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TRENCH AND TRENCH COVERS • DESIGN BASICS

Fibrelite's line of composite trench covers can be custom built in a wide range of dimensional sizes, shapes, load ratings and colors and can also include custom markings and other cover features. All Fibrelite trench covers can be designed with bolt-down or roto-locking features for security, increased water or vapor tightness or as a theft deterrent. We have included some basic design guidelines in this design guide to assist with the design of your trench and trench cover project.

Types of Concrete Utility/Cable Trench Systems

Trench designers should first determine if the trench system will be a cast in place concrete trench (concrete trench poured on the site to form the trench) or a precast concrete trench. For precast concrete trench systems, Fibrelite has a complete line of composite trench covers designed for use with the Trenwa line of precast concrete trench – these trench covers are available only from Trenwa. For more details, see the full range of Fibrelite trench covers for H20, Tier 15 and Pedestrian load rated applications at www.trenwa.com/fibrelite-lids/.

This design guide will focus primarily on trench covers for use in cast in place concrete trench or vaults.



Precast trench example



Cast in place trench example

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CAST IN PLACE TRENCH • STANDARD TRENCH COVER SIZES

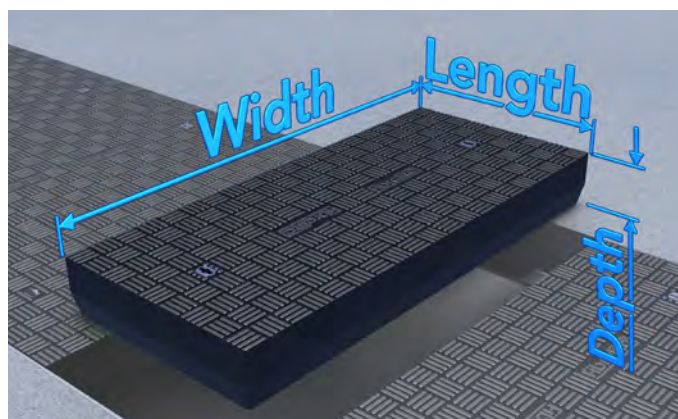
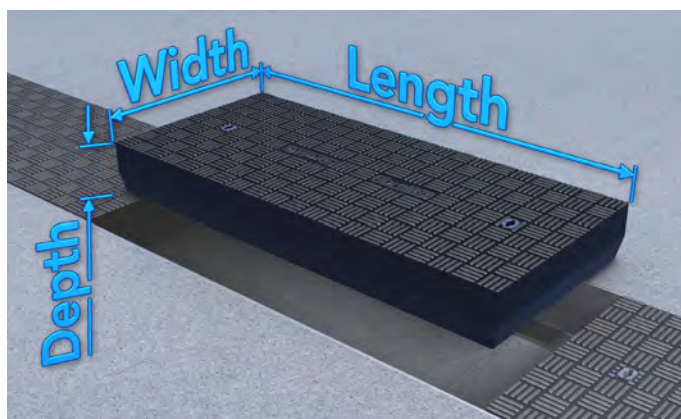
Design Guidelines

Trench systems or vaults must be primarily designed to accommodate the utilities, cable, wiring, piping and other devices that will be installed in the trench or vault.

The following design guidelines are to assist architects and engineers in incorporating Fibrelite trench covers into the cast in place trench or vault design.

