

REQUESTED COMMISSION ACTION:

Consent Ordinance Resolution Consideration Workshop

SHORT TITLE OR MOTION: A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF POMPANO BEACH, FL, APPROVING AND AUTHORIZING THE PROPER CITY OFFICIALS TO EXECUTE A CONSTRUCTION AGREEMENT BETWEEN THE CITY OF POMPANO BEACH AND DP DEVELOPMENT OF THE TREASURE COAST, LLC; PROVIDING AN EFFECTIVE DATE (\$183,375.00)

Summary of Purpose and Why:

The City of Pompano Beach experiences periodic flooding along Riverside Drive, partially due to the Intracoastal Waterway flowing in reverse through the stormwater outfalls and out through the drainage basins, especially during extreme lunar tides. In order to reduce the flooding, flow operated check valves are required to be installed at five (5) outfall locations along South and North Riverside Drive. DP Development of the Treasure Coast, LLC was selected per Request for Proposals E-53-14, to design, permit and install these check valves for this project.

Attached is the Construction Contract along with the following exhibits: Exhibit A: Plans and Submittals, Exhibit B: Conditions of the Contract, Exhibit C: Contract Breakdown, Exhibit D: Partial Waiver of Lien and Affidavit of Payment Form, and Exhibit E: Final Waiver of Lien and Affidavit of Payment Form.



Accomplishing this item supports achieving Initiative 1.6, "Improve Stormwater disposal and treatment process" identified in the City's Quality and Affordable Services Strategy.

QUESTIONS TO BE ANSWERED BY ORIGINATING DEPARTMENT:

- (1) Origin of request for this action: Staff, Stormwater Master Plan
- (2) Primary staff contact: A. Randolph Brown / John Sfiropoulos, P.E. Ext 7044 / 7009
- (3) Expiration of contract, if applicable: _____
- (4) Fiscal impact and source of funding: CIP 14-235, Account No. 425-7513-538.65-12, \$183,375.00

DEPARTMENTAL COORDINATION	DATE	DEPARTMENTAL RECOMMENDATION	DEPARTMENTAL HEAD SIGNATURE OR ATTACHED MEMO NUMBER
Utilities	<u>5-14-15</u>	APPROVE	<u>[Signature]</u>
City Attorney	<u>5/15/15</u>	APPROVE	<u>[Signature]</u>
Finance	<u>5-14-15</u>	APPROVE	<u>[Signature]</u>
Budget	<u>5/18/15</u>	APPROVE	<u>[Signature]</u>

Advisory Board
 Development Services Director
 City Manager [Signature]

[Signature]

ACTION TAKEN BY COMMISSION:

Ordinance	Resolution	Consideration	Workshop
1st Reading	1st Reading	Results:	Results:
_____	_____	_____	_____
2nd Reading	_____	_____	_____
_____	_____	_____	_____



City Attorney's Communication #2015-933

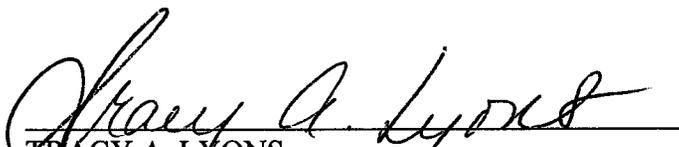
May 1, 2015

TO: Alessandra Delfico, P.E., City Engineer
FROM: Tracy A. Lyons, Assistant City Attorney
RE: Resolution – Construction Agreement
DP Development of the Treasure Coast, LLC

Pursuant to your request, I have prepared and attached the following captioned resolution:

A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF POMPANO BEACH, FLORIDA, APPROVING AND AUTHORIZING THE PROPER CITY OFFICIALS TO EXECUTE A CONSTRUCTION AGREEMENT BETWEEN THE CITY OF POMPANO BEACH AND DP DEVELOPMENT OF THE TREASURE COAST, LLC; PROVIDING AN EFFECTIVE DATE.

Please feel free to contact me if I may be of further assistance.


TRACY A. LYONS

/jrm
l:cor/engr/2015-933

Attachment

RESOLUTION NO. 2015-_____

CITY OF POMPANO BEACH
Broward County, Florida

A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF POMPANO BEACH, FLORIDA, APPROVING AND AUTHORIZING THE PROPER CITY OFFICIALS TO EXECUTE A CONSTRUCTION AGREEMENT BETWEEN THE CITY OF POMPANO BEACH AND DP DEVELOPMENT OF THE TREASURE COAST, LLC; PROVIDING AN EFFECTIVE DATE.

