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22 Cortlandt Street, 31st Floor
New York, NY 10007
Tel (212) 608-3990 Fax (212) 566-5059

March 8, 2018

GCT Bayonne, LP
302 Port Jersey Blvd
Jersey City, NJ 07305

Attention: Mr. Guy Buzzoni

Reference: Greenville Yard Intermodal Container Transfer Facility, Jersey City, NJ

Subject: ICTF Trailer – Storm Tie Down Pull Out Test

Dear Mr. Buzzoni:

Per your request, CH2M HILL, Inc. witnessed a structural pull-out (load) test for the storm tie downs at the Greenville Yard Intermodal Container Transfer Facility (ICTF) trailer on February 22, 2018. The purpose of the load test was to identify the rated in-situ strength for one of the sixty-eight (68 ea.) storm tie downs installed around the perimeter of the trailer at the referenced project site when pulled at a forty-five degree angle relative to the pavement surface.

Background

In January 2018, Anchor Modular Buildings (Anchor) placed the Greenville Yard ICTF trailer, composed of six individual trailer modules, into position per the construction documents associated with the referenced project (Photo 1). According to calculations performed by Anchor's foundation engineer, a minimum of 68 storm tie downs were required to structurally support the trailer to the ICTF asphalt pavement per design criteria outlined in the project's design documents. The minimum required load capacity of each tie down, noted on the ICTF Trailer Foundation Plan provided by Anchor, is 1,889 lbs, and the project's design documents specify that certified tie down details and calculations be provided by the Contractor selected to install the structure. Absent these documents, Anchor agreed to perform an in-situ load test of anchors installed adjacent to the ICTF trailer (test anchors).

Description of Storm Tie Down Assembly

Each storm tie down assembly at the ICTF Trailer consists of an Asphalt Anchor Corp. Bolthold SP12 anchor fitted with a Home Pride HP12LS steel tension head, a Home Pride SP22 frame clamp, and Home Pride HP40 1-1/4 in. wide galvanized steel strapping, detailed on the ICTF

Trailer Foundation Plan (Photo 2). The SP22 frame clamp is used to secure the strapping to the trailer chassis, and a Home Pride HPAB 1/2 in. diameter knurled bolt, inserted horizontally through one of the holes in the tension head, is used to secure the strapping to the SP12 anchor. Each SP12 anchor is secured through 12 in. of asphalt over a compacted densely graded aggregate base course via. Quickcrete Anchoring Cement (No. 1245). A detail for the pavement placed beneath the ICTF Trailer is presented in Figure 1 below.

