

Working With Our Products

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IDENTIFYING STRONGWELL GRATING

Each standard or pre-fabricated (by Strongwell) grating panel is labeled on the panel's outer edge at the time of manufacture. If panels are fabricated in the field, a label may or may not be present.

To ensure the grating product you are using is manufactured by Strongwell, request a certification of origin document.

DURAGRID® Phenolic Pultruded Grating

DURAGRID® Phenolic logo

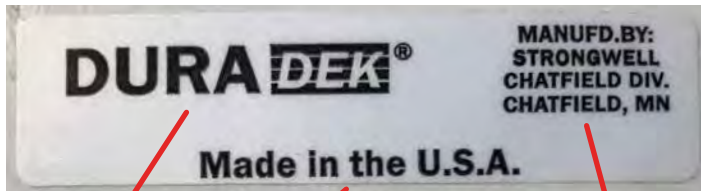
Manufactured by Strongwell Corporation in Chatfield, MN



United States Coast Guard Certification Number

Testing standard specification. DURAGRID® Phenolic is the first FRP grating to meet all the requirements of the ASTM F3059 standard for Level 2 areas.

DURADEK® Pultruded Grating



DURADEK® logo

Made in the U.S.A.

Manufactured by Strongwell Corporation in Chatfield, MN

DURAGRID® Pultruded Grating



DURAGRID® logo

Made in the U.S.A.

Manufactured by Strongwell Corporation in Chatfield, MN

DURAGRATE® Molded Grating



DURAGRATE® logo

WORKING WITH DURADEK® / DURAGRID®

Fabricated vs. Plain Panels

At some point, there will be a decision to use plain panels (fabricated on site) or order prefabricated panels. There are positives and negatives to both methods depending on each situation.

Plain panels provide speed and flexibility, but there is typically more waste with this procedure – as much as 20% or more depending on the deck layout. Custom fabricated panels do not have waste, but are dependent on drawing time, revisions and approvals. Fabricated panels can have cross rods strategically placed during the manufacturing process to minimize deflection and eliminate single bar syndrome (a bearing bar with a single cross rod). Strongwell can also add notes to approval drawings as to where (if any) structural trimmers should be added to prevent soft spots. Penetration plates (numbered and marked) and pipe sleeves can also be added to the drawings.

Please note that grating fastener locations are not indicated on approval drawings. It is up to the installer to determine these locations and make any panel modifications required for the use of the fasteners selected by the installer.

Strongwell recommends fabricators order a few spare plain panels to deal with change orders after drawing approval and manufacture. The obsolete panel may be used as a template for the new panel if a penetration has been moved – a very fast and simple, no-wait process.

The decision on plain vs. pre-fabricated panels should be discussed with the owner and fabrication team well in advance of the required material date.

Layout

DURADEK®/DURAGRID® is installed the same way steel bar grating is installed. The bearing direction is the direction of the structural shape or length (see 5.4).

Standard panel sizes for DURADEK® and DURAGRID® are available in their respective product catalogs. Generally, for offshore projects, the following panel sizes are used: 3' x 20', 4' x 20', 1m x 6m, 1m x 5m, 1m x 4.5m. Longest panel sizes should be used for the optimum performance and cost benefit. Smaller panel sizes are often used to maximize packing efficiencies in ocean containers (20' panel does not fit in a 20' container; two 20' panels placed end to end require a 45' container) and/or to accommodate installer handling restrictions. Panel widths should be limited to no less than 300mm (12") whenever possible to minimize deflection differences between panels. Custom panels (within a 5' x 20' envelope) are available upon request.

Cutting

Circular-, jig-, hack-, and reciprocating- (Sawzall) saws are generally used for cutting. Circular saws make the best straight cuts. Fine to medium grit carbide or diamond tip blades are



CNC precision cutting from CAD drawings at the Strongwell factory. Note the additional cross rods added to the particular area.



Fabricated panels from Strongwell may (if requested) include adding additional crossrods, penetration plates, pipe sleeves, and identifying areas where additional structure (trimmers) should be added.



Plain panels await fabrication and installation at the job site.

WORKING WITH DURADEK® / DURAGRID®

preferred. Diamond tipped (30-60 grit) or coated blades are best, allowing for faster cuts and longer blade life. Disposable hacksaw blades (17-32 teeth per inch) are also suitable, but are labor intensive. The best jigsaw/Sawzall blades are tungsten carbide. Routers and even disc grinders (cut-off tools) equipped with metal cut off blades have been used to cut grating but are not recommended. Safety precautions should be strictly observed as circular saws, jig saws, and reciprocating (Sawzall) saws are better tools for the application.

Sealing

All factory cut edges are sealed at the factory. Field cuts should be clear coated with one of the following: urethane, acrylic, enamel, lacquer, epoxy, polyester resin or vinyl ester resin.

It is a standard practice to seal all cuts on composite structures (polyester, vinyl ester, phenolic FRP/GRP, etc.) with resin or epoxy to prevent wicking of the glass fibers. Structural composites (grating included) are often found in highly corrosive environments where traditional metals rapidly deteriorate due to chemical exposure. Strongwell has been producing pultruded components since the continuous process was invented in our facility in 1956. Strongwell pultruded composite structures are very high quality and resist wicking. Strongwell has researched the issue of sealing and found that in certain markets, sealing did not produce any significant benefit. Please note that this applies specifically to Strongwell product only - not other manufacturers. General offshore applications are not considered "highly" corrosive to Strongwell composites, but as a precaution, sealing is still recommended as a general practice:

1. Seal only the cuts that you make (factory cuts are already sealed). Make as many cuts as possible before sealing. Note that a little sealant goes a long way and once the sealing process has started, it is finished quickly.
2. A spray sealer is easiest, but if you brush or dab it on – mix your resin in a simple plastic dish, paper cup, or plastic Frisbee. Avoid quick-dry (5 minute) epoxy as it limits working time. Make sure to follow all label directions and safety procedures.
3. When spraying, dabbing, brushing, or rolling, apply the sealant until the cut appears wet. A single pass or two is all that is needed. If you roll the sealer on, roll it as if you were applying paint to the edge of a table.



Convenient hand or power tools may be used. A Tool Manufacturer availability list is located on the last page of this section.



A worker uses a reciprocating saw to notch a grating panel prior to installation.



Simple spray sealing



3" paint rollers making sealing fast and easy!

WORKING WITH DURADEK® / DURAGRID®

The Simple Sealing Shopping List

All sealers are locally available and should be purchased from local suppliers. Clear sprays are available in simple spray cans from any hardware or paint center. Polyester resin is typically available at auto parts, discount, or boat supply stores. The typical cost for spray sealers is very minimal. Polyester resin (and necessary plastic dish and paint roller for application) will cost slightly more. Coverage varies with each applicator, but could be as high as 800 linear ft. of cut grating edge. Please note that airline regulations prevent the shipment of these coatings. Therefore, they must be obtained locally.

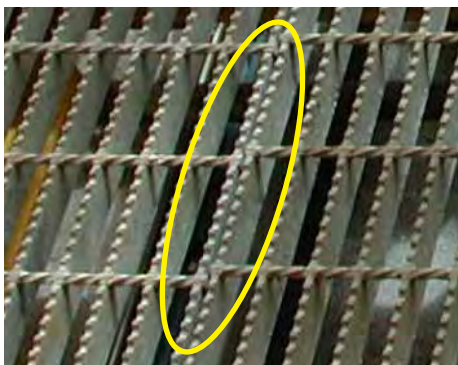
Frequently Asked Questions

- Q: What will happen if I miss a spot?
A: Probably nothing in this environment
- Q: What happens if dirt and dust get on the sealant as it is applied?
A: Nothing
- Q: Can I move the panels while they are drying?
A: Yes. Be aware the edges are wet.
- Q: While moving a fresh sealed panel, it was dropped in the dirt – What now?
A: Brush off the dirt if you wish. No need to reseal
- Q: While sealing, some of the resin dripped on the structure. Will it damage it?
A: No
- Q: Which sealant is better - spray on or roll on?
A: In this application, neither has an advantage in terms of durability. Sprays are easier to apply, however.
- Q: What concerns should my workers have during sealing?
A: Follow all safety instructions when handling sealers.
- Q: What about using 2-part catalytic sealers?
A: They are acceptable, but more difficult to use. The overall results are similar to sprays.
- Q: I want to use a pigmented sealer so I can see that the bar is sealed. Is this OK?
A: This is acceptable, although the results will not look very good due to color mismatch. Clear sealers work just as well and are more aesthetically pleasing. (See Question 1 above)

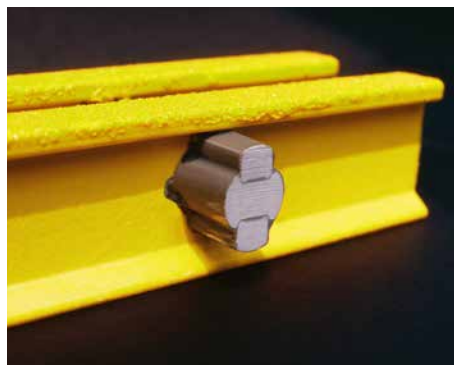
Banding (Not Required)

Unlike steel grating, DURADEK®/DURAGRID® bearing bars are connected using a large heavy duty 3 piece cross rod system. This system transfers loads between cut bearing bars (as in penetrations) and un-cut bearing bars. Banding (a costly necessity) for steel grating is not applicable to Strongwell grating. The Strongwell unique cross rod system forms a “couple” - locking the bearing bar in place - preventing rotation. The grating is more durable to heavy loads.