Standard Fibrelite Trench Cover Sizes

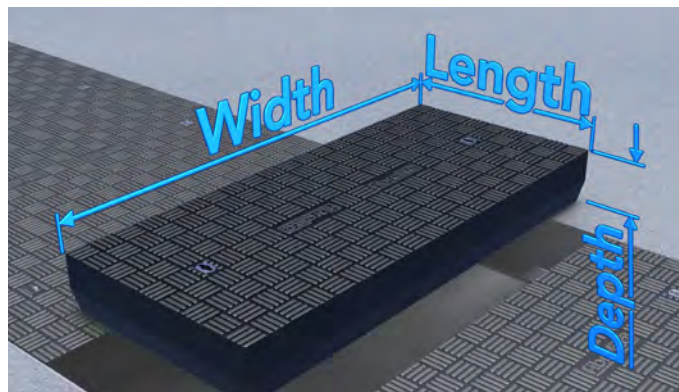
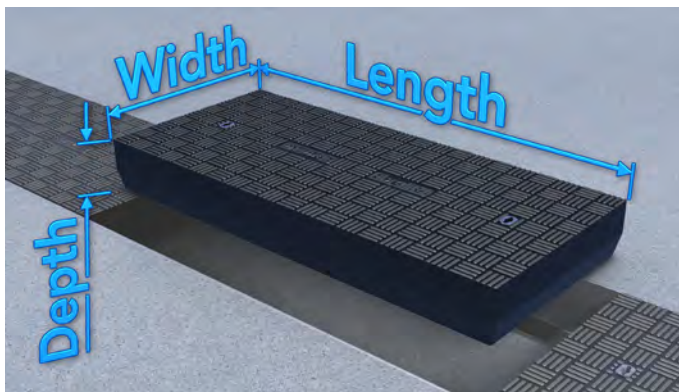
Fibrelite has a wide range of standard trench covers that are available in a variety of load ratings and sizes (see the tables below with sizes and part #s for all of the standard covers). Fibrelite's standard trench covers will not require any custom tooling to be made – custom tooling will increase the unit cost of the trench covers and will add up to 4-6 weeks to the overall lead time depending on the complexity of the tooling.



Standard Cover Sizes (Load Ratings – Vehicles, Heavy Trucks, Large Forklifts)

Width	Length	Trench Span	Depth	H20 Part #	H25 Part #	Tier 22 Part #
16"	60"	10"	4"	FM16-60-4-H20	FM16-60-4-H25	FM26-60-4-TIER22
26"	60"	20"	4"	FM26-60-4-H20	FM26-60-4-H25	FM30-36-4-TIER22
30"	24"	24"	4"	FM30-24-4-H20	FM30-24-4-H25	FM30-24-4-TIER22
30"	36"	24"	4"	FM30-36-4-H20	FM30-36-4-H25	FM36-30-4-TIER22
36"	30"	30"	4"	FM36-30-4-H20	FM36-30-4-H25	FM36-48-4-TIER22
36"	48"	30"	4"	FM36-48-4-H20	FM36-48-4-H25	FM36-60-4-TIER22
36"	60"	30"	4"	FM36-60-4-H20	FM36-60-4-H25	FM46-20-4-TIER22
38"	30"	32"	4"	FM38-30-4-H20	FM38-30-4-H25	FM38-30-4-TIER22
42"	24"	36"	4"	FM42-24-4-H20	FM42-24-4-H25	FM42-24-4-TIER22
44"	30"	38"	4"	FM44-30-4-H20	FM44-30-4-H25	FM44-30-4-TIER22
46"	20"	40"	4"	FM46-20-4-H20	FM46-20-4-H25	FM46-30-4-TIER22
46"	30"	40"	4"	FM46-30-4-H20	FM46-30-4-H25	FM54-20-4-TIER22
54"	20"	48"	4"	FM54-20-4-H20	FM54-20-4-H25	FM54-30-4-TIER22
54"	30"	48"	4"	FM54-30-4-H20	FM54-30-4-H25	FM54-30-4-TIER22
60"	30"	54"	4"	FM60-30-4-H20	FM60-30-4-H25	FM60-30-4-TIER22

CAST IN PLACE TRENCH • STANDARD TRENCH COVER SIZES



Standard Cover Sizes (Load Ratings – Utility Vehicles, Standard Forklifts)

Width	Length	Trench Span	Depth	Tier 15 Part #	Tier 8 Part #
16"	60"	10"	3"	FM16-60-3-TIER15	FM16-60-3-TIER8
26"	60"	20"	3"	FM26-60-3-TIER15	FM26-60-3-TIER8
30"	36"	24"	3"	FM30-36-3-TIER15	FM30-36-3-TIER8
36"	30"	30"	3"	FM36-30-3-TIER15	FM36-30-3-TIER8
36"	38"	30"	3"	FM36-38-3-TIER15	FM36-28-3-TIER8
36"	60"	30"	3"	FM36-60-3-TIER15	FM36-60-3-TIER8
46"	20"	40"	3"	FM46-20-3-TIER15	FM46-20-3-TIER8
46"	30"	40"	3"	FM46-30-3-TIER15	FM46-30-3-TIER8
54"	20"	48"	3"	FM54-20-3-TIER15	FM54-20-3-TIER8
54"	30"	48"	3"	FM54-30-3-TIER15	FM54-30-3-TIER8
60"	30"	54"	3"	FM60-30-3-TIER15	FM60-30-3-TIER8