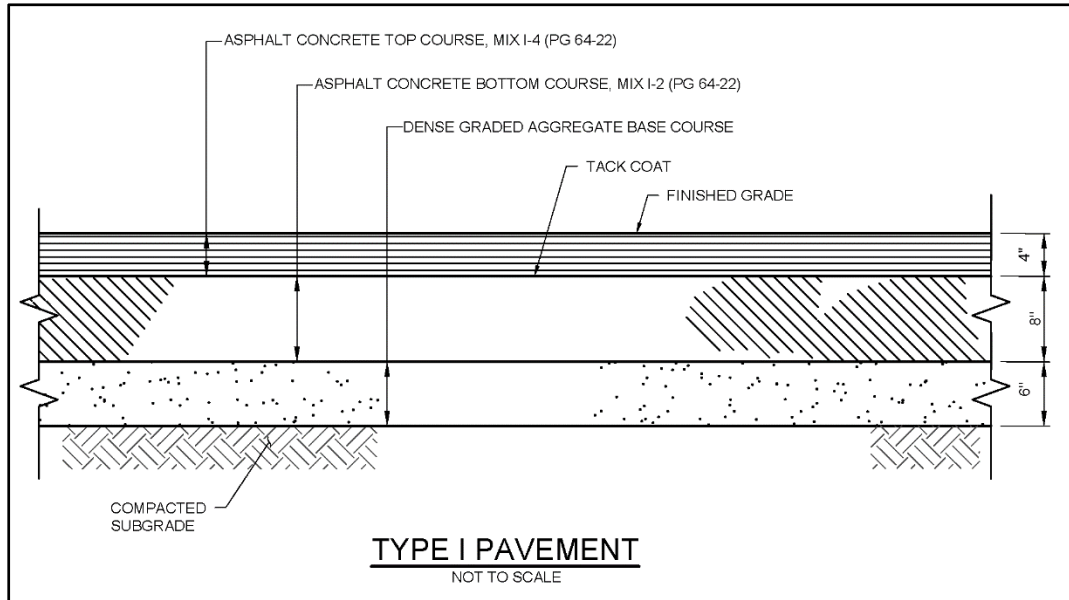


Figure 1
Pavement Detail beneath the Greenville Yard ICTF Trailer

The SP12 anchor consists of a 12 in. long by 5/8 in. diameter tube constructed from zinc plated steel. Each anchor contains a 1-1/4 in. x 3/8 in. mounting bolt threaded into a 1-3/8 in. diameter washer and bolt sleeve assembly welded to the top of the anchor. The load rating of the storm tie down assembly, governed by the pull-out resistance of the SP12 anchor installed per manufacturer's instructions, is 2000 lbs in shear when pulled parallel to the asphalt pavement surface. The manufacturer's representative during the test indicated this anchor rating is for short term loads such as wind gusts rather than sustained long term loads. The correct load rating of the strapping is unclear. A 4725 lb rating is indicated in the Home Pride product catalog and a 3150 lb rating is indicated on the ICTF Trailer Foundation Plan. However, both values are above the minimum required load of each tie down assembly provided by Anchor.

Test Anchor Installation

On February 13, 2018, Anchor installed a total of three SP12 test anchors spaced approximately 3 ft apart approximately 15 ft west of the ICTF Trailer location (Photo 3). A 7/8 in. diameter hole was drilled into the asphalt to install the test anchors. A thermometer was lowered into one of the three test holes prior to installing the test anchors and measured 48.8F degrees, and the same Quickcrete cement used to install the sixty-eight trailer anchors was also used to set the test anchors (Photo 4). Weather and temperature conditions during the test anchor installation were approximately 45F degrees and dry, and was similar to what was encountered during the installation of the 68 storm tie down assemblies.

Load Test Equipment and Procedures

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On February 22, 2018, Anchor performed a load test on each of the test anchors and structurally loaded them in tension to failure. To perform the tests, a fork lift was stationed adjacent to the test anchors to provide reactive support for the test assemblies. A 3-Ton come-along and a 25,000 lb dynamometer were secured in-line to the fork lift carriage and were chained to a scrap piece of I-Beam mounted on the fork lift's forks. During the load tests, the forks and I-Beam were raised to achieve a strapping angle similar to the assembled angle of the 68 storm tie downs, at approximately 45 degrees to the pavement surface.

The test anchors were numbered sequentially from north to south for testing purposes. For the first load test, at test tie down No. 1, the same 1-1/4-in.-wide steel strapping and SP22 frame clamp was used to connect the test anchor to the I-Beam (Photo 5). For the successive load tests, steel chain, rated at 6000 lbs, and steel braided cable eyes were used in place of the strapping and frame clamp, and the steel chain and cable assembly was secured directly to the 1/2 in. diameter knurled bolt at the HP12LS tension head (Photo 6). Each test tie down was increasingly loaded in approximately 500 lb increments for one minute until the test was terminated, or failure of one of its components occurred.

Load Test Results

At test tie down No. 1, the SP12 anchor, HP12LS tension head, and SP22 frame clamp and strapping assembly were incrementally loaded to failure, which occurred at approximately 1975 lbs. The failure component was the steel strapping, and the failure occurred due to shear stress at the strapping eye, where the strapping connects to the HP22 frame clamp (Photos 7 and 8). No displacement or evidence of overstress was observed at the test anchor and tension head assembly during the test. The SP22 frame clamp and strapping were replaced with steel chain and braided cable eyes for all successive load tests.

To continue the load testing and identify the strength of the test anchor and tension head assemblies, the test components were repositioned at test tie down No. 2, prior to returning to test tie down No. 1.

At test tie down No. 2, the SP12 anchor, HP12LS tension head, and steel chain and braided cable eye assembly were incrementally loaded to failure, which occurred at greater than 5000 lbs (Photo 9). The failure component was the SP12 mounting bolt sleeve, and the failure occurred due to shear stress at approximately 0.93 in. from the top of the mounting bolt washer (Photos 10 and 11).

To effectively quantify the ultimate strength of the remaining two test anchor and tension head assemblies in relation to the published pull-out resistance of the SP12 anchor, the remaining load tests were limited to two times the SP12 pull-out resistance, at 4000 lbs.

At test tie down Nos. 1 and 3, the SP12 anchor, HP12LS tension head, and steel chain and braided cable eye assembly were incrementally loaded to 4000 lbs. At this load, minor displacement up to 1/8 in. of the washer and bolt sleeve assemblies was evident (Photo 12). The load test data for test tie down Nos. 1 through 3 are presented in Table 1 below.

