

**Note: Floor and Wall mounting hardware is shown only for reference purposes and is not included**

## How Concrete Anchors Work

Concrete is a special material that is more difficult to work with than other materials.

As opposed to drilling a screw into wood or bolting two pieces of metal together, fastening to concrete requires a certain finesse and specialized anchors.

This process involves three steps:

1. Drill a hole into your concrete surface.
2. Fill that hole with an anchor.
3. Insert a fastener into the anchor.

The last step is where the magic happens. When you insert the fastener into the anchor, it causes the anchor to expand and grip the sides of the hole.

### Pre-expanded Anchors vs. Unexpanded Anchors

While all anchors must expand to work, there are two different types of expansion anchors.

The first is a *pre*-expanded anchor, like the split drive anchor, which expands as you install it.

Unexpanded anchors, such as the machine screw anchor, do not expand on their own. They need to be set after installation.

Of course, this process requires precision to work. You need the perfect hole size and embedment depth for the masonry anchor to hold.

## How Strong Are Concrete Anchors?

When concrete anchors are installed correctly, they can support a lot of weight. Heavy-duty anchors (the type used in commercial construction) can support wall-hung objects weighing over 200 pounds.

However, several factors can impact a fastener's strength:

- Concrete's age, thickness, and compression strength
- Load weight
- Hole size

- Fastener length

A fastener's strength also varies if you're mounting to a ceiling, wall, or floor. Suspended objects require stronger anchors, as they have nothing supporting them from underneath.

Luckily, there is also a wide selection of anchors to choose from, each with its own unique features that work for specific concrete construction projects.

Let's look at each of these more closely.

# Machine Screw Anchor



## *Photo: Confast*

Machine screw anchors are a type of unexpanded anchor. There are eight different diameters of machine screw anchors to choose from.

To use these anchors, you will need the following equipment:

- Hammer drill
- Drill bit
- Vacuum cleaner or compressed air
- Machine screw anchor
- Setting tool
- Machine screw or bolt

The installation process has five steps:

1. Drill a hole in the concrete with a carbide drill bit. The drill bit size should be larger than the anchor diameter. Follow these easy-to-read specifications [here](#).
2. Clean all debris and dirt out of the hole by vacuuming it or blowing compressed air into it.
3. With the threaded cone face down, insert the wall anchor into the hole at the correct embedment.
4. Place the setting tool over the anchor. Hit it with a hammer until the edge of the tool meets the head of the anchor.
5. Place the fixture over the anchor. Connect it with a machine screw through the fixture and into the anchor on the other side.

One of the best reasons to use this type of anchor is that you can remove the fixture later if necessary. Simply unscrew the bolt or screw to detach the fixture.

One downfall of this type of anchor is that it is made from Zamac, a highly corrosive zinc alloy.

This type of anchor works with just about any base material, including mortar and stone, but it cannot bear heavy loads.

# Lag Shield



**Photo:** Grainger

This anchor is like the machine screw anchor but requires a lag screw instead of a machine screw. It also requires no setting tool.

These anchors are cylindrical sleeves with a rib on the exterior that cuts into the base material when expanded.

Lag shields are one of the best anchors you can use in a situation where they may be subjected to vibration.

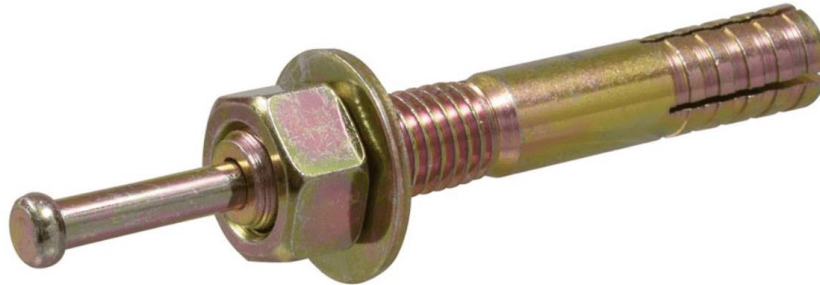
Lag shields come in six different diameters, both long and short.