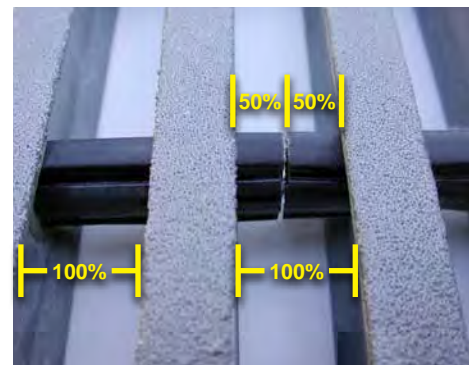
This DURADEK®/DURAGRID® feature can save the installer significant cost during installation as this Strongwell system transfers loads better around cut outs – minimizing the need for added support structure.



Banding is required on steel. Steel panels are typically edge to edge.



Banding is not required with DURADEK®/DURAGRID®. Crossrods extend past the last bearing bar in each panel at 50% - the space between is equal to bar spacing.



WORKING WITH DURADEK® / DURAGRID®

Stairtreads and Landings (Nosing Requirement)

DURADEK® and DURAGRID® gratings feature an integral closed nosing on stairtreads. These are often called “Bull Nosing” as they are intended to take high impact on the front edge of the tread from workers using the stairs. The nosing is box shaped for strength and safety. It is a safety hazard to have anything on the front of the tread that could catch a boot or pants. Small grating panels with exposed cross rods should never be used as stair treads. Double I bar grating with cross rods exposed should never be used. Examples of nosing solutions can be found later in this section (see 5.23).



While Strongwell does produce large landings with fabricated nosing, DURATREAD™ may be a field installed solution as an alternate to factory closed nosing. DURATREAD™ may be bolted, bonded, or Hilti'ed in place.



Worker access lanes (black) and caution areas (yellow) have been specifically painted on DURAGRID® Phenolic grating (fire integrity brown). This can be accomplished using an epoxy compatible paint.

Protection

During construction, the grating, used in high traffic areas should be protected from dropping and dragging heavy objects. It is very important to properly secure the grating in these areas with the proper number of grating hold downs as the panel could shift and damage another grating panel. Protection can be in the form of suitable rubber or wood mats.

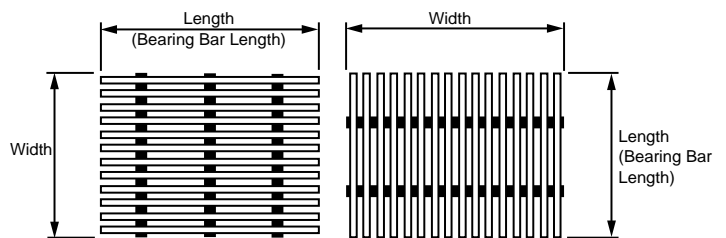


Light wood panels protect major walkways during construction. Wood blocks should also be placed under scaffold poles.

Bearing Direction

When ordering DURADEK® or DURAGRID®, make sure the bearing bars are oriented in the correct direction for the application. Bearing bars should traverse from support to support. Cross-rods are not intended to be applied in the span direction. The adjacent drawing will help you specify the width and length of panels.

Note: Width is the measurement from end to end of the cross-rods. Length is always the bearing bar length.



Panel Sizes Are Specified: Width x Length

Passive Fire Protection

Please contact Strongwell for information on installing grating on PFP.

WORKING WITH CUT-OUTS

Penetrations

The decision to provide additional support to the grating because of a penetration must be addressed on a case by case basis because of the infinite number of cut out possibilities. If the penetration requires a kickplate or pipe sleeve, then this may provide enough support. Later in this section is a conservative guideline for penetrations which attempts to address the issue for those who require it (see 5.18).

Typical Questions

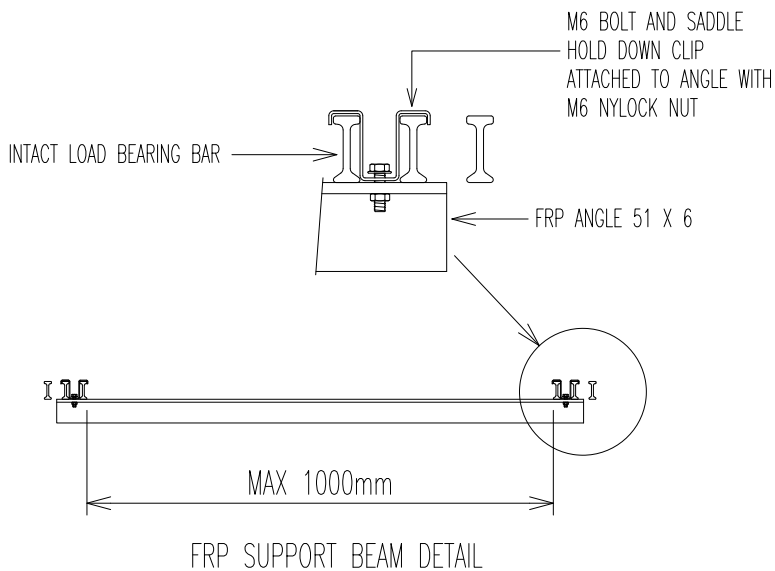
- Q: What is the maximum size hole I can cut before I need to add structure?
A: It is impossible to predict due to numerous variations.
- Q: Do I need to use panel connectors at the mid span of every panel?
A: Generally not. Panel Connectors can be used to eliminate soft spots around a hole where any grating is split into two panels. Panel connectors are very rarely used on higher strength DURADEK®/DURAGRID® products. Note the penetration guide later in this section for more information on the potential use of panel connectors (see 5.18).
- Q: Isn't molded grating better to use around cut outs?
A: When comparing it to DURADEK®/DURAGRID® – No! When comparing it to numerous “look alike” products particularly those with two piece cross rods-Yes!. Unfortunately product performance (and installed cost) varies between manufactures because of the design and quality of those products.
- Q: How can I avoid the high cost of adding structure (and paint) around a potential soft spot in the grating due to a penetration?
A: Strongwell offers several ways to add structure without the additional high cost of welding and paint. View the Penetration Guideline at the end of this section.



An 850mm stainless steel pipe sleeve is used on a NORSOK required pipe penetration.

FRP Support Beams

- The use of FRP Support Beams is to correct soft spots around grating penetrations where pedestrians may feel uncomfortable with deflection without the support beam.
- The FRP Support Beam is not intended to correct unsupported bearing bars that are cantilevered by only crossrods.
- The FRP Support Beam is not intended as a further support to bearing structure that is not continuous with the width of the grating panel. Bearing structure shall be continuous to support all grating bearing bars.
- The FRP Support Beam is not intended to be used on active trolley ways - properly located fixed structure should be used in this application. (Not tied to the grating bearing bars).
- Strongwell recommends a minimum strength requirement for the FRP Support Beam to be greater than or equal to the EXTREN® equal leg angle of 51 mm x 6mm (2" x 1/4"). EXTREN® angles that are larger than this are acceptable. Steel and aluminum angles exceeding the strength of the EXTREN® 51mm x 6mm (2" x 1/4") angle are also acceptable; however, metallic angles are subject to corrosion leading to reduced strength over time. The use of these angles should be cleared with the owner before proceeding with installation.



It is the responsibility of the fabricator/installer to provide adequate support for grating.