Table 1 – Greenville Yard ICTF Trailer Storm Tie Down Load Test Data

Test Tie Down No. ¹	Test Load (lbs) ^{2,3}	Load Duration (m-ss)	Notes
1	554	3:00	
	1060	1:13	
	1516	1:02	
	1975	-	Strapping eye sheared at I-Beam connection while loading, at 1975 lbs.
1	500	1:00	Retested. Strapping removed and anchor secured to dynamometer with 6000 lb steel chain and cable.
	1202	1:00	
	1650	1:00	
	1990	1:00	
	2510	1:00	
	3090	1:00	
	3520	1:00	
	4020	1:00	Load test terminated. Minor displacement of anchor mounting bolt washer and sleeve. ⁴
2	494	1:00	
	1040	1:00	
	1476	1:00	
	2002	1:00	
	2500	1:00	
	3080	1:00	
	3500	1:00	
	4080	1:00	
	4480	1:00	
	4926	1:00	
	>5000	-	Mounting bolt sleeve sheared approximately 0.93 in. from top of mounting bolt washer.
3	500	1:00	
	1016	1:00	
	1560	1:00	
	1992	1:00	
	2484	1:00	
	2990	1:00	
	3510	1:00	
	3976	1:00	Load test terminated. Minor displacement of anchor mounting bolt washer and sleeve. ⁴

Notes:

¹ Test tie downs numbered sequentially from north to south.

² Test tie downs were incrementally loaded in tension at approximately 500 lb intervals.

³ Loading angle was approximately 45 degrees from the horizontal pavement surface.

⁴ Load test was terminated at two times the rated pull-out resistance of the anchor, at 4000 lbs.

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Conclusions

Testing of tie down nos. 1, 2, and 3 indicated the pull-out resistance of the SP12 anchor and tension head assembly was found to be at least 4,000 pounds when loaded at forty-five degrees to the horizontal pavement surface, or two times the minimum required 1,889 lb load capacity of the tie down assembly required.

Testing of tie down no.2 to failure indicated the ultimate pull-out capacity of the SP12 anchor, was greater than 5000 lbs due to failure of the tension head assembly.

The testing of tie down No. 1 revealed that the 1-1/4 in. wide steel strapping used to secure the test anchor to the trailer chassis met the minimum required load capacity of the tie down assembly, at 1,889 lbs for this application, but did not meet the manufacturer's published or design load ratings for this component.

Should you have any questions, please do not hesitate to contact the undersigned.

Respectfully Submitted,

CH2M HILL, Inc.



Stephen J. LoPorcaro, P.E.
Resident Engineer

c. Robert Shulte (CH2M), Bill Papis (CH2M), Ken Klim (GCT)
SL/sl

Attachments: ICTF Trailer Foundation Plan, AAC SP12 Datasheet, Home Pride Equipment Cut Sheets, Quickrete Anchoring Cement Data Sheet, Dynamometer Calibration Certificate

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Photo 1 Overall view of the Greenville Yard ICTF Trailer, looking southeast.



Photo 2 View of typical storm tie downs at the Greenville Yard ICTF Trailer.



Photo 3 Anchor Modular Buildings installing a test anchor.



Photo 4 View of three SP12 test anchors installed adjacent to the ICTF Trailer, numbered 3, 2, 1 from left to right.