BE IT RESOLVED BY THE CITY COMMISSION OF THE CITY OF POMPANO BEACH, FLORIDA:

SECTION 1. That an Agreement between the City of Pompano Beach and DP Development of the Treasure Coast, LLC, a copy of which Agreement is attached hereto and incorporated by reference as if set forth in full, is hereby approved.

SECTION 2. That the proper City officials are hereby authorized to execute said Agreement between the City of Pompano Beach and DP Development of the Treasure Coast, LLC.

SECTION 3. This Resolution shall become effective upon passage.

PASSED AND ADOPTED this _____ day of _____, 2015.

LAMAR FISHER, MAYOR

ATTEST:

ASCELETA HAMMOND, CITY CLERK

CONSTRUCTION CONTRACT

This agreement is made on the _____ day of May, 2015, by and between **CITY OF POMPANO BEACH**, a municipal corporation organized and existing under the laws of the State of Florida, having its principal office at 100 W. Atlantic Boulevard, Pompano Beach, Florida, 33060, referred to below as "owner," and **DP Development of the Treasure Coast, LLC**, a Florida corporation, having its principal office at 2240 NW 22nd Street in Pompano Beach, referred to below as "contractor."

In consideration of their mutual promises, the parties agree as follows, intending to be legally bound by this contract:

1. *Contract.* The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated in it. The Contract represents the entire and integrated agreement between the parties to it and supersedes prior negotiations, representations or agreements, either written or oral. The Contract Documents shall not be changed and are not subject to negotiation.

2. *Work.* Contractor agrees to install five Tideflex valves in substantially the format shown in the attached drawings as per the attached quote, which plans are incorporated here by this reference as Exhibit "A," and in accordance with the conditions of the contract attached to this contract as Exhibit "B",. Contractor agrees to furnish all of the materials, equipment, services, personnel and labor and to acquire all permits and approvals required by law to accomplish the work delineated in this contract, the plans, drawings and specifications and the attachments to this contract (referred to below as the "contract documents"). The following shall also apply:

(a) Notwithstanding the above, the following are not included in this contract: asphalt paving, striping, bumpers, fencing, and landscaping.

(b) Contractor shall perform the work in a good and workmanlike manner, promptly and diligently, in accordance with the contract documents and this contract. Unless otherwise specified in the contract documents, contractor shall use new, high-quality materials. Contractor shall furnish materials and labor that are free from faults and defects and which conform to the plans and contract documents.

(c) The work shall result in a finished project in which the additions and renovations match the remainder of the project so that the result is structurally sound and complete facility.

(d) Contractor shall make records and reports and furnish personnel and facilities as required to complete the work, and perform all other obligations required in this contract to be performed by contractor.

(e) Contractor shall obtain all permits and approvals necessary for construction and use of the completed project from any and all governments, boards and agencies. Contractor shall perform the work so that the work and project fully comply with all applicable building, zoning and other applicable codes. The contractor will pay for all such costs, fees and other amounts as part of the cost of performing this contract. Contractor will be reimbursed for all fees associated with all permits, impact fees, insurance, fees and charges levied by or on behalf of any governmental entity relating to the work.

3. Owner designates Michael Taylor as owner's agent for the purpose of this contract, to serve without compensation from either owner or contractor unless expressly approved by the owner's board of directors. Owner authorizes owner's agent to communicate with contractor, to inspect the work from time to time, to receive invoices from contractor, and to approve invoices for payment by owner. Owner's agent is not authorized to increase the contract sum or to issue change orders the net effect of which would increase the contract sum. Owner's agent may issue change orders that add and subtract to a net amount that would not increase the contract sum. In no case may the contract sum be increased above the amount set forth in Paragraph 7 of this contract unless expressly approved by the owner's board of directors.

4. Schedule. Contractor shall commence work under this contract within fifteen (15) days after the date of this contract.

5. The Contractor shall achieve Final Completion of the entire Work not later than 120 calendar days commencing with the date set forth in the NOTICE TO PROCEED as issued by the Owner, subject to adjustments of this Contract Time as provided in the Contract Documents.

6. Contractor's time for completion shall be extended one day for each day of delay caused by acts of God and force majeure; provided however, that contractor must give owner written notice of the delay immediately after occurrence of the act causing the delay. Force majeure means that contractor cannot perform the work due to causes that are both: (a) outside the control of contractor and those working under contractor; and (b) could not be avoided by exercise of due care.