Standard Cover Sizes (Load Ratings – Pedestrian, Light Utility Vehicles Or Mowers)

Width	Length	Trench Span	Depth	Pedestrian Part #	Tier 5 Part #
16"	60"	12"	2"	FM16-60-2-PED	FM16-60-2-TIER5
26"	60"	20"	2"	FM26-60-2-PED	FM26-60-2-TIER5
30"	36"	24"	2"	FM30-36-2-PED	FM30-36-2-TIER5
36"	30"	30"	2"	FM36-30-2-PED	FM36-30-2-TIER5
36"	28"	30"	2"	FM36-28-2-PED	FM36-28-2-TIER5
36"	60"	30"	2"	FM36-60-2-PED	FM36-60-2-TIER5
46"	20"	40"	2"	FM46-20-2-PED	FM46-20-2-TIER5
46"	30"	40"	2"	FM46-30-2-PED	FM46-30-2-TIER5
54"	20"	48"	2"	FM54-20-2-PED	FM54-20-2-TIER5
54"	30"	48"	2"	FM54-30-2-PED	FM54-30-2-TIER5

CAST IN PLACE TRENCH • CUSTOM TRENCH COVERS

Design Guidelines

We recommend the following design guidelines when designing cast in place trench systems that will require custom size trench covers.

Trench Cover Load Ratings

Fibrelite's line of composite trench covers can be specified and designed to meet any of the load ratings shown on the chart below. We strongly recommend that trench covers be designed with a safety factor allowance for the highest possible load that will be expected to be in contact with the covers. For example, if the trench covers are installed in a pedestrian walkway area where light utility vehicles or lawn mowers occasionally operate, then the load rating should be specified for the light utility vehicle or lawn mower loading. Please contact the Fibrelite technical sales team with any inquiries or questions related to trench cover load ratings.

Note: All of the load ratings used by Fibrelite typically have a built-in safety factor of 2.5 times the expected wheel load.



Fibrelite trench covers installed in Trenwa precast trench at a mission-critical satellite facility

Load Rating	Description Of Load Rating
Pedestrian	Pedestrian loading is generally specified for sidewalks, plazas and other pedestrian only areas where no vehicular traffic of any kind is anticipated under any condition. The Pedestrian load rating is typically between 250 to 350 lbs. per sq./ft. applied over the entire area of the cover.
ANSI Tier 5	Tier 5 Loading is specified for sidewalk or pedestrian only areas that may experience non-deliberate light vehicular traffic. The Tier 5 design load is 5,000 lbs. with a minimum failure load of 7,500 lbs.
ANSI Tier 8	Tier 8 Loading is specified for sidewalk or pedestrian only areas that may experience non-deliberate light vehicular traffic. The Tier 8 design load is 8,000 lbs. with a minimum failure load of 12,000 lbs.
ANSI Tier 15	Tier 15 Loading is specified for areas such as driveways, factory floors, parking lots and off roadway applications subject to occasional light vehicle traffic (such as forklifts or light vehicles). The Tier 15 design load is 15,000 lbs. with a minimum failure load of 22,500 lbs.
ANSI Tier 22	Tier 22 Loading is specified for areas such as driveways, factory floors, parking lots and off roadway applications subject to occasional vehicular traffic. The Tier 22 design load is 22,500 lbs. with a minimum failure load of 33,750 lbs.
H20/HS-20	H20 or HS-20 Loading is specified for areas that will be subjected to frequent vehicle traffic. The H20 design load is per AASHTO's M-306-10 load test requirements – proof load testing to 40,000 lbs. without any permanent deformation exceeding 1/8".
H25/HS-25	H25 or HS-25 Loading is specified for areas that will be subjected to frequent heavy vehicle traffic (such as trucks or buses). The H25 design load is per AASHTO's M-306-10 load test requirements – proof load testing to 50,000 lbs. without any permanent deformation exceeding 1/8".
H40/HS-40	H40 or HS-40 Loading is specified for areas that will be subjected to extremely heavy truck traffic (such as truck stops, fire stations and mining facilities). The H40 design load is per AASHTO's M-306-10 load test requirements – proof load testing to 64,000 lbs. without any permanent deformation exceeding 1/8".
Extreme Loading Requirements	For applications such as airport runways, piers and other areas where wheel load ratings exceed H40, please contact Fibrelite directly for design assistance.