WORKING WITH CUT-OUTS



Pipe Sleeves

Pipe sleeves are kickplates around pipe penetrations preventing items from accidentally being kicked into the hole which the pipe passes through. They are generally used with fluid carrying pipes or valve bodies. The distance between the sleeve and the pipes allows for some pipe movement. Strongwell pipe sleeves are custom produced in fiberglass and intended to have easy installation, be lightweight, and totally maintenance free.

They are available:

Height: 101.6mm (4") or 152.4mm (6")
 Diameter: 50.8mm (2") Minimum size only; No Maximum size
 Thickness: 6.4mm (1/4")
 Standard Color: Gray

Irregular sizes (Oval/Trapezoid) are also available

Standard Mounting flange is 50mm (Optional 76mm)

**NOTE: Further information and a more detailed drawing can be found on page 5.20 of this section.*

Strongwell pipe sleeves can be used with any type metal, composite gratings, or solid decking.

Sleeves come with attaching hardware.

Small sleeves may be bonded to FRP grating with a structural adhesive (contact Strongwell for additional information) - However, bonding sleeves should carefully be considered as removal (access to the pipe or grating removal) may be difficult. For this reason, sleeves are typically bolted.

Each pipe sleeve is custom made, please consult Strongwell for price and availability.

**NOTE: Sleeve color may not match free standing kickplate color due to different processing.*

Typical Pipe Sleeve Guidelines

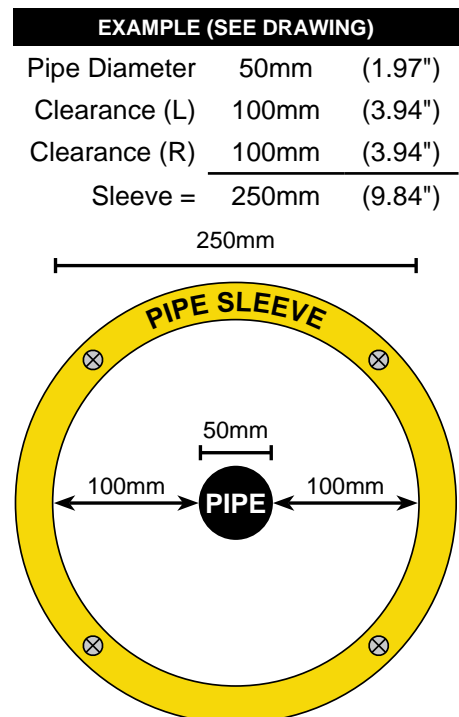
Sleeve Size	Bare Pipe	Insulated Pipe	NORSOK*
152.4mm (6")	50.8mm (2")		
203.2mm (8")	76.2mm (3") & 101.6mm (4")		
254.0mm (10")	152.4mm (6")	50.8mm (2") & 76.2mm (3")	50.8mm (2")
304.8mm (12")	203.2mm (8")	101.6mm (4")	101.6mm (4")
355.6mm (14")		152.4mm (6")	152.4mm (6")
406.4mm (16")	254.0mm (10")	203.2mm (8")	203.2mm (8")
457.2mm (18")	304.8mm (12")	254.0mm (10")	254.0mm (10")
508.0mm (20")	355.6mm (14")	304.8mm (12")	304.8mm (12")
558.8mm (22")	406.4mm (16")	355.6mm (14")	355.6mm (14")
609.6mm (24")	457.2mm (18")	406.4mm (16")	406.4mm (16")
660.4mm (26")	508.0mm (20")	457.2mm (18")	457.2mm (18")
711.2mm (28")	558.8mm (22")	508.0mm (20")	508.0mm (20")
762.0mm (30")	609.6mm (24")	558.8mm (22")	558.8mm (22")

Additional Sizes Available

*NORSOK L-002 Edition 3, July 2009 Section 5.4, Page 13:

"Piping penetrations through deck or wall shall be equipped with sleeves that give a minimum clearance of 100mm between pipe and sleeve."

NORSOK requires 100mm clearance between the pipe and pipe sleeve.



WORKING WITH CUT-OUTS

Pipe Sleeve Installation Procedure



1 Mark the hole using the pipe sleeve as a guide. After cutting the hole (use a Jigsaw), with the sleeve in place, select a spot between bearing bars & drill your holes using an 8mm (9/32") drill bit for the 1/4" sleeve fastener. Drill the holes between the unsupported grating bearing bars. The hole should be in the center of the sleeve flange as shown.



2 Assemble the pipe sleeve fastener through the holes drilled in step 1. The bottom channel may face either direction. The flat washer should be installed between the bolt head and the top flange of the sleeve. The fastener is designed to slide between the bearing bars of Strongwell grating models I-6000 and I-5500. Pipe sleeves can be installed before or after piping is installed. All installation is done from the walking surface of the grating



3 With a finger or a tool, rotate the channel (after it is positioned under the bottom of the grating bearing bar) 90° (perpendicular to the grating bearing bar).



4a With a 7/16" wrench, socket, or nut driver, complete the fastening operation. A slight upward pressure on the sleeve will aid in installation.



4b This photo shows the position of the channel fastener against the bottom of the grating.



5 This section of the pipe sleeve is now complete. Follow the same procedure to install the second section completing the entire pipe sleeve installation.

WORKING WITH CUT-OUTS

Free Standing Kickplate

Free standing kickplate is typically used for either square or rectangular penetrations. A typical example would be around cable tray/ladder penetrations. It is also very successful in applications to border groups of multiple in-line pipes.

The kickplate comes in stick form: either 102mm (4") or 152mm (6") heights. The mounting flange is 51mm (2") and the length is 6.1m (20'). The standard color is gray.

Fabrication is typically done in the field by cutting the lengths and widths (typically with a portable chop saw) to form the "box". The four corners are assembled using 50mm x 6mm (2" x 1/4") EXTREN® angle cut to a length equal to the height of the kickplate. A hole is then drilled in the center of each side of the angle – through the kickplate. Attachment of the angle to the kickplate is by SS bolt and nut (purchased separately).

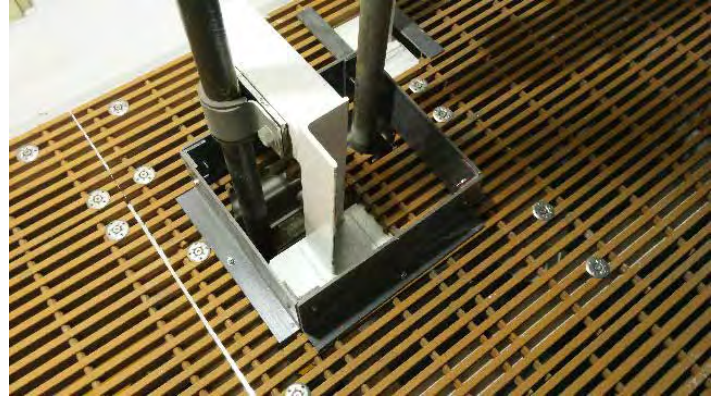
Connecting angles can be placed inside or outside of the formed box - this is up to the installer.