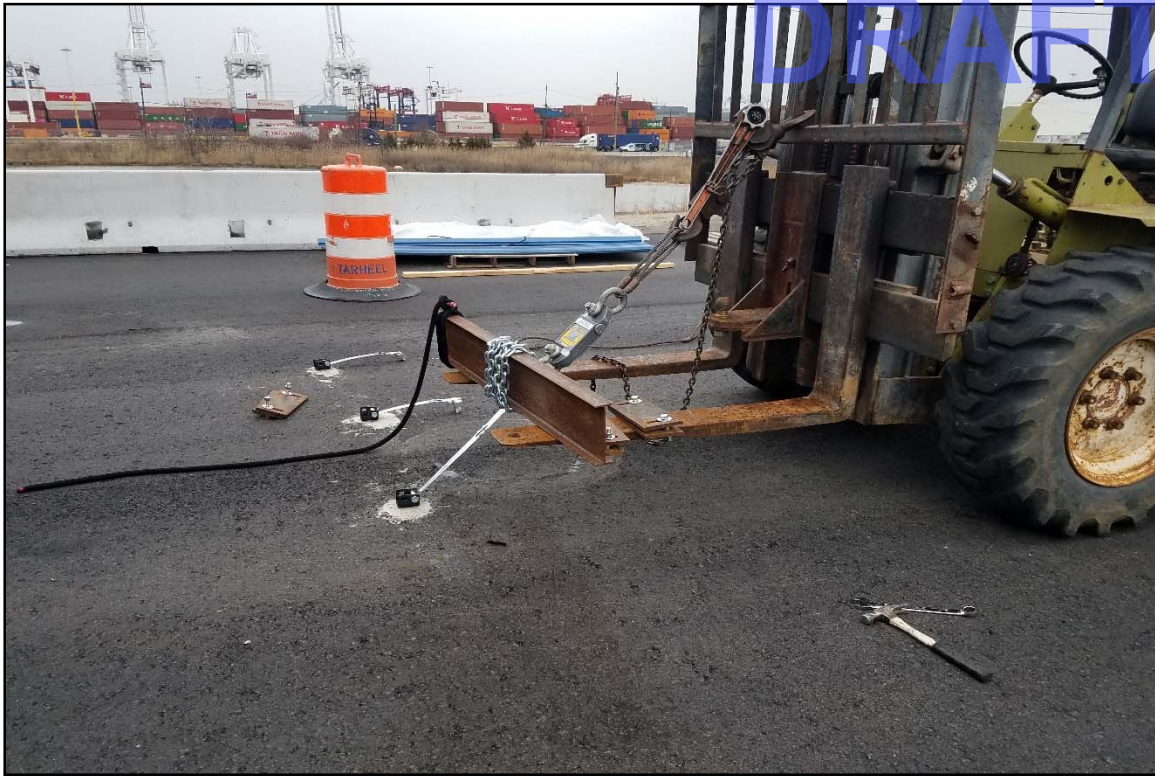


Photo 5 View of SP22 frame clamp and strapping assembly attached to the SP12 anchor.

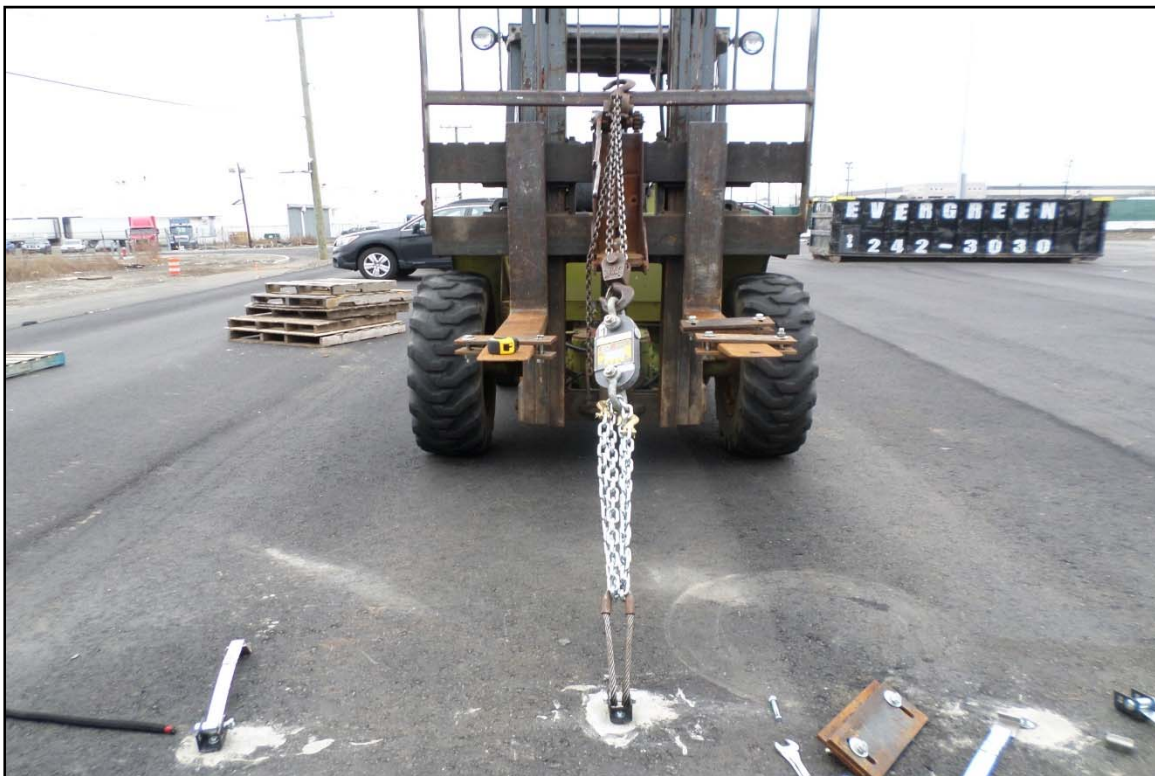


Photo 6 View of steel chain and cable assembly attached to the SP12 anchor.

