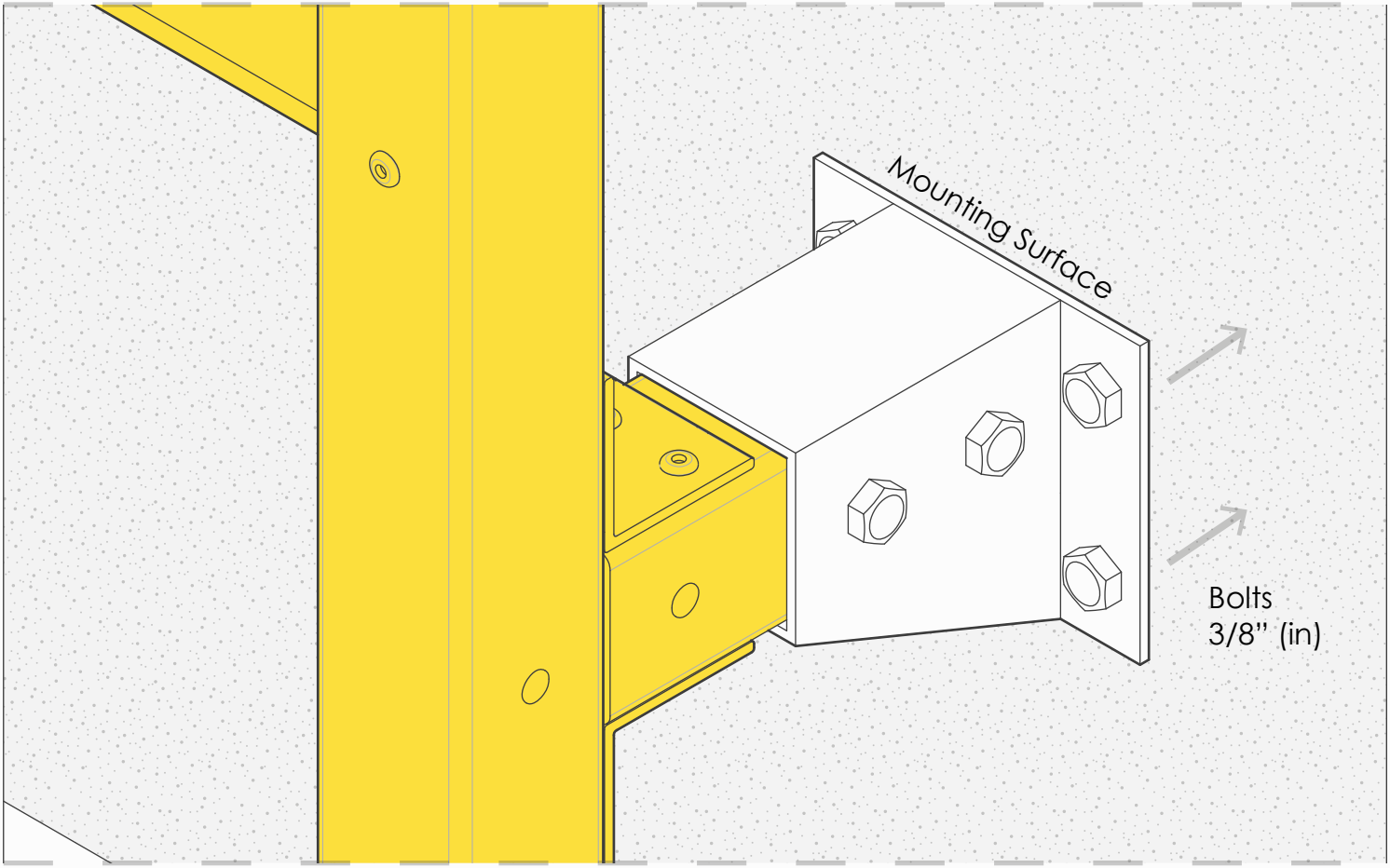
Top View

Front View

Side View

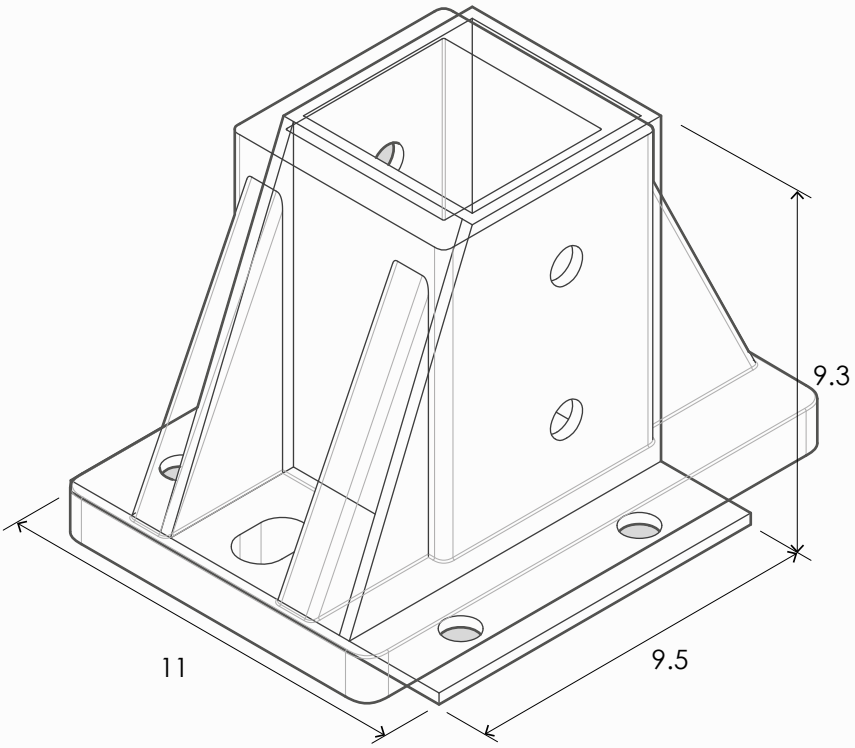
