RESEARCH PROJECT

TOPIC
-CEMENT BOARD
-SELF DRILLING SCREW
-HOW TO MOUNT CEMENT BOARD

CEMENT BOARD

How is fiber cement board manufactured?

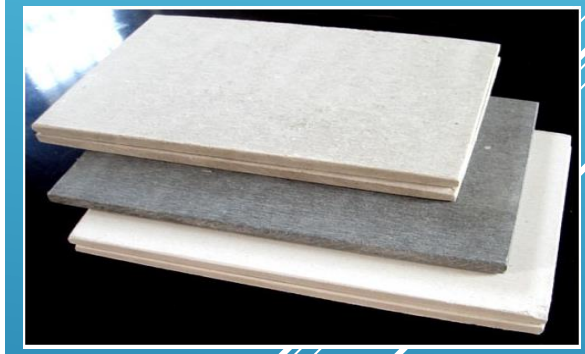
Fiber Cement Board

Fiber cement board are composed of cement, silica sand and wood pulp. Reinforced fiber cement products such as fiber cement board are manufactured using the 'Hatscheck Process'. The Hatsheck process was initially developed for the production of asbestos composites, but it is now used for the manufacture of non-asbestos, cellulose fiber reinforced cement composites.

In the Hatscheck Process, unbleached cellulose fibers are re-pulped in warm water at an alkaline pH of 11 to 12.5; the re-pulped fibers are refined and then mixed with cement, silica sand, and other additives to form a mixture. The fiber cement mixture, is deposited on a felt band substrate, vacuum de-watered,and cured to form a fiber reinforced cement matrix in sheet form.

Fiber cement board offer numerous advantages over other traditional materials such as wood siding: they are weatherproof, fire and insect resistant, flexible, highly workable and durable.

Fiber cement board manufacturing process also makes use of autoclave technology. In autoclave technology, polymer based composites are manufactured by applying intense heat and pressure to eliminate moisture from fibre cement materials. This leads to composite consolidation and the result is an extremely strong and robust fibre composite material.



HILTI SELF DRILLING SCREW

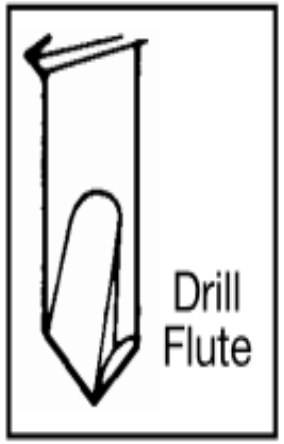
3.6.2.1 Product Description

Hilti self-drilling screws are designed to drill their own hole in steel base materials up to 1/2" thick. These screws are available in a variety of head styles, thread lengths and drill-flute lengths for screw diameters #6 through 1/4". Hilti self-drilling screws meet ASTM C1513, ASTM C954 and SAE J78 standards, as applicable.

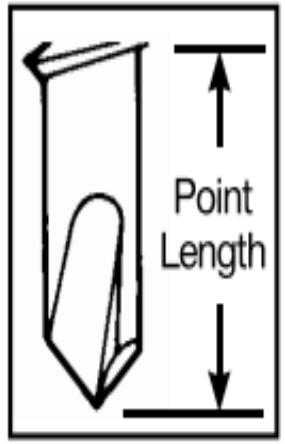
Product Features:

- Hex head for metal-to-metal applications
- Flush head for wood-to-metal applications
- For metal from 0.035" to 0.500" thick
- Winged reamers for wood over 1/2" thick
- Stitch screws for light gauge metal-to-metal
- Sealing screws for water resistant fastenings

DETAIL OF DRILLING POINT



Drill Flute
The length of the drill flute determines the metal thickness that can be drilled. The flute itself provides a channel for chip removal during drilling action. If it becomes completely embedded in material, drill chips will be trapped in the flute and cutting action will cease. This will cause the point to burn up or break.



Point Length
The unthreaded section from the point to the first thread should be long enough to assure the drilling action is complete before the first thread engages the drilled metal. Screw threads advance at a rate of up to ten times faster than the drill flute can remove metal. All drilling therefore should be complete before threads begin to form.

Drilling Through Wood to Metal
If your application calls for drilling through wood over 1/2" thick, a clearance hole is required. Select a fastener with breakaway wings for this type of job. The wings will ream a clearance hole and break-off when they contact metal surface (minimum metal thickness 0.06") to be drilled.