(a) Title. Title to material and equipment furnished by contractor for incorporation in the work covered by this contract shall pass to owner on delivery to the job site. Contractor shall however, nonetheless remain liable for the safekeeping and preservation of the material and equipment, and for loss, theft or damage to it pending completion of the work by contractor and acceptance of the work by owner.

7. *Contract Sum.* Owner shall pay contractor for the performance of the contract the fixed contract sum of \$183,375.00, which is based on the contract breakdown set forth on Exhibit "C" attached to this contract and incorporated by reference.

8. *Progress Payments.* Owner shall make progress payments to contractor in the following manner:

(a) On the first day of every month contractor shall submit an itemized invoice to owner showing the value of the work in place and performed by contractor during the previous month, excluding all values which may have been included in previous invoices submitted by contractor under this contract. The value of the work in place shall be based on the contract breakdown attached to this contract as Exhibit "C" and shall include only line items that have been completed. The itemization shall include the names, work performed, and bills of all laborers, subcontractors, and materialmen performing work on the job. The value of the work in place shall not include materials stored off the construction site. The value of the work in place shall not exceed the contract sum stated in Paragraph 7 above. Contractor shall at the same time furnish to owner properly executed partial waivers of lien and affidavits of payment in the forms of Exhibit "D" and Exhibit "E" attached to this contract from contractor and from all subcontractors, laborers, suppliers and materialmen who have furnished work, equipment or material to the project. The partial completion date in each lien waiver shall be filled in to be the same as the date of contractor's current invoice and not its last invoice. Owner shall have the right to approve or disapprove the amount specified by contractor as the value of work in place, and any dispute shall be submitted to architect for determination of the value of work in place for the purpose of that progress payment.

(b) Within ten (10) days after owner's receipt of the progress payment invoice and all lien waivers/affidavits, owner shall pay to contractor as the progress payment an amount equal to 90% of the value of work in place, but less the total of prior progress payments, so that the total of progress payments shall never exceed 95% of the contract sum is reserved for final payment.

(c) Disbursement of each progress payment by owner to contractor is conditioned on owner's approval of construction after inspection of the work from time to time by owner or owner's agent. Progress payments may be withheld if any of the following occur: (a) work is found defective by owner and not remedied by contractor; (b) contractor does not make prompt and proper payments to subcontractors, laborers and materialmen; (c) contractor does not make prompt and proper payments for labor, materials or equipment furnished; (d) claims of lien are filed; or (e) contractor fails to maintain insurance or otherwise breaches this contract.

(d) Progress payment shall be paid within 45 days after owner's receipt of the progress payment invoice and all lien waivers/affidavits, unless owner disapproves the value of work in place stated in the invoice.

9. *Final Payment.* Owner shall make final payment to contractor within 30 days after all of the following are completely done:

(a) Performance of all of the work by contractor in accordance with the terms of the contract documents is fully completed to owner's satisfaction;

(b) Contractor has performed the items contained on a walk-through checklist or punch list compiled by owner;

(c) Contractor has delivered to owner a final waiver of lien and affidavit of payment, in the form of Exhibit "E" attached to this contract, from contractor and all subcontractors, suppliers and materialmen who have furnished any work or materials to the project, and acknowledging payment in full through the completion of the work;

(d) Contractor has furnished to owner evidence satisfactory to owner as to the payment of all bills for the work; and

(e) Contractor has furnished owner with contractor's statement under oath as required by Fla. Stat. § 713.06(3)(d)(1).

10. OWNER'S RESPONSIBILITIES

(a) Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in orderly progress of the Work.

(b) **OWNER'S RIGHT TO STOP THE WORK** If the Contractor fails to correct any Work, that is not in accordance with the requirements of the Contract Documents or persistently fails to carry out Work in accordance with the Contract Documents, the Owner, by written order signed by the Owner's Representative may order the Contractor to stop the Work, or any portion of it, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity

(c) **OWNER'S RIGHT TO CARRY OUT THE WORK** If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents with due diligence and fails to provide a schedule of repairs and commence the repairs within a period of time, to be determined by the Owner, Owner in its sole discretion, may after such period of time, and without prejudice to other remedies the Owner may have, withhold progress payments until the Contractor substantially completes the repairs cited in the Owner's notice. If the Contractor fails to substantially complete the repairs, the Owner may contract with another contractor for the necessary repairs. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. The Contractor's failure to substantially complete the repairs may, at the Owner's sole discretion, be a reasonable basis for the Owner to terminate the contract.