**NOTE: Free standing kickplate color may not match pipesleeves due to different processing.*

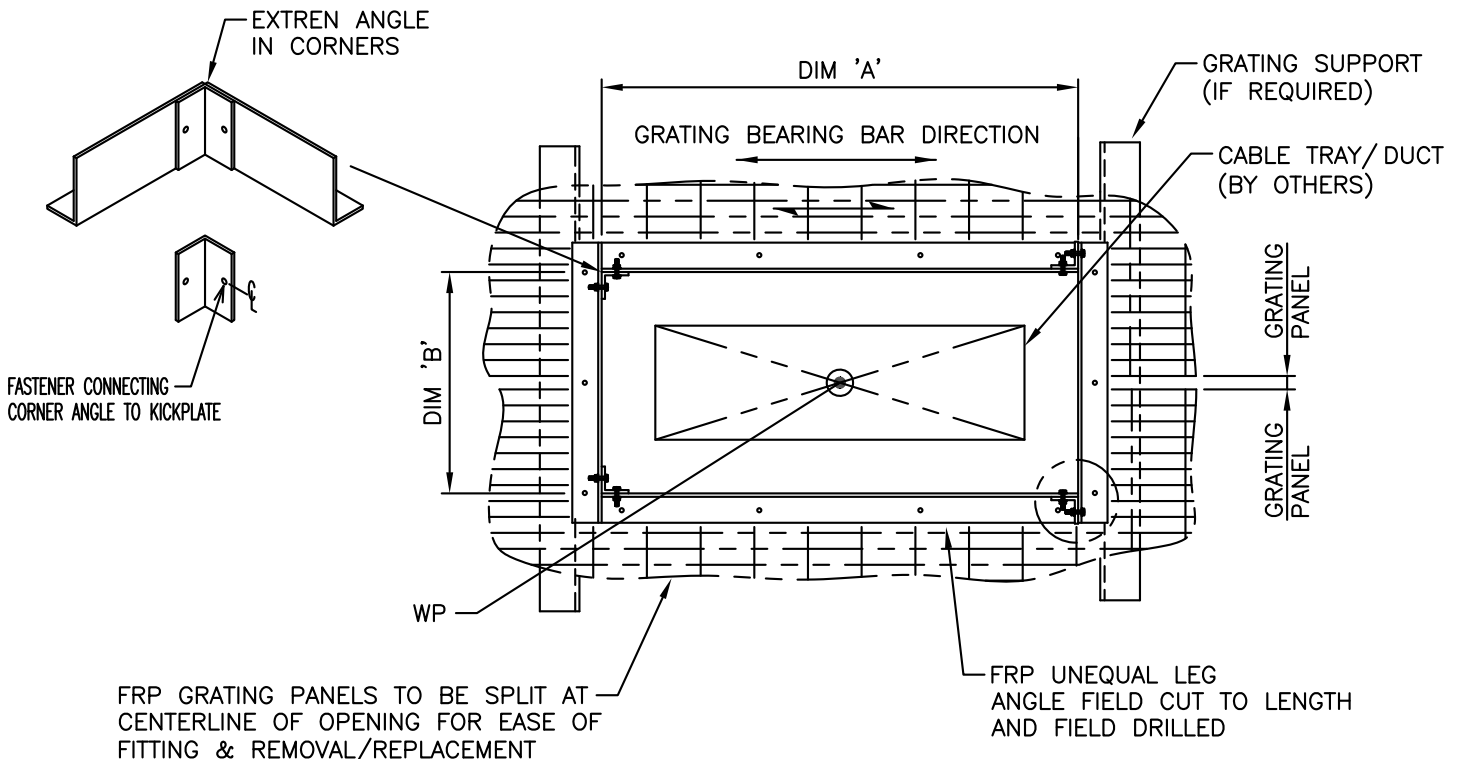
The entire free standing kickplate assembly is then fastened to the grating (FRP or metallic) with special kickplate fasteners 304.8mm OC (12") or with adhesive (to FRP only). Adhesive is typically used where bolting is difficult due to the facilities structure.

Please contact Strongwell for adhesive recommendations.

See 5.19 and 5.20 for additional information.



Portable Chop Saw



WORKING WITH CUT-OUTS

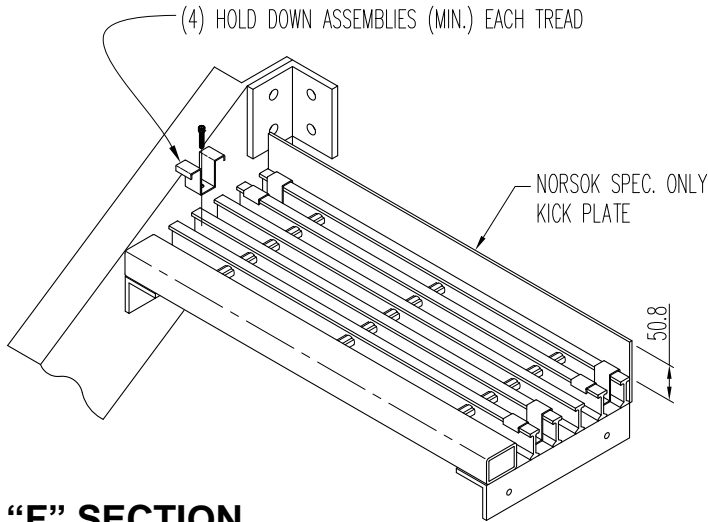
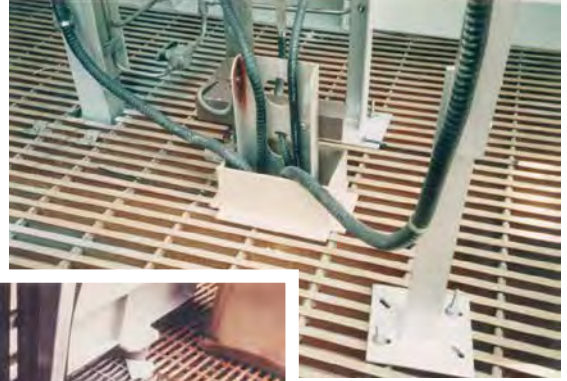
"F" Section for Kickplate

Another solution for kickplate involves using Strongwell "F" Section. This product is also used for square or rectangular penetrations with metal or FRP grating.

"F" section is only available as a 100mm kickplate for 38mm thick grating. The section may be pressure fit by tapping it into place with a rubber mallet or a standard hammer and a block of wood. The grating's epoxy grit surface provides a secure hold on the kickplate. It may also be bonded using an adhesive or pinned to the FRP bearing bar using a SS roll pin. The product is easily cut in the field by simple hand saw or portable chop saw.

Please note that enough grating overhang must be present in order for the "F" section to slide over the grating.

"F" section is often used with the NORSOK stair tread requirement kickplate at the back of the tread.

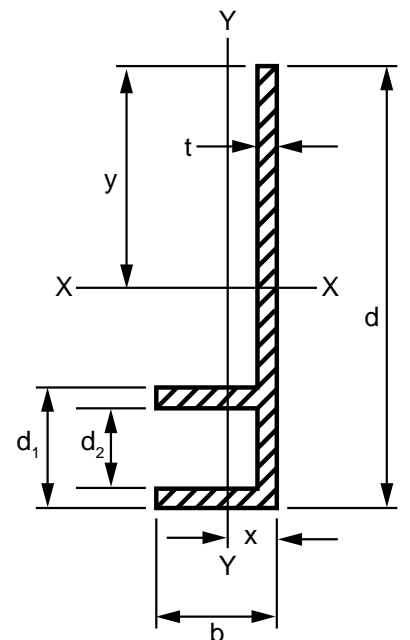


"F" SECTION

PHYSICAL PROPERTIES					
d	d ₁	d ₂	b	t	NOM. Weight
mm (in)	mm (in)	mm (in)	mm (in)	mm (in)	kg/m (lbs/ft)
140 (5.5)	38.1 (1.5)	25.4 (1.0)	38.1 (1.5)	6.35 (0.25)	2.35 (1.58)
152 (6.0)	50.8 (2.0)	38.1 (1.5)	38.1 (1.5)	6.35 (0.25)	2.50 (1.68)

Note: d₂ correlates with grating thickness.

* For full section properties, refer to Section 6 of Strongwell's Design Manual.



WORKING WITH CUT-OUTS

Penetration Plates

Strongwell Penetration Plates are produced from high quality EXTREN® FRP structural plate. Penetration Plates are often used for:

- Covering accidental over-cutting of grating
- Providing “drop-thru” protection for tools/loose objects
- Addressing trip hazards such as with instrument stands.
- Improving cosmetic issues of the installation



Prefabricated

Strongwell can fabricate penetration plates to your requirements with suitable drawings. The plates can be cut to either a 75mm or 100mm plate radius (for mounting). Each plate will be marked with the appropriate number for easy installation.

Strongwell can also provide plates to eliminate trip hazards around control post stands. These posts typically welded to support structure leaving a potential twisted angle trip hazard.

Plates are used to eliminate this problem.

Kit Model Number	Maximum Pipe Size	Pre-cut EXTREN® Plate*
SCP-6	6" (150mm)	32 pieces 12" x 12"
SCP-12	12" (300mm)	10 pieces 18" x 18"
SCP-18	18" (450mm)	8 pieces 24" x 24"
SCP-24	24" (600mm)	2 pieces 36" x 36" 2 pieces 24" x 24" 2 pieces 12" x 36"
SCP-36	36" (900mm)	2 pieces 48" x 48"

* Sizes in inches are approximate

** Plates may be attached to the grating by adhesive or mechanical fastening

For more information on the use of EXTREN® plate on cutouts, please contact Strongwell.