THREAD SELECTION

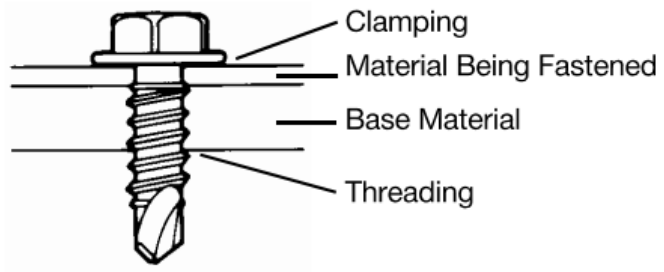
Thread Pitch

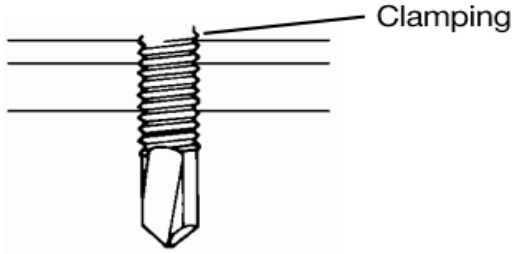
The thickness of material being fastened and diameter of the screw determine the type of thread pitch to be used. In general, the thinner the fastened materials, the fewer the number of threads. The thicker the material, the greater the number of threads. This principle is due to two primary methods of thread engagement/holding power: **Clamping** and **Threading**. In light gauge metal, the materials are actually being clamped together by the upper and lower threads.

3.6.1.2 Thread Selection

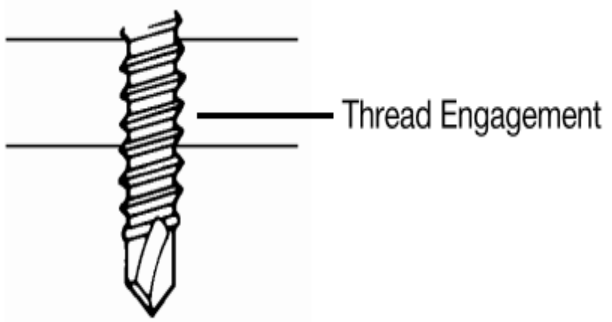
Thread Length

Always choose a fastener with sufficient threads to fully engage in the base metal. For attachments to 1/4" base steel, a self-drilling screw should have at least 1/4" of threads. It is helpful, but not critical, that the threads also engage in the material being fastened. The head of the fastener provides the bearing force for the material being fastened, while the threads provide the clamping force in the base material.





Thinner base material requires a coarser thread pitch to assure proper clamping. The thicker the material, the finer the threads must be. In very thick metal (3/8" to 1/2" thick), a fine thread is advisable. This will allow the thread to tap into the base material with less installation torque than a coarse thread.



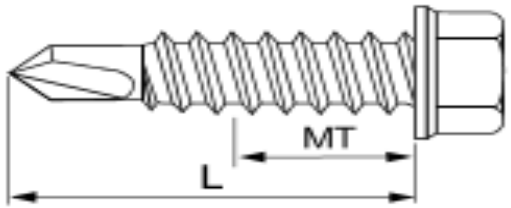
SCREW LENGTH

Length of the screw (L)

Depending on the screwhead, there are two different ways to measure the overall length of a screw.

For HWH/HHWH, PPH, PTH, PFTH, SHWH and PPCH screws, the overall length is measured from the bottom of the washer under the head to the point of the screw.

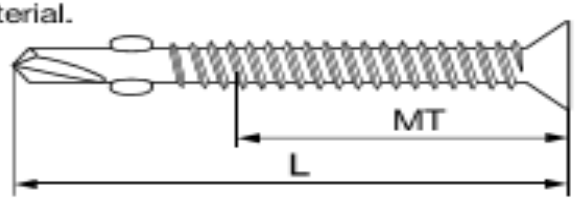
For PWH, PFH, PBH and PFHUC screws, the overall length is measured from the top of the head to the point of the screw.



Maximum Total Thickness (MT)

The maximum total thickness (MT) for all screws is the length of the threads reduced by the first three threads (protruding past the back-side of the base material). See drawings above and below.

The maximum total thickness (MT) describes the maximum thickness of all attachments to be fastened plus the base material.



CASE STUDY
HOW TO DO THE SHOWER

Required Materials for this Project

Avoid last-minute shopping trips by having all your materials ready ahead of time. Here's a list.

- 2 x 4s
- Cement board
- Cement board screws
- Fiberglass mesh tape (use the special, heavier type sold for use with thin-set mortar — drywall mesh tape will rot)
- Thin-set mortar

Required Tools for this Project

Have the necessary tools for this DIY project lined up before you start—you'll save time and frustration.

- Cordless drill
- Jigsaw
- Stapler
- Straightedge
- Taping knife
- Utility knife

Step 1: Overview

The traditional method of installing ceramic tile called for setting it in a solid mortar bed. Troweling a perfectly flat bed required great skill, but the reward was a tile job that lasted for decades. Today, most professional tile setters back their tile with cement board instead, because it offers almost the same durability with a lot less work. And the best part? Do-it-yourselfers can use it too.

Cement board is a thin layer of mortar sandwiched between sheets of fiberglass mesh cloth. The 1/2-in. thick board is unaffected by water, making it a great substitute for a mortar bed.

In this article, we'll show you how to create a strong, durable and waterproof tile base around your bathtub using cement board. We chose the tub surround because it's highly leak-prone, and an ideal spot for cement backer board. Although cement board is heavy and a bit awkward to cut, even a novice should be able to complete a professional-quality tub surround, ready to tile, in a day. (Allow half a day to tear out the old tile and perhaps several more days to let damp wood dry out.)