CAST IN PLACE TRENCH • CUSTOM TRENCH COVERS

Custom Trench Cover Dimensions

Fibrelite can design custom size trench covers to meet nearly any dimensional requirements, with the following dimensional limitations.

Cover Load Rating	Design/Test Load	Maximum Cover Width	Maximum Trench Span	Maximum Cover Length*	Recommended Cover Depth(s)
Pedestrian	1500 lbs.	54"	50"	60"	2"
Tier 5	5000 lbs.	54"	50"	60"	2"
Tier 8	8000 lbs.	54"	48"	60"	3"
Tier 15	15,000 lbs.	54"	48"	60"	3"
Tier 22	22,000 lbs.	54"	48"	60"	4"
H20/HS20	40,000 lbs.	54"	48"	60"	4"
H25/HS25	50,000 lbs.	54"	48"	60"	4"
H40	64,000 lbs.	54"	48"	60"	4"
D400	89,000 lbs.	40"	34"	60"	4"
FAA/100K	100,000 lbs.	36"	30"	60"	4" with step
E600	135,000 lbs.	30"	24"	30"	4" with step
F900	202,000 lbs.	30"	24"	30"	6"

* The dimensions shown in the dimensional chart are guidelines only – for example, while Fibrelite can manufacture covers up to 72" in length, a 60" cover length is typically easier to handle when removing or replacing the cover. In addition, the weight of the cover will be affected by the overall volume of the cover. When designing covers to be below a specific weight or for a specific load rating, please contact the Fibrelite technical sales team with the trench layout and any other design requirements.

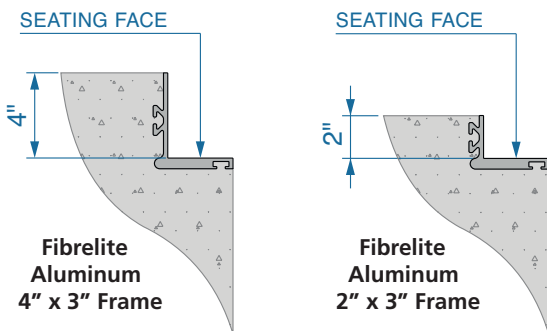
TRENCH COVER SEATING FACE DESIGN

Trench Cover Seating Face

Whether using the Fibrelite aluminum framing system, steel or galvanized angle to create the seating face for the trench cover, the dimensions and design of the seating face is critical. Installing a trench with an improperly designed seating face can lead to trench cover seating issues and/or rocking problems and may require a number of custom sized covers to be built to fit the trench properly.

Fibrelite Aluminum Framing System

We recommend specifying the Fibrelite aluminum framing system as it provides the correct seating face and is also designed to match the depth, width and profile of all of Fibrelite's standard trench cover sizes. It is also designed to better ensure the dimensional integrity of the frame after installation. All of the Fibrelite framing systems use 10 ft. long extruded aluminum frame sections which are designed with connector kits to bolt the frame lengths together at the ends. The framing systems can also be boxed out at the end of a trench run which will help the framing system maintain its width and shape. When trench covers require bolt-down features, the Fibrelite framing with threaded receivers must be used.