(d) **OWNER'S RIGHT TO PERFORM WORK AT THE SITE** Contractor shall have the non-exclusive right to perform work at the Project site. The Owner and Owner's Contractors and Subcontractors shall be allowed to work at the Project site, as long as such work does not interfere with the Contractor's work.

11. CONTRACTOR'S RESPONSIBILITIES

(a) The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Owner and Consultant at once. The Contractor shall perform the Work in accordance with the Contract Documents and submittals.

(b) The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents specifically provide otherwise.

(c) The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a Contract with the Contractor.

(d) The Contractor shall be responsible for inspection of portions of Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

12. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

(a) Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required, the way the Contractor proposes to conform to the information given, and the design concept expressed in the Contract Documents.

(b) The Contractor shall review, approve and submit to the Owner Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals made by the Contractor that are not required by the Contract Documents may be returned without actions.

(c) The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the Consultant has approved the respective submittal. Such Work shall be in accordance with approved submittals.

(d) By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related to them, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

13. *Changes.* If Owner desires to make additions, deletions or other revisions in the work after this contract is signed by both Contractor and Owner, contractor agrees that it will fully cooperate with owner in arriving at the basis of compensation for the change, if any, and for any adjustment in the time for performance occasioned by the change. If owner and contractor do not otherwise agree, then the compensation for the change shall be equal to contractor's actual cost of labor and materials plus 15% of those costs for contractor's overhead and profit. Contractor shall not be authorized to proceed with any change in the work unless and until it has been directed by written change order signed by owner and accepted by contractor, specifying the adjustment, if any, in the compensation and time for performance occasioned by this change. Contractor, to the extent possible, shall perform work under change orders concurrently with other work so as not to exceed the required time for completion of work under this contract.

14. *Insurance.* Prior to commencing work under this contract, contractor shall furnish certificates of comprehensive general liability, bodily injury and property damage liability insurance on all automotive or truck equipment to be used in the performance of work under this contract, with limits of no less than \$1,000,000 per person and occurrence for bodily injury and \$1,000,000 per occurrence and aggregate for property damage. Contractor shall also furnish certificates evidencing workers' compensation insurance coverage as required by law, written by an insurance company authorized and qualified to write workers' compensation insurance in Florida. The certificates shall state that the premium for the insurance has been paid and that the insurance company agrees to give owner at least 30 days' written notice prior to termination of the insurance.

15. *Indemnification.* Contractor agrees to indemnify, defend and hold owner and owner's employees, agents, officers and directors harmless from all actions, suits, debts, dues, sums of money, attorney's fees, expenses, property damage, personal injury, third party liability, controversies, damages, penalties, punitive damages, fines, losses, interest, costs, judgments, claims, settlements, and demands, in law or in equity, on or by reason of any matter, cause or thing which relate to or arise from, in whole or in part, the work or any act or omission of contractor or anyone working under by, under or through contractor. This is a continuing obligation that shall survive the termination, expiration and performance of the other provisions of this contract.

Nothing contained herein shall constitute a waiver of sovereign immunity in accordance with Chapter 768.28 Florida Statutes.

It should be noted that the condition of the sea wall is an unknown at the time of this contract. The design of the Tideflex valves being installed by the Contractor is designed to transfer the dead loads to the surrounding pipe as opposed to the wall. Contractor will exercise due care in drilling connections into the wall, and will patch and epoxy connections as needed. However there is no way to test the integrity of these older walls long-term. The contractor assumes no liability for failure of the walls as a result of installation of the Tideflex valves after a period of three (3) years.

16. *Protection of Work and Property.* Contractor shall continuously maintain adequate protection from damage for all its work and for the other property at the jobsite and shall pay

for the replacement or repair of any damage or loss to the work and to owner's property. Contractor shall take precautions to prevent intrusion of water and other natural elements into the work and property.

17. *Default.* Time, orderly progress of work and completion of the work within the time provided for by this contract are the essence of this contract. It is accordingly agreed that Contractor is in default of this contract if any of the following occur:

(a) Contractor at any time and in any respect fails to prosecute the work required by this contract steadily and with such promptness and diligence as deemed necessary to assure completion by the time provided for by this contract; or

(b) Contractor does not complete the construction, installation and other work required by this contract in accordance with the contract documents on a schedule so as to be completed on or before the date provided for in this contract for the completion; or

(c) Contractor fails to perform any of the provisions of this contract and the failure continues for a period of ten (10) *days* after written notice of the failure to perform from owner to contractor.