Here is the four-step process of installing a lag shield:

1. Drill a hole in the concrete with a carbide drill bit. The drill bit size should correspond to the anchor diameter. Follow these easy-to-read specifications [here](#).
2. Vacuum out the hole to ensure it is free from debris and dirt.
3. Insert the shield into the hole, then tap it with a hammer until it is flush with the base material.
4. Place the fixture over the shield and line up the holes. Connect it with a lag screw through the fixture and into the screw on the other side.

Again, like machine screw anchors, this type of anchor keeps the fixture removable. All you need to do to remove the fixture is remove the lag screw.

# Strike Anchor



**Photo:** City Mill

Strike anchors are male anchors used to attach lightweight fixtures. They are made from steel coated in yellow zinc.

These anchors require no tools for installation and come packaged with a heavy-duty fastener, nut, and washer.

They are also known as *hammer drive pin* anchors or *hammer set* anchors. They come in many different sizes and lengths.

The installation of these anchors requires six steps:

1. Drill a hole into the concrete at the correct depth using a hammer drill. Your drill bit's diameter should be the same as the anchor size.
2. Use a vacuum cleaner to remove all dust and debris from the hole.
3. Attach the nut and washer to the end of the anchor.
4. Insert the anchor through both the fixture and the predrilled hole in the concrete.
5. Using the set pin as a fastener, hit it with a hammer until it is flush with the end of the anchor.

# Wedge Anchor



*Photo: Confast*

Wedge anchors are one of the strongest anchors available. They come in nine different diameters and several different lengths.

The larger the anchor, the more holding power it has.

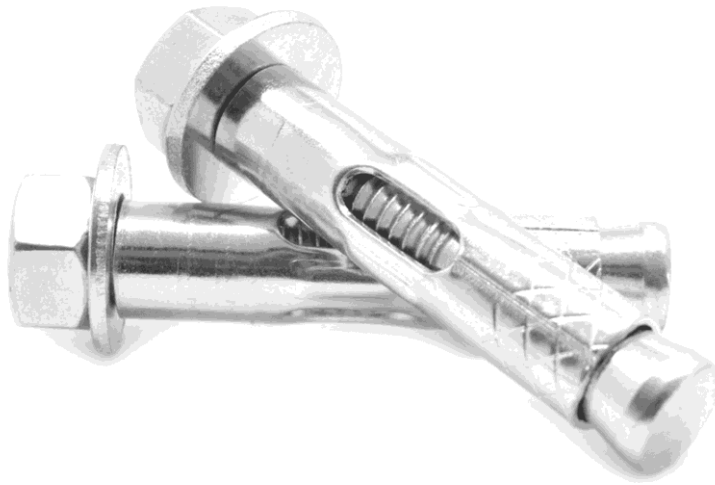
They also come in several different materials, so you can use them in areas with or without the possibility of corrosion. These include carbon steel, 304 stainless steel, and 316 stainless steel.

304 stainless steel is suitable for areas with moisture and water present, but 316 stainless steel can withstand chemicals and water submersion.

If your concrete is damaged or at high risk of cracking, look into ITW Red Head Trubolt concrete wedges. This specialized product is approved for use in cracked concrete and seismic areas. It comes zinc-plated for indoor use.

Follow the manufacturer's installation instructions [here](#).

# Sleeve Anchor



*Photo: ASMC*

This anchor is a threaded bolt covered by a metal sleeve with a nut and washer connected to one end.

You can find them with a few different types of bolt heads:

- Hex head
- Flathead
- Roundhead
- Acorn head

Sleeve anchors come either zinc-plated or in 304 stainless steel.

There are six steps to installing a sleeve anchor:

1. Using a hammer drill with a carbide-tipped drill bit, make a hole the same diameter as the sleeve and a little longer than the length of your anchor.
2. Clean the hole of any debris.
3. Tighten the nut to the anchor until it is flush with the top of the anchor.
4. Insert the anchor through both the fixture and the predrilled hole in the concrete.
5. Tighten the nut with your fingers.
6. Use a wrench to tighten the nut further, about four full turns.