Wall mounting system

Fixed Vertical Ladder



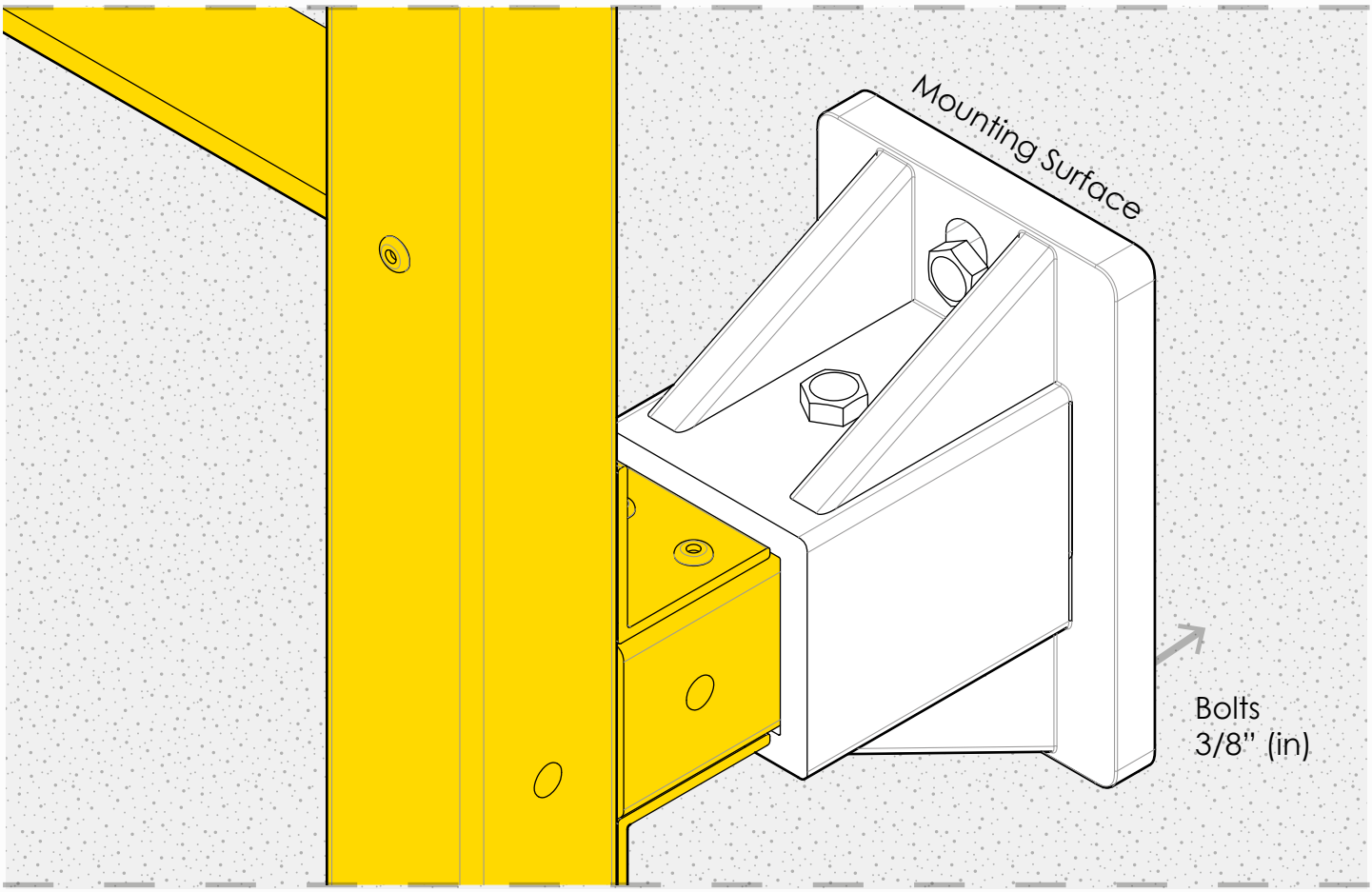
Metal Base Plate
2”x2” (in)