Penetration Plates are:

- Economical
- Light weight
- Easy to install (user friendly)
- Maintenance free
- Attractive

Attachment by:

- Adhesive (generally)
- Mechanical fastener



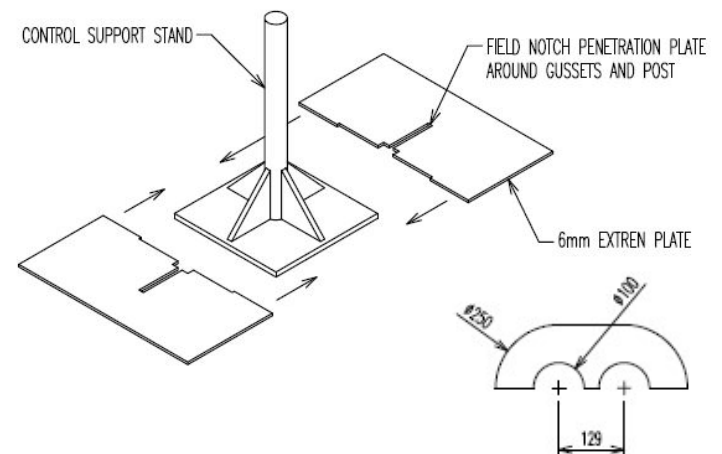
“Do it Yourself”

Penetration plate material can be purchased in large 1219mm x 2438mm (4' x 8') sheets* with thicknesses of:

3.2mm (1/8") • 4.8mm (3/16") • 6.4mm (1/4")

Plate can be easily cut on site using a jig saw or band saw to fit the appropriate application.

Precut penetration plates are also available from Strongwell. These plates are easy to handle and generally weigh less than 7.3 kg/m² (1.5 lbs./SF). They are the perfect low cost solution for drop through protection.



*NOTE: Further information and a more detailed drawing can be found on page 5.21 of this section.

MARK
13-03
QUANTITY
2

UNDERSTANDING GRATING FASTENERS

The proper selection of the appropriate grating fastener is as important as the grating selection itself. Although it is often overlooked because of its seemingly insignificant purpose, the fastener can greatly influence installation costs, safety, and future maintenance costs.

Installation Cost

The fastener installation cost includes the clip, cost of special tools, and the labor (time) required for installation. Minimizing these costs will compliment the overall installed cost of the project. As projects become more fast track, installation speed and the ability to quickly complete change orders (where grating must be removed and replaced) plays a major role in the project's success as well as expense.

Safety

It is important that the grating hold down does not become a trip hazard after it is installed. Too often, inexpensive means the purchase of a shallow top clip that folds as it is tightened — becoming a trip hazard. On stairtreads, the clip must be able to take the side loading that is common with this type of installation. Moving stair treads can be very dangerous.

Future Maintenance

The ease of removal and reinstallation of grating for the purpose of maintenance affects the cost and sometimes worker safety. If the panel is too difficult to remove, a worker may choose an alternate method that could jeopardize his well-being.

How many clips are needed?

While this decision rests with the owner, the industry typically recommends 1 fastener in every corner (simple span) and 2 fasteners at each structural support (multiple spans). Molded gratings typically require 4 fasteners every 0.8m² - 1.1m² (9 - 12 ft²). Higher strength products like DURADEK®/DURAGRID® use less fasteners (4 fasteners every 1.5m² - 1.9m² (16 - 20 ft²)). A good general rule of thumb is 4 per m². NOTE: Stairtreads require 4 fasteners per tread.

Basic Fastener Types

Saddle Clip Fasteners

This type of hold-down is the most common. It must work in conjunction with one of the following:

- Bolt/nut combo
- Welded or shot stud
- Self tapping screw
- Directly welded to structure

Saddle clips often appear to be the low cost alternative; however, the additional cost associated with bolts, screws or studs, and the time required for installation are additional and are often overlooked. Surface preparation for welding and future corrosion problems are a drawback to welded studs. Applications that use high tensile steel may require additional preheating — an additional cost. Bolting does require drilling which consumes time, but the fastener is very secure — unlike screws which can eventually corrode or loosen. Welding the clip to the structure is an alternative with some clips, but it is rarely used as removal is difficult.

Speed Clip Fasteners

This type of clip is gaining quick acceptance for many of today's offshore fast track projects. Their simplicity and overall cost as compared to other methods is difficult to improve on. Although they cost slightly more than a saddle clip, speed clips install faster and can be easily removed for change orders or maintenance. As they clamp to the structure, the type of steel is irrelevant. These clips do little if any damage to expensive paint systems.

Although some of the clips have had loosening problems in the past, the latest generation uses a stiffer improved top portion. It should be noted that workers must remember to tighten these clips! **These clips are not recommended for stairtreads or crane booms.**

Shot or Screw-In Stud Fasteners

A powder charge (Hilti XBT) is used to drive a threaded stud into the steel and is followed by a fastening disc to secure the grating. This type of fastening is extremely popular and is covered in the following pages of this section. Newer varieties include a screw-in (Hilti SBT) system to eliminate the use of powder charges.

UNDERSTANDING GRATING FASTENERS



Type: "Saddle" Clip

Material: 316L Stainless Steel

Torque Rating: Depends on fastener

Fastener Selection:

1. 1/4" x 20 shoulder less bolt/nut combo allen head or 7/16"
2. 1/4" stud - welded or shot - nut combo
3. Self tapping screws
4. Can be welded directly to structure

Installation: Pending fastener

Flange: Not affected by flange thickness although fastener may be.

Distinctive Features: Clip bottoms out - unaffected by tightening - reducing trip hazards. Can withstand over 1,000 lbs. pull

This type of clip is strongly recommended for use on stairtreads as the design limits side to side movement. It should also be used on Crane Boom applications.

Weight: Approx. 2 oz. with bolt/nut combo



Type: "M" Clip

Material: Various

Torque Rating: Various

Fastener Selection: Typical bolt or stud

Distinctive Features: Low fastener cost. These fasteners often create tripping hazards if over tightened. They are commonly used with molded gratings because of price. They are very labor intensive and can adversely affect painted surfaces. Total installed cost is very high.



Type: Universal Fastening Disc

Material: Various

Torque Rating: Various

Fastener Selection: Typical bolt

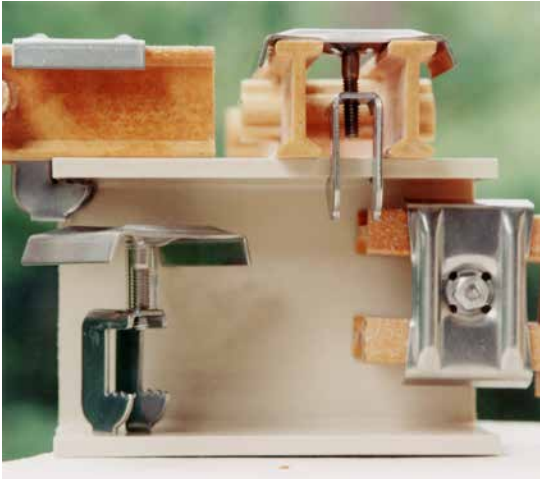
Distinctive Features: Universal – fits typically all types of grating—molded, pultruded, steel or plate. This fastener is more durable than the "M" clip – but continues to have a high Total Installed Cost as installation is similar.



Type: RAMSTUD Friction Welded Studs (Stud only)

Specially designed studs have been developed for use with the RAMSTUD Friction Welding Process. RAMSTUD offers friction welded studs (in different materials) from 3 mm- 33 mm diameter and in lengths of 20 mm to 275 mm after welding. RAMSTUD should be consulted regarding the specifics of this product.

UNDERSTANDING GRATING FASTENERS



Distinctive Features: Fast and dependable. This clip was specially designed for I-6000 series pultruded grating.

Type: G-Clip F top (Model FSSGG-1C)

Material: 316SS (galvanized bottoms available also)

Torque Rating:

Reusable: 100 - 125 in/lbs

Non reusable: 200 in/lbs

Fastener Size: 1/4" x 20

Installation Tool: 7/16" nut driver, socket, or wrench

Installation: From Top - 1 handed

Flange Thickness:

"1" 1/4" - 3/4"

"2" 3/4" - 1-1/4"

"3" 1-3/4" - 2-1/4"

Available to 3-1/4" flange thickness

Weight: Approx. 3 oz.

Typical G-Clip Tops to be added to a G-Clip bottom or used independently with a screw or bolt



*Pultruded Grating Top
I-6000 Series Only*



*Universal Fastening Top Disk
Use on any grating*



*Molded Grating Top
Several sizes available
(see 5.16 † note in comment box)*

G-Clips offer a large variety of tops and bottoms for various attaching situations. The product comes fully assembled in a box (typically 50) for fast, simple installation.