If Contractor is in default, in addition to any other remedies at law or equity, owner may notify contractor in writing to stop all work and may take possession of the premises and work and of all materials and equipment, other equipment owned by contractor, and complete the unfinished work by any method owner may deem expedient and charge the cost and damages incurred in doing same against the remaining contract sum still unpaid, and if the costs and damages exceed the remaining contract sum still unpaid contractor shall pay owner the difference on written demand.

18. *Warranties.* Contractor guarantees and warrants to owner and its successors and assigns as follows, all of which shall survive the termination, expiration and performance of the other provisions of this contract:

(a) Contractor at its sole cost and expense shall promptly repair, correct or replace any defective materials, equipment and work furnished or performed by contractor or its subcontractors or materialmen which exist within one year after final payment or acceptance of the work by owner;

(b) there shall be no defects in material or workmanship in the work; and

(c) the improvements shall be constructed in a good and workmanlike manner and shall be in compliance with all applicable ordinances, statutes, codes and regulations of local, county, state and federal agencies.

In addition to these warranties of contractor, contractor also transfers and assigns to owner the following:

(a) all manufacturer's and distributor's warranties on the work, fixtures and equipment included in the improvements;

(b) all subcontractors' and materialmen's warranties for their work and material; and

(c) the roof warranty and guarantee of the roofing subcontractor and manufacturer.

19. *Miscellaneous.* This instrument and the contract documents incorporated into it by reference contain the entire contract of the parties. It may not be changed orally but only by a contract in writing or written change order as provided above, which must be signed by the party against whom enforcement of any waiver, change, modification, extension or discharge is sought. This contract shall be interpreted under Florida law and shall be binding on and inure to the benefit of and be enforceable by the respective heirs, personal representatives, successors and assigns of the parties. If there is a breach of this contract and litigation ensues, the prevailing party in the litigation shall be entitled to recover costs and reasonable attorney's fees from the other party. Paragraph headings are inserted only for convenience and are not to be construed as part of the contract or a limitation of the scope of the particular paragraph to which they refer. This contract may be assigned only with the written consent of both parties. The waiver by any party of a breach of any provision of this contract must be in writing and shall not operate or be construed as a waiver of any subsequent breach by any party.

In witness of the above, contractor and owner have signed this contract the date first written above.

“THIS SPACE HAS BEEN INTENTIONALLY LEFT BLANK”

“CITY”:

Witnesses:

CITY OF POMPANO BEACH

By: _____
LAMAR FISHER, MAYOR

By: _____
DENNIS W. BEACH, CITY MANAGER

Attest:

ASCELETA HAMMOND, CITY CLERK

(SEAL)

Approved As To Form:

GORDON B. LINN, CITY ATTORNEY

STATE OF FLORIDA
COUNTY OF BROWARD

The foregoing instrument was acknowledged before me this _____ day of _____, 2015 by **LAMAR FISHER**, as Mayor, **DENNIS W. BEACH** as City Manager and **ASCELETA HAMMOND**, as City Clerk of the City of Pompano Beach, Florida, a municipal corporation, on behalf of the municipal corporation, who are personally known to me.

NOTARY’S SEAL:

NOTARY PUBLIC, STATE OF FLORIDA

(Name of Acknowledger Typed, Printed or Stamped)

Commission Number

"CONTRACTOR":

Witnesses:

M. Cabanad

LLCSignature

[Handwritten Signature]

Signature

By: DP Development of the Treasure Coast,

Print Name Patrick Borrigo

Title: Managing Member



STATE OF Florida
COUNTY OF Broward

The foregoing instrument was acknowledged before me this 29th day of April, 2015, by Patrick Borrigo, as Managing Member of DP Development of the Treasure Coast, LLC, a Florida corporation. He is personally known to me or who has produced (type of identification) as identification.

NOTARY IS SEAL:

[Handwritten Signature]
NOTARY PUBLIC, STATE OF FLORIDA

Mary Grey

(Name of Acknowledger Typed, Printed or Stamped)

FF 132864

Commission Number



EXHIBITS TO CONSTRUCTION CONTRACT

- A. Plans and Submittals
- B. Conditions of the Contract
- C. Contract Breakdown
- D. Partial Waiver of Lien and Affidavit of Payment form
- E. Final Waiver of Lien and Affidavit of Payment form

EXHIBIT "A"

Plans and Submittals

1. Shop Drawing Submittal 01 Epoxy Polyurethane Sealant and and Concrete Grout Specifications
2. Shop Drawing Submittal 02 Tideflex Check Valve
3. Shop Drawing Submittal 03 Wood Pilling
4. Shop Drawing Submittal 04 Plans
5. Shop Drawing Submittal 05 Stainless Steel