Material:
- Stainless Steel
- Galvanized Steel



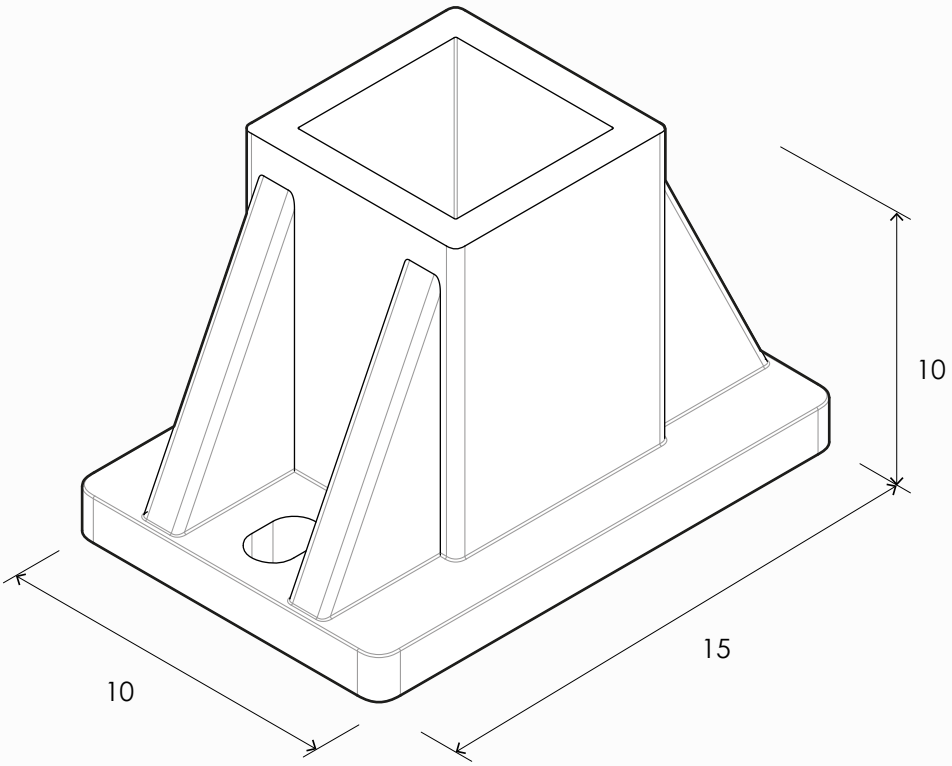
Wall mounting system