The clamp style attachment should not be used on stairtreads due to lateral forces. G-Clip top discs are very robust and may be used on stair treads with a bolt – similar to a saddle clip installation.

For additional information visit their website at www.gclips.com. All information is subject to change.



**G-Clip Model
RSCGC-1C (316 SS)**

Designed for narrow openings (for grating series I-4000 to I-5000).



**G-Clip Model
RSSGG-1C (316 SS)**

Designed for grating series I-5500 to I-7000.



**G-Clip Model
GA1-SSGT-R2**

*Designed to attach to angle or flat bar
(Note: The angle attachment is only available in heavy galvanized.)*

Please note that grating fastener locations are not indicated on approval drawings. It is up to the installer to determine these locations and make any panel modifications required for the use of the fasteners selected by the installer.

UNDERSTANDING GRATING FASTENERS

The Hilti Grating Fastening System (XBT Shot Stud)

Hilti offers several different types of grating fastening systems. The choice of system is largely influenced by the application, the owner's desired results, and even the geographic location. The original Hilti XCR stud (pointed) has been superseded by the XBT system which does not cause any underside (of structure) paint damage that was common with XCR on reduced thickness structure. Both the XCR and XBT systems are installed using a powder (explosive) charge. All Hilti studs (XCR, XBT, SBT) use common Hilti fastening discs with 8 mm treads.

Important issues with Hilti XBT:

1. The pre-dilled hole must be done using the required Hilti bit which should be changed out after 100 holes drilled.
2. Torque is critical – Follow Hilti Torque requirements. Over torque can cause a failure in the stud.



Standard Hilti XBT installation tools, which include drill with a shouldered drill bit, stud installer, powder charge, stud fastening disc and torque driver.

Please note that grating fastener locations are not indicated on approval drawings. It is up to the installer to determine these locations and make any panel modifications required for the use of the fasteners selected by the installer.



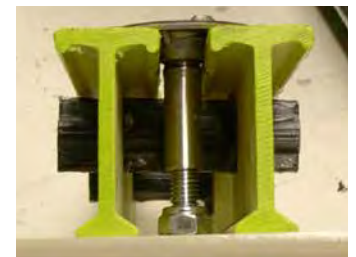
Hilti XCR Stud



XBT Stud



Fastening Disc



Hilti used on a fiberglass beam by way of a simple 8 mm bolt. The Hilti fastening disc can also be used with an 8 mm screw in stud.

Type: Shot Stud System

Clip Material: Stainless or Galvanized Steel

Tools Required: Drill (for holes): Hilti SFC 22-A
Installation tool (for powder charge): Hilti DX 351-BTG
Drill (for disc install): Hilti DFC 22-A (Torque setting: 6 ft lbs (8nm))

Distinctive feature: The manufacturer claims of cost savings due to rapid installation - up to 120 fastenings per hour with no external power source.

The Hilti fastening disc can also be used without a shot or SBT stud. The structure may be drilled, tapped, and screw-in studs installed. For flanged installations, an 8 mm bolt or welded stud of the same may be used.

UNDERSTANDING GRATING FASTENERS

The Hilti Grating Fastening System (SBT Screw-In Stud)

In 2017, Hilti introduced a powderless (non-explosive) screw in stud option to their grating fastener line. The screw in system may be used in geographic locations where powder charges are limited or prohibited. The existing Hilti fastening discs for XCR and XBT did not change and are fully compatible with SBT studs. The Hilti grating installation system is ABS Type Approved.



SBT Stud



Installed SBT Stud

Please note that grating fastener locations are not indicated on approval drawings. It is up to the installer to determine these locations and make any panel modifications required for the use of the fasteners selected by the installer.

Type: Screw-In Stud System

- Clip Material:** Stainless or Galvanized Steel
- Tools Required:** Drill (for holes): Hilti SFC 22-A
 Drill (for disc install): Hilti SFC 22-A (Torque setting: 6 ft lbs (8nm))
 1 Shouldered drill bit is supplied with each box of 100 studs
- Distinctive feature:** The manufacturer claims of cost savings due to rapid installation - up to 120 fastenings per hour with no external power source.

Hilti Grating Fastener Systems Comparison Summary

Minimum Steel Thickness	SBT System	XBT System	XCR System
Reduced holding strength	3/16" (4.76mm)	3/16" (4.76mm)	3/16" (4.76mm)
Standard holding strength	5/16" (7.94 mm)	5/16" (7.94 mm)	3/8" (9.53mm)
No Paint damage	1/4" (6.35mm)	5/16" (7.94 mm)	1/2" (12.7mm)
Stud part number	S-BT-GR M8/7 SN6	X-BT M8-15-6-SN12R	X-CR M8-9-12 FP10
Stud working strength	405 lbs	405 lbs	405 lbs
Safety factor	5x	5x	5x

Hilti availability is generally global.

Weight: Fastening disc for 38mm grating with stud (any) is approx. 48 grams (1.7 oz.)

**Note: Battery powered tools are not intrinsically safe.

For additional information visit www.hilti.com. All information subject to change.

UNDERSTANDING GRATING FASTENERS

Fastener Options per Grating Series

Grating Series/Clip	Saddle Clip	Bolt/Nut	Hilti Top	Hilti Stud (see note)	G-Clip
I-6000 1-3/4" (45mm)	7355	797	X-FCM-R 45/50		FSSGG-1D
I-5500 1-3/4" (45mm)	7355	797	X-FCM-R 45/50		RSSGG-1D
I-5000 1-3/4" (45mm)	SSGT-R##	393	X-FCM-R 45/50		RSCGC-1D
I-4800 1-3/4" (45mm)	SSGT-R##	393	X-FCM-R 45/50		RSCGC-1D
I-4000 1-3/4" (45mm)	SSGT-R##	393	X-FCM-R 45-50		RSCGC-1D
I-6500 1-1/2" (38mm)	4808	797	X-FCM-R 35/40		RSSGG-1C
I-6000 1-1/2" (38mm)	744	797	X-FCM-R 35/40		RSSGG-1C
DI-H60-1-1/2" (38mm)	SSGT-R#	393	X-FCM-R 35/40		RSSGG-1C
I-5500 1-1/2" (38mm)	4148	797	X-FCM-R 35/40		RSSGG-1C
DI-H60 N1 1-1/2" (38mm)	SSGT-R#	393	X-FCM-R 35/40		RSSGG-1C
I-5000 1-1/2" (38mm)	4148	797	X-FCM-R 35/40		RSCGC-1C
I-4800 1-1/2" (38mm)	751	797	X-FCM-R 35/40		RSCGC-1C
I-4000 1-1/2" (38mm)	751	797	X-FCM-R 35/40		RSCGC-1C
I-6500 1" (25mm)	7167	797	X-FCM-R 25/30		RSSGG-1A
I-6000 1" (25mm)	741	797	X-FCM-R 25/30		FSSGG-1A
I-5500 1" (25mm)	4147	797	X-FCM-R 25/30		RSSGG-1A
I-5000 1" (25mm)	4147	797	X-FCM-R 25/30		RSCGC-1A
I-4800 1" (25mm)	749	797	X-FCM-R 25/30		RSCGC-1A
I-4000 1" (25mm)	749	797	X-FCM-R 25/30		RSCGC-1A
T-5800 2" (50mm)	7168	797	X-FCM-R 45/50		FFSSGG-1E
T-5000 2" (50mm)	746	797	X-FCM-R 45/50		FFSSGG-1E
DURAGRATE® 1" (25mm) SM	RZ17600108	RZ99000004	X-FCM-R 25/30		YSSGG-1A†
DURAGRATE® 1" (25mm) RM	RZ17600108	RZ99000004	X-FCM-R 25/30		YSSGG-1A
DURAGRATE® 1-1/2" (38mm) SM	RZ17600108	RZ99000002	X-FCM-R 35/40		YSSGG-1C†
DURAGRATE® 1-1/2" (38mm) RM	RZ17600108	RZ99000002	X-FCM-R 35/40		YSSGG-1C
DURAGRATE® 2" (50mm) SM	RZ17600200	RZ99000002	X-FCM-R 45/50		YSSGG-1E†

Notes on Hilti Studs: *For XCR system please consult Hilti for latest part number*
For XBT system use X-BT M8-15-6-SN12R XBT shot stud
For SBT system use S-BT-GR M8/7 SN6 screw in stud

Comments:

* Saddle clips are stated for DURADEK®/DURAGRID® Product - "M" Clips are stated for DURAGRATE® Product

SM - Square Mesh RM - Rectangular Mesh

‡ All Hilti studs may be installed with the grating in place except I-4000 & I-4800. Grating may be marked for fastener-removed-studs installed- grating replaced - fastener disc installed OR The grating can be reamed with a tapered reamer to 19 mm allowing the Hilti installation tool to be inserted and the stud installed. The grating remains in place during this operation - For more information contact Strongwell or Hilti directly.