GENERAL SPECIFICATIONS

1 Materials



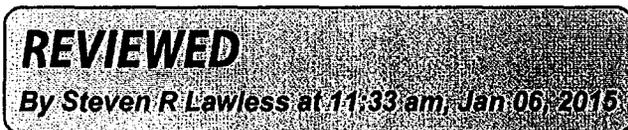
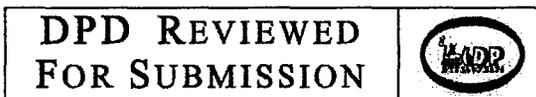
All materials shall be as follows:

- 1 Grout to be SikaGrout 212
- 2 Cement to be Rapid Set Concrete mix
- 3 Epoxy to be HIT-RE 500 Epoxy Adhesive Anchoring System
- 4 Insert/flange assembly 2205 Duplex or Super Duplex Stainless steel. All stainless steel welds shall be performed at the factory and appropriately treated to remove heat tint.
- 5 6 (or 8 for 36 in) Flange Face Bolts to be 12 inch long, 5/8 in dia SS, fully threaded and epoxied into wall and soil, with 1 in x 5/8 threaded nuts using 2205 Duplex or Super Duplex Stainless steel
- 6 Internal bolting to be 8 - 8 in long, 1/2 in diameter threaded epoxied through fiberglass insert, pipe and surrounding soil with 1/2 in threaded nuts using 2205 Duplex or Super Duplex Stainless steel

See attached manufacturer's material for details.

2. Installation

Installation of all materials shall be in conformance with the manufacturer's recommendation. No deviations from the recommended installation practice will be permitted.



Dymonic® FC

Low Modulus, Polyurethane Sealant

Product Description

Dymonic® FC is a high-performance, low modulus, one-component, moisture-cure, polyurethane sealant.

Basic Uses

Dymonic FC is a durable, flexible, sealant that offers excellent performance in moving joints and exhibits tenacious adhesion once fully cured. Typical applications for Dymonic FC include expansion and control joints, precast concrete panel joints, perimeter caulking (windows, door, panels), EIFS, aluminum, masonry & vinyl siding.

Features and Benefits

Dymonic FC is fast curing with a skin time of 60 minutes and a tack-free time of 3-4 hours to significantly reduce dirt-pick up. It will not green crack due to early movement and has an exceptional movement capability of +100 / -50%. Dymonic FC will not crack or craze under UV exposure.

Colors

Almond, Beige, Black, Anodized Aluminum, Aluminum Stone, Bronze, Buff, Dark Bronze, Gray, Limestone, Off White, Redwood Tan, Stone, White, Natural Clay

Packaging

10.1 oz (300 ml) cartridges; 20 oz (600 ml) sausages; 2 (7.6 L), 3 (11.4 L) and 5 (19 L) gallon pails.

Coverage Rates

308 linear feet of joint per gallon for a 1/4" X 1/4" joint. For specific coverage rates that include joint size, and usage efficiencies, visit our website usage calculator at www.tremcosealants.com.

Applicable Standards

Dymonic FC meets or exceeds the requirements of the following specifications

- ASTM C 920 Type S, Grade NS, Class 50, Use NT, M, A, and O
- U.S. Federal Specification TT-S-00230C, Class A, Type II
- CAN/CGSB-19.13-M87

Fire rated Systems

FF-D-1063, FW-D-1059, HW-D-1054, WW-D-1054.

Joint design

Dymonic may be used in any vertical or horizontal joint designed in accordance with accepted architectural/engineering practices. Joint width should be 4 times anticipated movement, but not less than 1/4" (6.4mm).

Joint backing

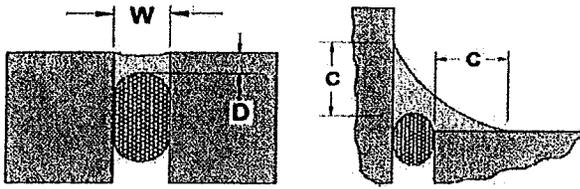
Closed cell or reticulated polyethylene backer rod is recommended as joint backing to control sealant depth and to ensure intimate contact of sealant with joint walls when tooling. Where depth of joint will prevent the use of backer rod, an adhesive backed polyethylene tape (bond breaker tape) should be used to prevent three-sided adhesion. All backing should be dry at time of sealant application.