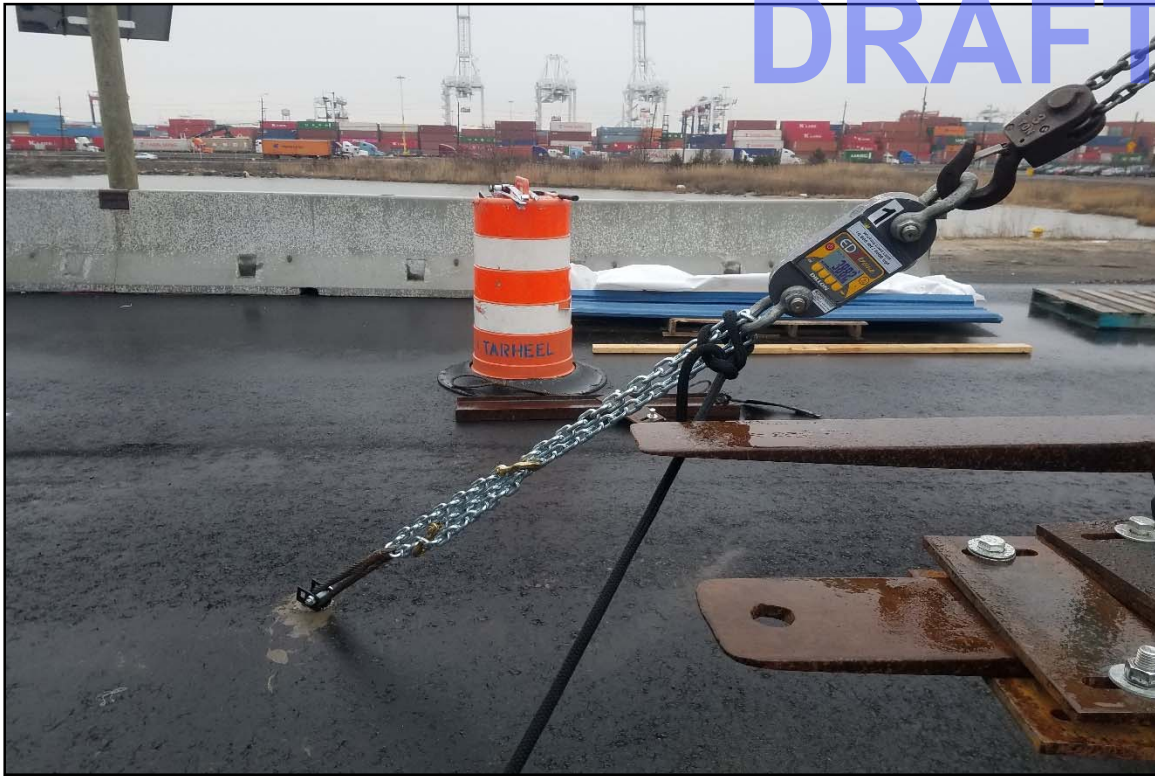


Photo 9 View of test tie down No. 2 during load test.



Photo 10 Looking down at broken mounting bolt sleeve at test tie down No. 2.



Photo 11 Close-up of broken mounting bolt sleeve from test tie down No. 2.

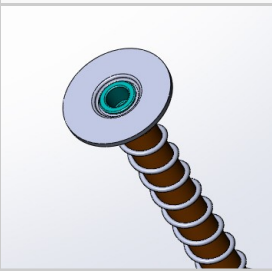


Photo 12 Close-up of 1/8 in. displacement of washer and bolt sleeve assembly at test tie down No. 1.

ATTACHMENTS

Overview Asphalt Anchors Corp. has developed the **BoltHold SP** family of ground anchors suitable for mounting structures to asphalt surfaces. The SP12 anchors are 12" (30 cm) long and 5/8" (18 mm) in diameter. They are available with a 3/8"-16 UNC female thread (model SP12-38) or M8x1.25 mm female thread (model SP12-M8).

Description The SP12 is constructed from Zinc plated steel. A thick-walled 14 mm tube is the backbone of the anchor. The bottom is flared and sealed to act as a wedge when driving the anchor into the ground. The top incorporates a welded thread and a large washer.