Fixed Vertical Ladder



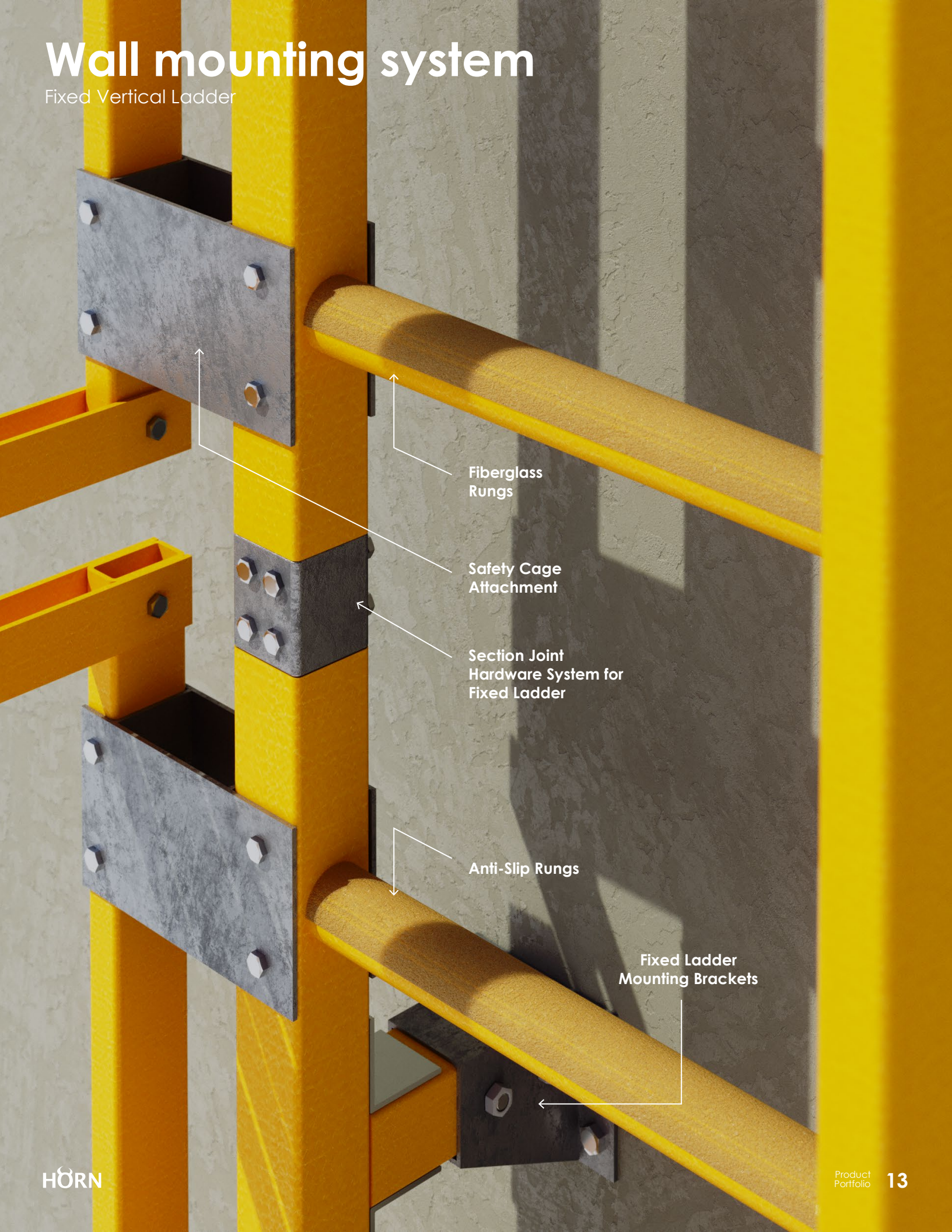
Plastic Base Plate
2"x2" (in)