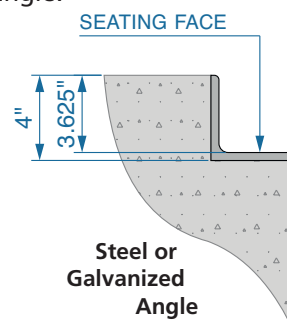
Cast in place trench using Fibrelite 4" x 3" aluminum framing

Steel or Galvanized Angle

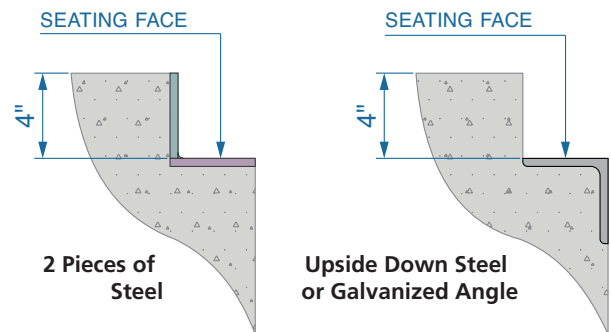
Steel or galvanized angle is often specified or used by contractors to create the trench cover seating face. There are number of issues that can be created by using steel or galvanized angle for the seating face.

- Steel Angle Dimensions

Standard hot or cold rolled steel angle typically does not fit the depth of Fibrelite's standard trench covers. For example, 4" x 4" x 3/8" steel angle will have a depth of 3.625" as the width of the steel on the base is included in the 4" overall height of the angle. If this angle is used to form the seating face, the trench will require custom sized trench covers to fit properly in the angle.

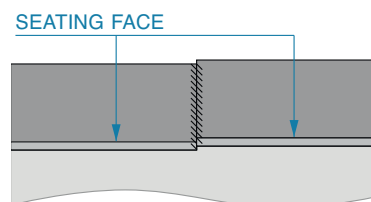


If using steel angle, this issue can be prevented by either fabricating the steel angle out of 2 pieces of steel or by installing the angle upside down and forming the vertical wall.



- Welded Butt Joints

When steel angle is used for the trench cover seating face, the ends of the 10 ft. lengths are often welded together. This can result in slight differences in the depth of each length of steel angle and/or high and low points. This will cause seating issues and possible cover rocking.



BEAM SUPPORT OPTIONS

Using Steel I-Beam Supports at Trench Crossings

Trench runs may require 90° turns or T or Cross junctions. These areas of the trench may require additional support to be installed as the trench covers that cross the junction will have unsupported edges. Fibrelite can assist with the design of the I-beam or other support that will need to be designed to meet the same load rating as the trench cover.



I-Beams allow for coverage where no seating faces are available



Example of i-beam support at a junction



Securely fixed to trench side wall

Central or Removable Support Beams

For trench spans that are longer than 66", it may be necessary to install a central support beam that can act as the seating face for two covers. For vault spans that are longer than 66", a removable support beam can be used. Contact the Fibrelite technical sales team for design assistance.



Support beams allow coverage in even the largest of openings



Center support providing the seating face for covers

TRENCH COVER MODIFICATIONS

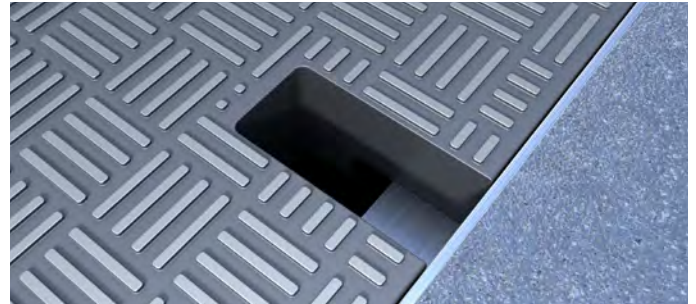
Trench Cover Penetrations, Custom Shapes or Custom Lengths

Nearly every trench will require some of the trench covers to be custom lengths or, some covers will need to have cutouts for piping or cable penetrations. Some trenches will require large cutouts for machinery or other equipment that is installed in the trench.

There are three ways to customize Fibrelite trench covers: (1) factory molded penetrations or openings, (2) factory cut and sealed custom lengths, shapes or penetrations or (3) field cut and sealed custom lengths, shapes or penetrations.

Factory Molded Slots, Penetrations or Openings

Fibrelite can create molded slots, openings or penetrations for piping or cable access. This type of molded opening can be done on the side or in the middle of the covers. While typically more expensive than factory cut and sealed penetrations, it makes sense if many of the covers will require some type of standard size opening.