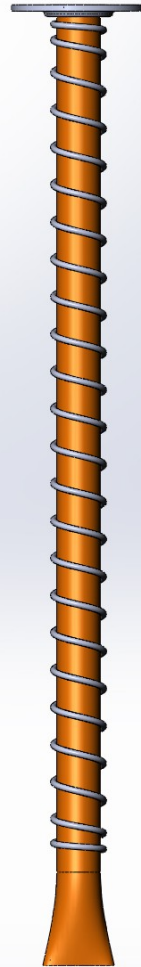


The washer prevents the anchor from dropping through the hole below the surface. The washer also prevents *static* pull forces on the anchor when the structure is attached

to the anchor. Such forces are likely if the head of the anchor is smaller than the hole in the base of the structure being attached; in the latter case, as the bolt is tightened, the anchor is pulled up into the base.

About Asphalt: Asphalt is a relatively weak surface, and care must be taken when installing structures to that surface. This is particularly the case when the asphalt is less than 5" (12 cm) thick, as is the case in many parking lots and driveways.

A significant increase in the installed anchor strength can be obtained from the gravel surface **below** the asphalt. The compacted gravel naturally resists sideways forces (shear). Bonding the length of the anchor to the gravel using grout also adds resistance to



pull forces on the anchor.

Force Rating The resistance of the installed anchors to extraction depends greatly on the nature of the asphalt and the gravel below it. The SP12 are pull-rated for **2,000 lb.** (950 Kg or 10KN) if installed using a 7/8" (22 mm) hole and a recommended grout. At ground level, the installed anchors can resist 2,000 lb. (950 Kg) of shear force (see note 1).

The anchors are also designed to resist rotational torque. Torque is generated when tightening the bolt into the anchor. Excessive torque will break the bond between the anchor and the asphalt, or it will damage the internal thread or weld in the anchor. The SP12 is rated for a torque of **200 lb-in.**

To find out if the anchors are suitable for your application, the only reliable way is to make a test installation of at least one anchor. You will be able to leave the anchors in place after the test without the need to remove them as they are flush with the roadway surface.

Grout Selection The term "grout" is used here in a broad meaning; the actual materials can be concrete, adhesives, epoxies and the like.

In general, the grout must be self-leveling (meaning that it flows easily, to fill in all the crevices and voids). It must cure to a hard material and must be immune to extended exposure to water and temperature fluctuations.

The most cost effective anchoring results are achieved using an expanding concrete mix labeled as "Anchor Cement". You will need 12 oz (360 cc) of mixture per anchor. The grout is available from AAC as the EPX2, in self contained packages that covers one anchor or in pails that cover 22 anchors.



10 Ridge Rd, West Orange, NJ 07052 USA

Tel: 1.973.669.8214

Fax: 1.973.669.5161

email: marketing@asphaltanchors.com

WEB: www.asphaltanchors.com

A cartridge-type epoxy is available in the market which works well but is 10 times more expensive. Do not use Kwixset or Rockite as these are not suitable for wet applications.

Installation The installation requires drilling a 7/8" (22 mm) hole, 12" (300) mm deep, into the asphalt and the gravel below it. The hole is filled with grout and the anchor is dropped in. The anchor is ready for use in 15 minutes (depending on the grout and ground temperature).

Always consult the latest installation instructions before installing these anchors. A comprehensive installation manual is available on our web site under "Library". The online manual is updated regularly to reflect the availability of grouts, new installation techniques and user feedback.

Packing

The **BoltHold SP12** anchors are packaged 6 anchors to a "set" carton. 9 Sets are packaged in a master carton (which holds 54 SP12).

Tariffs

The SP12 are shipped under schedule 60. HTS code (export) 7318.19.0000

RELATED PRODUCTS

SP10-38 is a 6" version of the SP12-38.

Security Bolts AAC offer a selection of security bolts for use with the SP12-M8, along with a special wrench.

Grout, washer, bolts AAC offers specially selected bolts, washers and grout packages as a convenience for the installer. See our web site and e-store for details.