† One non-bearing bar should be cut in two places to form a rectangle. This rectangle forms a slot for the G-Clip to move forward with the bottom jaw engaging the structure. The G-Clip cannot be properly installed on square mesh grating without performing this operation - these cuts are easily made with a reciprocating saw.

The standard clip for this grating consists of a G-Clip Stainless Steel Universal Fastening Disc Model SSGT-R and 1/4 x 20 bolt with 316 SS washer and nylon lock nut. Standard bolt size will be 2-1/2" (bolt is long enough for 9mm (3/8") material) for material thicker than 3/8" please adjust the bolt length accordingly.

##The standard clip for this grating consists of a G-Clip Stainless Steel Universal Fastening Disc Model SSGT-R and 1/4 x 20 bolt with 316 SS washer and nylon lock nut. Standard bolt size will be 2-1/4" (bolt is long enough for 9mm (3/8") material) for material thicker than 3/8" please adjust the bolt length accordingly.

N1 and Grating series I-0000 to I-5500 Comply with NORSOK S-002 and ISO 14122-2

Products are subject to change without notice.

TOOL AVAILABILITY LIST

Manufacturer	Circular Saws	Reciprocating Saws	Air-powered Tools	Miter Saws	Website	Availability
AEG Power Tools	✓	✓			www.aeg-pt.de	Global
Milwaukee	✓	✓			www.mil-electric-tool.com	USA Only
DeWalt	✓	✓		✓	www.dewalt.co/global/#	Global
Makita	✓	✓		✓	www.makita.com	USA Only
Ridgid	✓	✓			www.ridgid.com	Global
Skil/Bosch	✓	✓			www.boschtools.com	Global
Skil	✓	✓			www.skil.com	Global
Delta				✓	www.deltawoodworking.com	USA/Canada
Hitachi	✓	✓			www.hitachi.com/hpt/	Global
Black & Decker	✓	✓			www.blackanddecker.com	Global
Porter-Cable	✓	✓			www.porter-cable.com	Global
Sears Craftsman	✓	✓	✓	✓	www.sears.com/craftsman	USA
Ingersoll-Rand	✓	✓	✓		www.irtools.com	Global
Best Tools	✓	✓		✓		Europe
Atlas Copco	✓	✓	✓	✓	www.atlascopco.com	Global
Hilti	✓	✓			www.hilti.com	Global

Note: This is a partial list - there are many tool manufacturers. All information is subject to change.

BLADE AVAILABILITY LIST

Blades should be available from the tool manufacturer or supplier.

Recommended Blades - Diamond Tip 30-60 grit (Circular/Miter Saws)

Recommended Blades - Fine to medium grit carbide (Jigsaw/Recip)

Typical Sawzall Reciprocating Saw blade - Milwaukee 48-00-1420 6" carbide blade

Typical Jigsaw blade - Remgrit SS2-1C, SS2-1CH carbide blade - bimetal

Additional Blade Suppliers include:

National Diamond Lab (USA)

Continental Diamond Tool Corp

TUNCO - Di-Carb (USA)

Akutt (Norway)

Sample Marshall Labs.

LBI

Hilti

www.NDLab.com

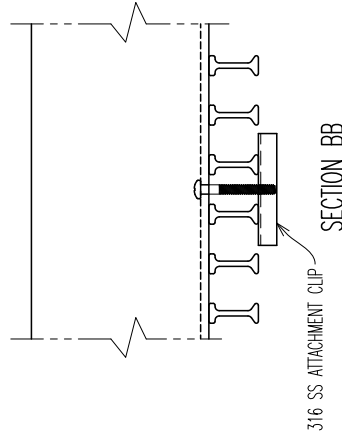
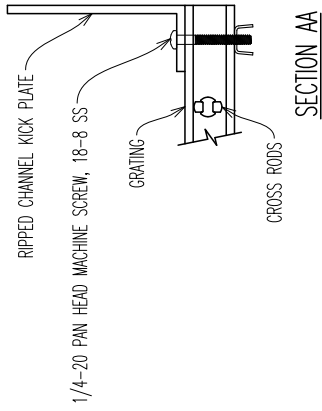
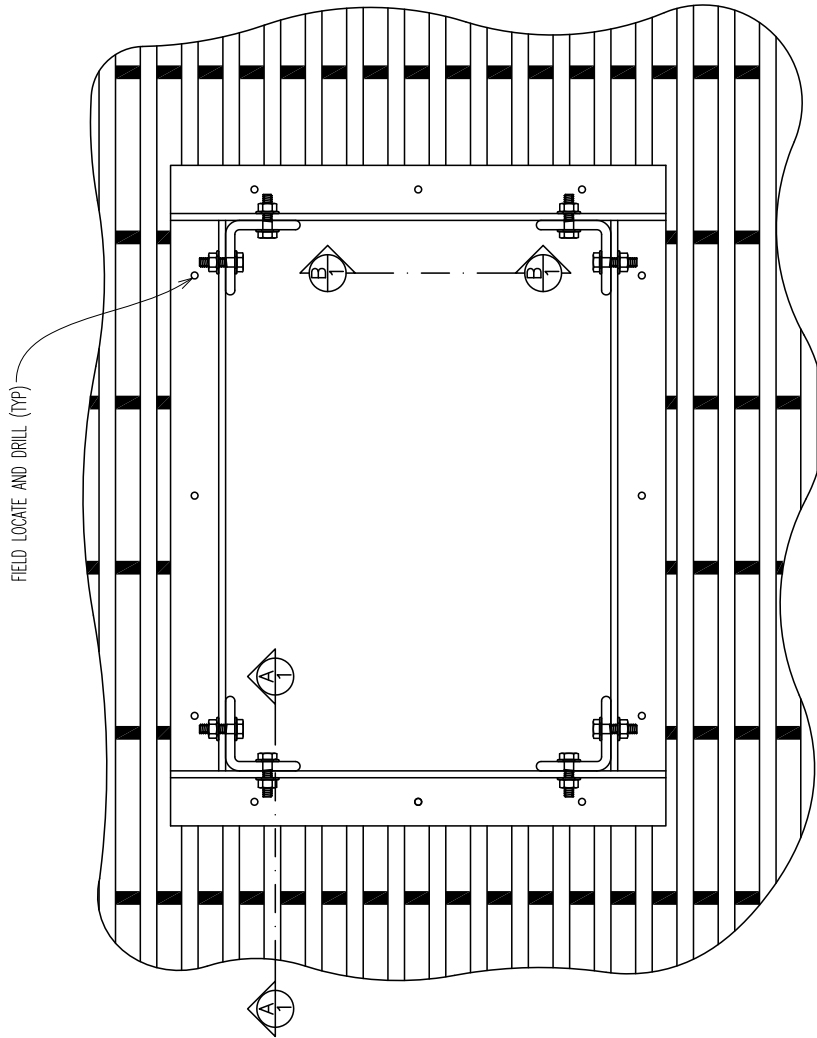
www.cdtusa.net/index.htm

www.tuncomfg.com

www.akutt.info

www.lbifiberglass.com

www.hilti.com



DATE	BY	REVISION	NO.