TYPICAL PHYSICAL PROPERTIES

Rheological Properties (ASTM C 639):	non-sag (NS), 0" of sag in channel
Extrusion Rate (ASTM C 1183):	93.1 ml/min.
Hardness Properties (ASTM C 661):	25
Weight Loss (ASTM C 1246):	Pass
Skin Time (no applicable test method)	1 hour
Tack Free Time (ASTM C 679):	3-4 hours
Stain & Color Change (ASTM C 510):	No visible color change/No stain
Adhesion-in-Peel (ASTM C 794):	Aluminum 20-25 pli (89-112N) Concrete 18-22 pli (80-98N) No Adhesion Loss
Effects of Accelerated Aging (ASTM C 793):	Pass
Movement Capability:	+100 / -50%

Sealant dimensions

W = Sealant width, D = Sealant depth, C = Contact area.



EXPANSION JOINTS - The minimum width and depth of any sealant application should be 1/4" by 1/4" (6mm by 6mm).

The depth (D) of sealant may be equal to the width (W) of joints that are less than 1/2" wide. For joints ranging from 1/2" to 1" (13mm to 25mm) wide, the sealant depth should be approximately one-half on the joint width.

The maximum depth (D) of any sealant application should 1/2" (13mm). For joints that are wider than 1" (50 mm) contact Tremco's Technical Service Department, or your local Tremco field representative.

WINDOW PERIMETERS – For fillet beads, or angle beads around windows and doors, the sealant should exhibit a minimum surface contact area (C) of 1/4" onto each substrate.

Surface preparations

Surfaces must be sound, clean, and dry. All release agents, existing waterproofing, dust, loose mortar, laitance, paints, or other finishes must be removed. This can be accomplished with a thorough wire brushing, grinding, sandblasting, or solvent washing, depending on the contamination.

Tremco recommends that surface temperatures be 40°F (5°C) or above at the time the sealant is applied. If sealant must be applied in temperatures below 40°F, please refer to the Tremco Guide for Applying Sealants in Cold Weather that can be found on our website at www.tremcosealants.com.

Priming

Where deemed necessary, use Tremco Primer #1 or TREMPRIME Silicone Porous Primer for porous surfaces, and TREMPRIME Non-Porous Primer for metals or plastics. Dymonic FC typically adheres to common construction substrates without primers; however, Tremco always recommends that a mock-up or field adhesion test be performed on the actual materials being used on the job to verify the need for a primer. A description of the field adhesion test can be found in appendix X1 of ASTM C 1193, Standard Guide for Use of Joint Sealants.



Application

Dymonic FC is easy to apply with conventional caulking equipment. Ensure that the backer rod is friction fitted properly and any primers have been applied. Fill the joint completely with a proper width-to-depth ratio and tool to insure intimate contact of sealant with joint walls. Dry tooling is always preferred, although xylene can be used in limited amounts to slick the spatula if needed.

For a cleaner finish, mask the sides of the joint with tape prior to filling.

Cure time

Dymonic FC generally cures at a rate of 3/32" per day at 75°F (24°C) and 50% relative humidity. Dymonic FC will skin in 1 hour and be tack free in 3-4 hours. The cure time will increase as temperatures and/or humidity decrease. A good rule of thumb is one additional day for every 10°F decrease in temperature.

Clean up

Excess sealant and smears adjacent to the joint interface can be carefully removed with xylene or mineral spirits before the sealant cures. Any utensils used for tooling can also be cleaned with xylene or mineral spirits.

Limitations

- Do not apply over damp or contaminated surfaces.
- Use with adequate ventilation.
- Do not use under polyurethane deck coatings unless the sealant is fully cured.
- Always utilize the accompanying MSDS for information on Personal Protective Equipment (PPE), and health Hazards.

Warranty

Tremco warrants its sealants to be free of defects in materials, but makes no warranty as to appearance or color. Since methods of application and on-site conditions are beyond our control and can affect performance, Tremco makes no other warranty, expressed or implied including warranties of MERCHANTABILITY and FITNESS FOR A PARTICULAR PURPOSE, with respect to Tremco sealants. Tremco's sole obligation shall be, at its option, to replace or refund the purchase of the quantity of Tremco sealant proven to be defective and Tremco shall not be liable for any loss or damage.