Step 2: Buying materials

Cement board, technically called cementitious backer unit (CBU), is manufactured under different brand names. The standard size sheet is 3 x 5 ft. and 1/2 in. thick, weighs 45 to 60 lbs. and is available at most full-service lumberyards and building supply centers. The 1/2-in. thick cement board spans studs spaced 16 in. on center. Other sizes, like 3 x 4 ft., 3 x 6 ft. and 4 x 4 ft., are available, but you may have to contact a tile supplier to find them. Our project, tiling the walls around a standard 5-ft. tub to a height of 6 ft., requires four 3 x 5-ft. sheets.

To attach the cement board to the studs, you'll need special 1-1/4 in. cement board screws (see Fig. B). These screws have a coating to resist corrosion, a special wide head with cutting flutes and hi-low threads for a strong grip. If you can't find them at a home center, call tile specialty stores. If special screws aren't available, attach the cement board with 1-1/2 in. hot-dipped galvanized roofing nails.

You'll also need a roll of 2-in. wide fiberglass mesh cement board tape and a 25-lb. bag of thin-set adhesive, both available at home centers. The thin-set is a cement-based powder that you mix with water or latex additive to form a thick paste, which is used to seal the seams in the board and can also be used to set the tile.

Finally, you'll need an 8 x 12-ft. piece of 4-mil plastic sheeting and some straight 2x4s.

STEP 3

Protect the bathtub with a dropcloth and seal the edges with tape to keep out debris. Tear out the old tile and backing to the bare studs. You'll have to remove the faucet handles, tub spout and shower head.

Now's the time to straighten crooked studs and add blocking (Photos 1 and 2). This is a critical step. Tile is easier to set and looks better on a straight wall. Extra blocking installed now makes it easier to screw in the edges of the cement board later.

Measure the thickness of the drywall or plaster where the cement board will meet it. If this dimension is more than 1/2 in., add strips of wood to the studs so the cement board will be precisely flush with the old wall.

While your walls are open:

- Add wood blocking now where you will be installing towel bars, grab bars or shower doors; then you won't have to rely on those frustrating little plastic anchors to hold up your fixtures.
- Upgrade the insulation on outside walls with new, higher R-value fiberglass batts.
- You can replace your old tub faucet with a new pressure-balancing shower valve.

Step 3: Getting started

Step 4: Waterproof the walls

Photo 3: Add the vapor barrier

Staple 4-mil plastic sheeting to the framing. Drape the plastic into the tub and cut it off after the cement board is installed.

Staple 4-mil plastic to the studs (Photo 3). Use a single piece to avoid seams. Push the plastic tightly into the corners before stapling to avoid creating a bridge of plastic that will tear when you install the cement board. The plastic serves as a vapor barrier for the insulated wall and as a last defense against any water that may sneak through the tile and cement board.

STEP 5

When the prep work is done, start the rewarding job of hanging the cement board. All your hard work will start to pay off as the first sheet goes up.

Photos 4 through 9 show how to measure, cut and drill cement board. Wear a NIOSH-approved dust mask and eye protection when cutting or drilling cement board.

Hanging cement board is one job where gaps are desirable. Space the bottom sheets 1/4 in. above the tub lip to allow for movement of the tub and floor. Use nails or screws as temporary spacers to create a 1/8-in. gap between sheets of cement board. When you squeeze the thin-set mortar into this gap, it will lock the two sheets together and strengthen the seam. Finally, leave extra clearance around each piece by deducting about 1/4 in. from your measurements before you mark the cement board for cutting. Believe me, you want to avoid the knuckle-skinning task of trimming a little off. Any gaps will be covered with mesh tape and thin-set.

You'll ruin a couple of knife blades while cutting (Photo 5), so keep some extras handy. Use carbide grit jigsaw blades to cut cement board. You can also use regular blades, though they'll wear out after a few cuts.

Cement board has a smooth side and a rough side. Face the rough side out if you will be using thin-set mortar adhesive to install the tile but the smooth side out if you will be using latex mastic.

STEP 6

Complete the job by piecing in any missing drywall and taping the seams (Photo 11). Cover all of the corners and seams, including the joint where drywall and cement board meet, with the fiberglass mesh tape.

Following the manufacturer's recommendations, mix the thin-set mortar adhesive with enough water to form a thick paste. Wear a NIOSH-approved dust mask when mixing the powder. Spread the thin-set over the tape (Photo 12).

When you're done covering the tape with thin-set, you're ready to tile. You don't even have to let the thin-set dry. Don't worry if the tile doesn't cover the joint between the cement board and the drywall. Just finish it with a setting-type joint compound, which comes in 25-lb. bags of powder that you mix with water. (It's available at home centers.) Setting-type compound is stronger and more water-resistant than the type that hardens by drying.

Step 6: Finishing up

- https://www.familyhandyman.com/tiling/tile-installation/cement-board-ceramic-tile/view-all/
- http://www.yunionboard.com/2015/02/fiber-cement-board-manufactured/
- https://www.hilti.com/medias/sys_master/documents/h54/9176426872862/Technical-information-ASSET-DOC-LOC-1577675.pdf
- http://image.made-in-china.com/2f0j00JeOEWwjFzmoK/Fiber-Cement-Board.jpg