Factory molded cable slot

Factory Cuts and Customization

If possible, all trench cover cuts and customization should be done in the factory per customer supplied drawings. Most trench covers that are factory cut or customized can be done using a method that maintains the trench cover's load rating and warranty. This is done by inserting steel supports into the cut face of the trench cover before bonding on a fiberglass end cap to seal the cut wall.



Factory cut cover openings

Field Cuts and Customization

It is often not practical to do all of the trench cover customization in the factory. Piping, conduits and cable are often not installed in the trench until after the covers arrive or can be re-routed in the trench after installation. Fibrelite has detailed instructions on how to cut or make penetrations of Fibrelite trench covers in the field and seal them to prevent exposure – see “FM-FS-APERTURE-FLEX-SEAL-APP” instructions for further details. No matter what type of saw is being used to make a cut or penetration in the field, it is essential to use a “composites compatible” blade.

Note: Field cuts or customization of Fibrelite trench covers will compromise the trench cover's load rating and will void the warranty. For this reason, field cut or customized covers should not be trafficked by loads heavier than pedestrian loading. If there are any concerns about the location of the cut or customized cover, we recommend contacting the Fibrelite technical sales team and/or having the trench cover factory cut or customized.



Field cut slots for pipe and cable penetrations

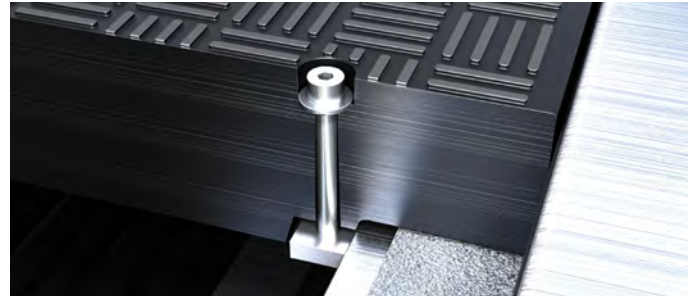


Field cut slots created on-site

TRENCH COVER OPTIONS

Bolt-Down or Roto-Locking Features

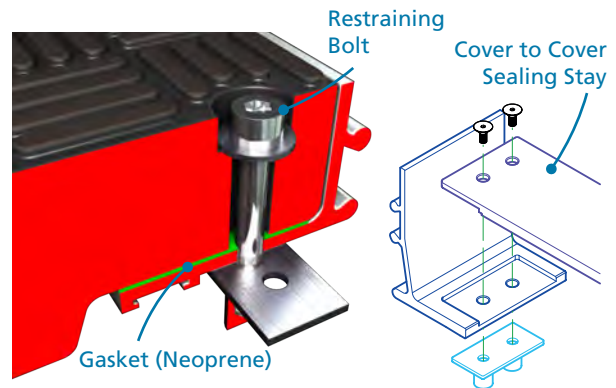
Most of Fibrelite's trench covers can be fabricated with bolt-down or roto-locking features. Bolt-down covers will require the use of Fibrelite's aluminum framing system with threaded receivers installed where the bolts will be located. Roto-locking covers will need to be stepped and will require steel angle to be installed on the trench wall.



Roto-locking system engaged

Watertight or Vaportight Covers

Fibrelite's composite trench covers can be designed with a special framing system to allow for increased water tightness or vapor tightness. Contact the Fibrelite technical sales team to discuss these options.



Markings

Fibrelite's composite trench covers typically include the load rating molded on the top surface of the cover. They can also be designed with company logos, ID plates, warnings or other molded lettering. The standard trench covers include 6" square molded recesses for markings. Contact the Fibrelite technical sales team to discuss these options.



Standard and Custom Color Options

Fibrelite's composite trench covers are typically black but can be molded in other colors such as gray, orange, yellow etc. Contact the Fibrelite technical sales team to discuss these options.



Green colored access covers

Skid Resistant Cover Top Surface and Other Options

Fibrelite's composite trench covers are typically molded with a bauxite filled, skid-resistant top surface. Other top surface options include a lower profile diamond plate surface and a flat surface for the installation of carpet tiling or any other applied flooring. Contact the Fibrelite technical sales team to discuss these options.



Bauxite skid resistant tread

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