Anchor Metrics	
Anchor Length	309 mm
Anchor body diameter	18 mm
Anchor washer diameter	43 mm
Washer thickness	2 mm
Anchor weight	0.2 Kg
Internal thread SP12-M8	M8 x 1.25 mm
Internal Thread SP12-38	3/8"-16 UNC
Maximum bolt length	250 mm
Finish	Zinc Plate
Typical pull resistance	10KN (950 Kg) (2000 lb)
Part Number, SP12-38	01-6315.38
Part Number, SP12-M8	01-6315.M8

Kit Packing Information	
Number of anchors per Set	6
Set Carton dimensions, mm	335 x 107 x 84
Set Carton dimensions, inch	13.2 x 4.2 x 3.3"
Set Carton weight	1.6 Kg 3.5 lbs
Set Carton Volume	0.003 CBM
Number of anchors per Master	54
Master Carton dimensions, mm	353 x 338 x 285
Master Carton dimensions, inch	13.9 x 13.3 x 11.2
Master Carton Weight	14.5 Kg 32 lb.
Master carton Volume	0.038 CBM

Note 1: When installing anchors close together, derate the pull strength of the additional anchors by 6% for every 1 inch less than 12. Thus an arrangement of 4

anchors at 4" apart will resist a total pull force of 5,120 lbs (2,000 + (3 x (52% x 2000))).



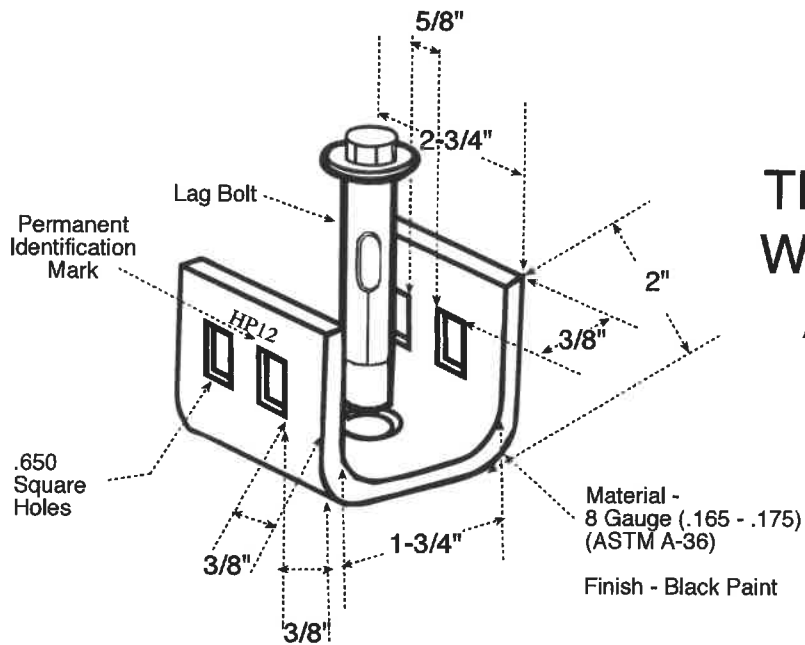
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email: marketing@asphaltAnchors.com

WEB: www.asphaltAnchors.com



HP12LS TENSION HEAD WITH LAG BOLT AND SHIELD



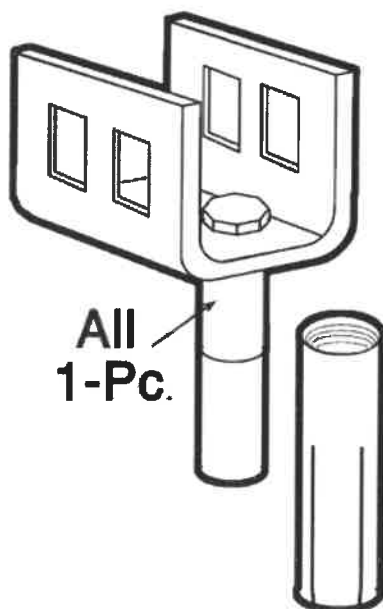
Material -
8 Gauge (.165 - .175)
(ASTM A-36)
Finish - Black Paint

INSTALLATION INSTRUCTIONS

1. Drill 5/8" x 3" hole in concrete slab.
2. Place sleeve over the expansion bolt and place into the drilled hole.
3. Place the washer and nut on top of the expansion bolt and tighten to maximum expansion of the sleeve. Remove nut and washer.
4. Place HP12 head over top of expansion bolt, then place washer and nut on top of HP12 and expansion bolt. Tighten nut.

- ◆ For dry concrete applications.
- ◆ Engineer certifications on file.

Note: Concrete slab must be a minimum of 4" thick, 2500 PSI, allowing 4750 lbs. vertical tension on anchor without lifting the slab.



HP12DA TENSION HEAD WITH LAG BOLT, SHIELD & SLEEVE

INSTALLATION INSTRUCTIONS

1. Drill 5/8" x 3" hole in concrete.
2. Place sleeve in drilled hole.
3. Screw anchor head and bolt assembly into the sleeve until maximum expansion.