STRONGWELL
 Chatfield Division
 1610 Highway 52 South, Chatfield, MN 55923-0799
 Telephone: (507) 567-3478 FAX: (507) 567-4831

DRAWN FOR: J. FINLEY

DRAWING NAME: RP ATTACHMENT DETAIL

DRAWN BY: CJC CUSTOMER P.O. #:

CHKD BY: DWG SIZE: B

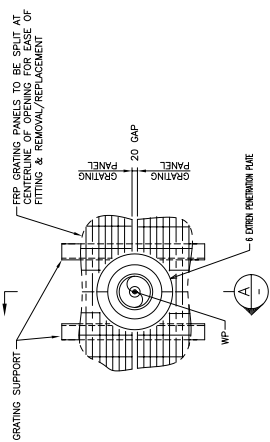
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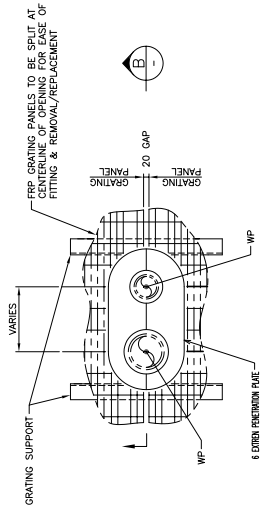
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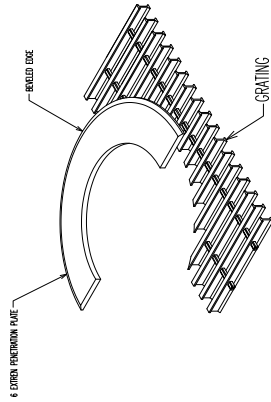


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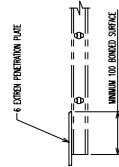
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FRP GRATING ONLY



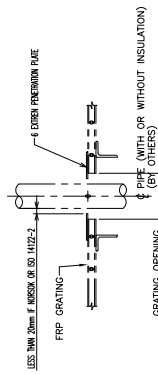
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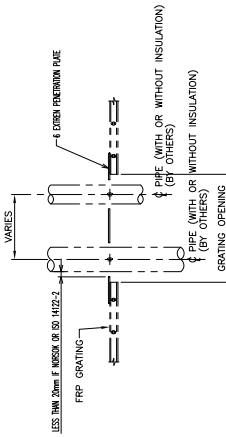
DETAIL OF PENETRATION PLATE



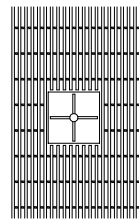
BONDING DETAIL
SUGGESTED ANCHOR SWITCH 110% OF APPROX. LOAD (BY OTHERS)



SECTION A-A

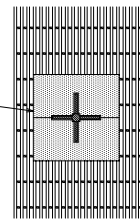


SECTION B-B

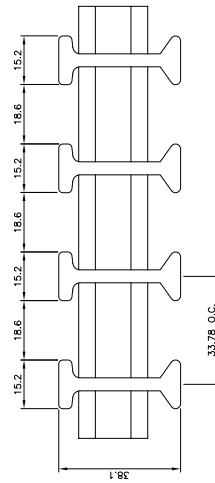


DESIGNED OVERHEAD SUPPORT SCENE - TRIP ALARMS

FIELD WITH PENETRATION PLATE
AROUND JOISTES AND TOP
SURFACE SCENE A

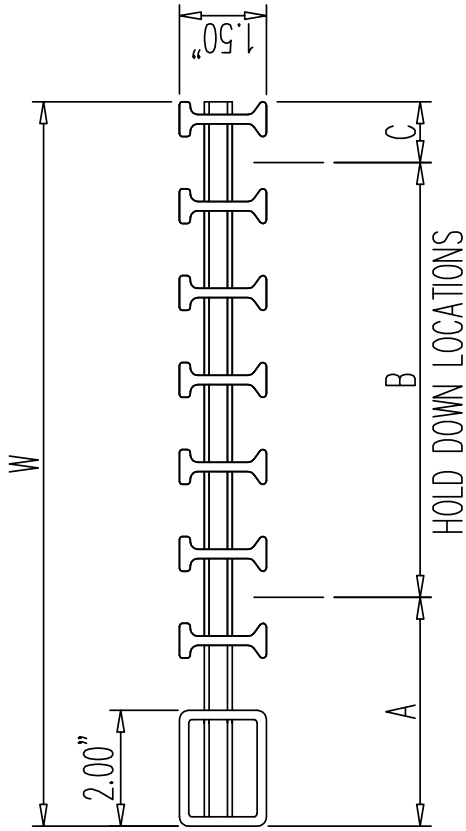


FINISHED INSTALLATION



DETAIL OF FRP GRATING
DURAGRID PHENOLIC I-5500 38mm

CONFIDENTIAL AND PROPRIETARY INFORMATION	
Company Name	FRP GRATING
Company Address	1000 W. 10th Street, Suite 100, Fort Worth, TX 76102
Company Phone	(817) 731-1111
Company Fax	(817) 731-1112
Company Email	sales@frpgrating.com
Company Website	www.frpgrating.com
Company Logo	
Company Name	FRP GRATING
Company Address	1000 W. 10th Street, Suite 100, Fort Worth, TX 76102
Company Phone	(817) 731-1111
Company Fax	(817) 731-1112
Company Email	sales@frpgrating.com
Company Website	www.frpgrating.com

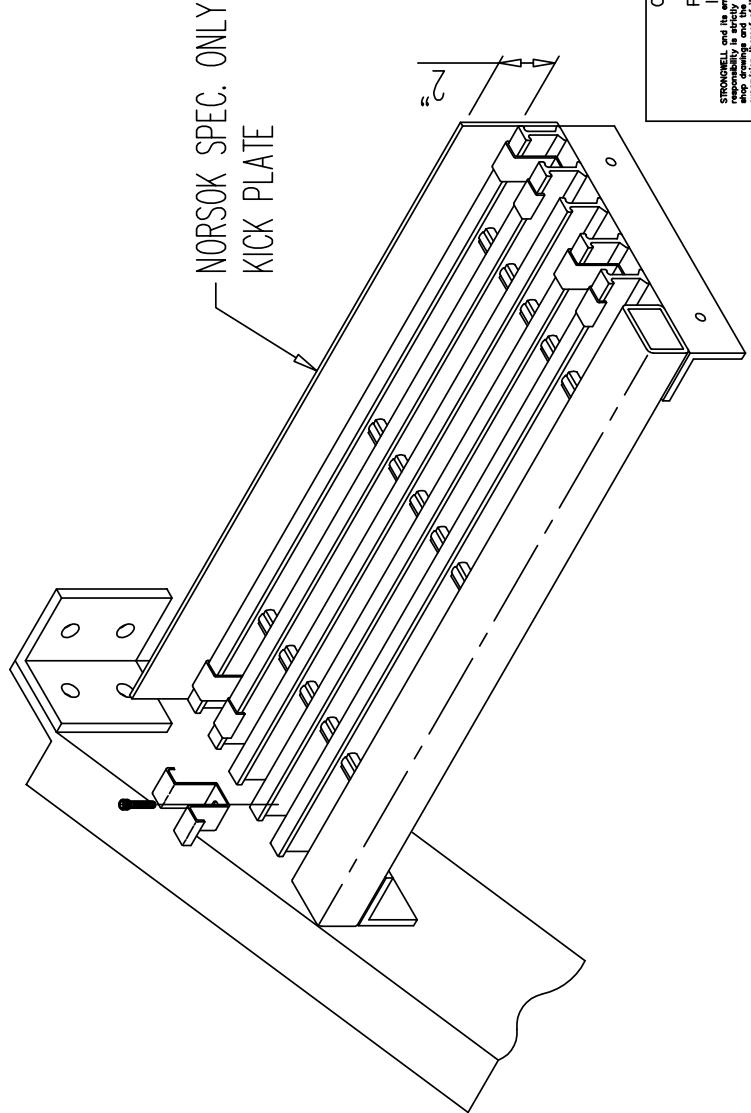


GRATING SERIES -4800 (1.161 o.c.)			
W	A	B	C
6.64	3.44	2.32	.88
7.80	3.44	3.48	.88
8.97	3.44	4.64	.88
10.13	3.44	5.80	.88
11.29	3.44	6.96	.88

GRATING SERIES -5500 (1.33 o.c.)			
W	A	B	C
5.99	3.69	1.33	.96
7.32	3.69	2.66	.96
8.65	3.69	3.99	.96
9.98	3.69	5.32	.96
11.31	3.69	6.65	.96

GRATING SERIES -6000 (1.5 o.c.)			
W	A	B	C
6.50	3.95	1.50	1.05
8.00	3.95	3.00	1.05
9.50	3.95	4.50	1.05
11.00	3.95	6.00	1.05
12.50	3.95	7.50	1.05

GRATING SERIES -6500 (1.71 o.c.)			
W	A	B	C
7.13	4.27	1.71	1.16
8.84	4.27	3.42	1.16
10.55	4.27	5.13	1.16
12.26	4.27	6.84	1.16
13.97	4.27	8.55	1.16



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 DURADEK® - DURAGRID®

DRAWING NUMBER
 NAD-400