# Drop-In Anchor



*Photo: Grainger*

These anchors are only to be used in solid concrete and require a setting tool for installation.

As the name implies, this anchor is dropped into a predrilled hole and set to expand.

It is a “female” anchor often used to hang threaded rods from ceilings to hold electrical cables, HVAC ductwork, or fire sprinklers.

Drop-in anchors come in five different diameters in zinc-plated steel, 304 stainless steel, or 316 stainless steel.

These anchors have a five-step installation process:

1. Use a hammer drill with a carbide bit to drill a hole the correct size for your anchor diameter. Check your specs here.
2. Make sure the drilled hole has no lingering debris.
3. Insert the slotted end and drop the anchor into your drilled hole.
4. Using the setting tool, strike it with a hammer until the top of the anchor is flush with the tool's lip.
5. Place the fixture hole over the anchor. Place either a machine-threaded bolt or rod through it and into the anchor.



## Threaded Rod Anchor



***Photo:*** MSC Industrial Supply

To use a threaded rod as an anchor, you need to drill a hole in the concrete and fill that hole with epoxy.

Place the threaded rod or rebar into the hole and leave it to cure. The curing time depends on the specific type of epoxy used.

## Split Drive



*Photo: Confast*

This anchor is simple to use. It resembles a bloated pin and comes with either a flat or round head.

They come in one diameter, quarter inch, but in different lengths. It is considered a pre-expanded anchor since the split base applies constant pressure against the side of the hole.

To install, simply drill a quarter-inch hole into the concrete. Lay the fixture over the hole, then insert the anchor through the fixture and tap it into place with a hammer.

# Concrete Screws



*Photo: Grainger*

These concrete fasteners differ from the other types in that they come in one piece; the anchor is built in.

Concrete screws resemble traditional screws, although they have coarser threads.

These screws are often referred to as *self-drilling* or *self-tapping* screws because they tap their own threads when inserted into a predrilled hole.

Tapcon is well known for its blue concrete screws. They come with either a hex head or a star head.

# Which Concrete Anchor Is Right for Your Job?

Some concrete anchors are made for light-duty fastening, while others are made for medium-duty or heavy-duty jobs.

You should consider a few factors to determine which are best for your situation.

For instance, you should think about the potential for corrosion. If your job site is indoors and dry, zinc-plated anchors will do just fine. However, if your project is outdoors or underwater, it is imperative to use stainless steel anchors, or they will rust, and you will lose holding strength.

You also need to find the right anchors for your base material.

The chart below can give you an idea of the types of anchors we discussed and how they are best used. They are listed from strongest to weakest.

*The X's mean the anchors are suitable for the materials, while the O's mean they can be suitable in certain situations. A dash means the anchor is not suitable for the material under any circumstances.*

	<b>Solid Concrete</b>	<b>Hollow Block</b>	<b>Filled Block</b>	<b>Stone</b>	<b>Brick</b>	<b>Mortar</b>
<b>Threaded Rod Anchor</b>	X	–	–	–	–	–
<b>Wedge Anchor</b>	X	–	O	O	O	O
<b>Sleeve Anchor</b>	X	X	X	X	X	X
<b>Drop-In Anchor</b>	X	–	O	O	O	O
<b>Split Drive</b>	X	O	X	X	X	X
<b>Lag Shield</b>	X	X	X	X	X	X
<b>Concrete Screws</b>	X	O	X	X	X	X
<b>Strike Anchor</b>	X	O	X	X	X	X
<b>Machine Screw Anchor</b>	X	–	X	X	X	X

**Note:** Steel rebar is used to strengthen solid concrete and can improve any anchor’s holding power. Rebar is used in every large-scale concrete construction project.

## Reference

FMPCConstructionMarketing. “The 13 Strongest Types of Concrete Anchors.” *FMP Construction*, 5 July 2023, [fmpconstruction.com/concrete-anchors/](https://fmpconstruction.com/concrete-anchors/).