Note: Concrete slab must be a minimum of 4" thick, 2500 PSI, allowing 4750 lbs. vertical tension on anchor without lifting the slab.

- ◆ For dry concrete applications.
- ◆ Engineer certifications on file.

ANCHORING CEMENT – EXTERIOR USE

PRODUCT NO. 1245-81

DIVISION 3

Cementitious Grouting
03 61 00

PRODUCT DESCRIPTION

QUIKRETE® Anchoring Cement – Exterior Use is a rapid-setting, high strength, shrinkage compensated, commercial grade construction product suitable for use in continuously wet environments.

PRODUCT USE

QUIKRETE® Anchoring Cement – Exterior Use expands slightly as it hardens, to fill voids and lock itself securely into place. This product is suitable for use with appliances, bolts, motors, posts, hooks, handrails, conveyors, pipes and conduits. Also may be used for fences, parking meters, columns, ornamental iron work, seats, signs, rods, racks, and door stops.

SIZES

- QUIKRETE® Anchoring Cement – Exterior Use is available in:
 - 10 lb (4.5 kg) pails
 - 20 lb (9.1 kg) pails
 - 50 lb (22.7 kg) pails

YIELD

- Each 50 lb (22.7 kg) pail of QUIKRETE® Anchoring Cement – Exterior Use will yield approximately 0.42 cu ft (12 L).

TECHNICAL DATA

APPLICABLE STANDARDS

ASTM International

- ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- ASTM C191 Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
- ASTM E488 Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

APPROVALS

QUIKRETE® Anchoring Cement - Exterior Use is suitable for a wide range of construction applications. Consult manufacturer for current information on specific agency or code approvals.

PHYSICAL/CHEMICAL PROPERTIES

Typical results obtained with QUIKRETE® Anchoring Cement - Exterior Use, when tested in accordance with applicable standards, are shown in Table 1. Test reports are available to qualified design professionals upon request.

FIRE RATING

Contains no combustible materials.



TABLE 1 TYPICAL PHYSICAL PROPERTIES

Property	Values
Setting time, ASTM C191	10 - 30 minutes, final set
Compressive strength, ASTM C109	2000 psi (13.8 MPa) @ 2 hours 4000 psi (27.6 MPa) @ 24 hours 6000 psi (41.4 MPa) @ 7 days 7000 psi (48.3 MPa) @ 28 days
Pull-out strength, ASTM E488 ¹	14,100 lb-force (6395 kg-force) @ 24 hours 21,000 lb-force (9525 kg-force) @ 28 days

¹Tested with a 1/2" (12.7 mm) diameter threaded bolt embedded to a depth of 8" (203 mm) in a 2" (51 mm) diameter hole which was bored in concrete with a compressive strength of approximately 4000 psi (27.6 MPa).

INSTALLATION

SURFACE PREPARATION

- Handle and store QUIKRETE® Anchoring Cement - Exterior Use according to QUIKRETE® recommendations and label directions
- Use a masonry core drill or chisel to create a hole in the concrete
- Hole should be at least 1" (25.4 mm) larger than the size of bolt or railing. Hole should be at least 2" - 4" (51 - 102 mm) deep. Increasing embedment depth will increase pullout strength
- Remove all loose concrete and debris from hole
- Dampen hole prior to pouring QUIKRETE® Anchoring Cement, but do not leave standing water in bottom of hole

METHODS

- Use clean container and clean water
- Mix by combining approximately 5 parts QUIKRETE® Anchoring Cement - Exterior Use with 1 part water for a pourable mixture
- Pour powder into water and mix vigorously

- Reducing amount of water will yield a putty-like consistency for vertical applications
 - Pour mixed material into hole or void to slightly above floor level
 - Hold bolt or post in place until material begins to stiffen
- Note - No special curing is required.

PRECAUTIONS

- Mix only enough QUIKRETE® Anchoring Cement - Exterior Use to be used within 10 minutes
- Some dusting may occur during mixing process. Fresh cement mixtures may be irritating to skin. Wash skin exposed to fresh cement with clean water. Consult Material Safety Data Sheet (MSDS). Wear eye protection and appropriate safety equipment and clothing.

WARRANTY

The QUIKRETE® Companies warrant this product to be of

merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE® Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

The QUIKRETE® Companies
One Securities Centre
3490 Piedmont Rd., NE, Suite 1300, Atlanta, GA 30305
(404) 634-9100 • Fax: (404) 842-1425

** Refer to www.quikrete.com for the most current technical data, SDS, and guide specifications*