Material:
- Polyester reinforced with fiberglass



Wall mounting system

Fixed Vertical Ladder

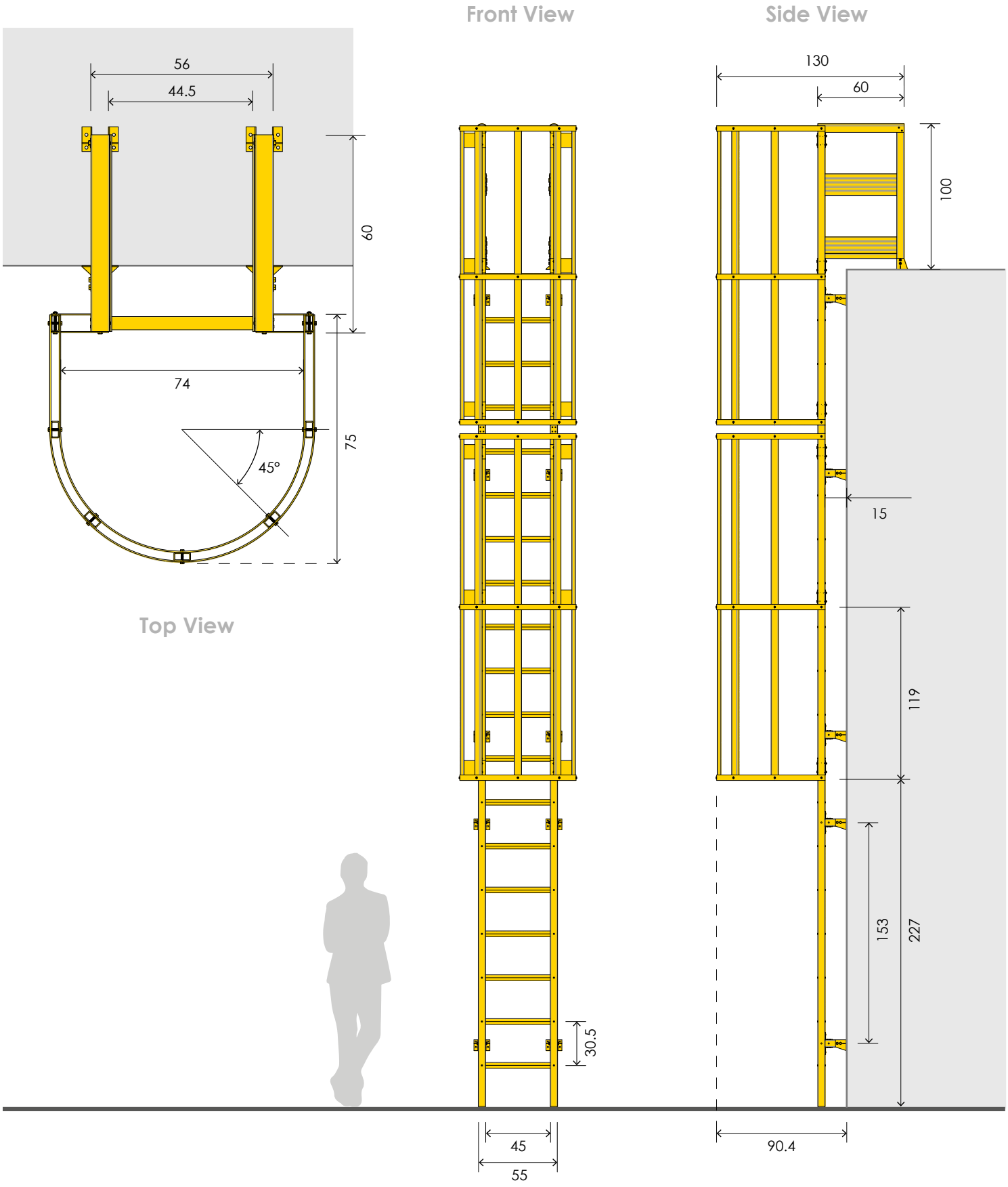


Safety cage *(optional)*

Fixed Vertical Ladder

Safety cage *(Dimensions)*

Fixed Vertical Ladder



Applications

Fixed Vertical Ladder

HÖRN®

Fixed Vertical Ladder
Product Portfolio

Ver. 1.0.05092023