SikaGrout® 212

High performance, cementitious grout

Construction

Description	SikaGrout 212 is a non-shrink, cementitious grout with a unique 2-stage shrinkage compensating mechanism. It is non-metallic and contains no chloride. With a special blend of shrinkage-reducing and plasticizing/water-reducing agents, SikaGrout 212 compensates for shrinkage in both the plastic and hardened states. A structural grout, SikaGrout 212 provides the advantage of multiple fluidity with a single component. SikaGrout 212 meets ASTM C-1107 (Grade C).
Where to Use	<ul style="list-style-type: none"> ■ Use for structural grouting of column base plates, machine base plates, anchor rods, bearing plates, etc. ■ Use on grade, above and below grade, indoors and out. ■ Multiple fluidity allows ease of placement: ram in place as a dry pack, trowel-apply as a medium flow, pour or pump as high flow.
Advantages	<ul style="list-style-type: none"> ■ Easy to use. . . just add water. ■ Multiple fluidity with one material. ■ Non-metallic, will not rust or stain. ■ Low heat build-up. ■ Excellent for pumping: Does not segregate. . . even at high flow. No build-up on equipment hopper. ■ Superior freeze/thaw resistance. ■ Resistant to oil and water. ■ Meets ASTM C-1107 (Grade C). ■ Shows positive expansion when tested in accordance with ASTM C-827. ■ SikaGrout 212 is USDA approved.
Coverage	Approximately .44 cu. ft./bag at high flow.
Packaging	50-lb. multi-wall bags; 36 bags/pallet.

How to Use

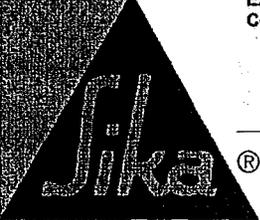
Surface Preparation Remove all dirt, oil, grease, and other bond-inhibiting materials by mechanical means. Anchor bolts to be grouted must be de-greased with suitable solvent. Concrete must be sound and roughened to a CSP 4 or higher to promote mechanical adhesion. Prior to pouring, surface should be brought to a saturated surface-dry condition. Steel should be cleaned and prepared thoroughly by blast cleaning to a white metal finish. Follow standard industry and Sika guidelines for use as an anchoring epoxy.

For pourable grout, construct forms to retain grout without leakage. Forms should be lined or coated with bond-breaker for easy removal. Forms should be sufficiently high to accommodate head of grout. Where grout-tight form is difficult to achieve, use SikaGrout 212 in dry pack consistency.

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

Shelf Life	One year in original, unopened bags.			
Storage Conditions	Store dry at 40°-95°F (4°-35°C).			
Product Conditioning	Condition material to 65°-75°F before using.			
Color	Concrete gray			
Flow Conditions (ASTM C-109, Plastic & Flowable; ASTM C-939, Fluid)		Plastic	Flowable	Fluid
Typical Water Requirements		6 pt.+	6.5 pt.	8.5 pt.
Set Time (ASTM C-266)	Initial	3.5-4.5 hr.	4.0-5.0 hr.	4.5-6.5 hr.
	Final	4.5-5.5 hr.	5.5-6.5 hr.	6.0-8.0 hr.
Tensile Splitting Strength, psi (ASTM C-496)	28 day	600(4.1 MPa)	575 (3.9 MPa)	500 (3.4 MPa)
Flexural Strength, psi (ASTM C-293)	28 day	1,400 (9.6 MPa)	1,200 (8.2 MPa)	1,000 (6.8 MPa)
Bond Strength, psi (ASTM C-882 modified) Hardened concrete to plastic grout	28 day	2,000(13.7 MPa)	1,900 (13.1 MPa)	1,900 (13.1 MPa)
Expansion % (ASTM C-1090)	28 day	+0.021%	+0.056%	+0.027%
Compressive Strength, psi (ASTM C-942)	1 day	4,500 (31 MPa)	3,500 (24.1 MPa)	2,700 (18.6 MPa)
	7 day	6,100 (42 MPa)	5,700 (39.3 MPa)	5,500 (37.9 MPa)
	28 day	7,600 (51.7 MPa)	6,200 (42.7 MPa)	5,800 (40 MPa)



Construction

Mixing	<p>Mix manually or mechanically. Mechanically mix with low-speed drill (400-600 rpm) and Sika mixing paddle or in appropriately sized mortar mixer.</p> <p>Make sure all forming, mixing, placing, and clean-up materials are on hand. Add appropriate quantity of clean water to achieve desired flow. Add bag of powder to mixing vessel. Mix to a uniform consistency, minimum of 2 minutes. Ambient and material temperature should be as close as possible to 70°F. If higher, use cold water; if colder, use warm water.</p> <p>Product Extension: For deeper applications, SikaGrout 212 (plastic and flowable consistencies only) may be extended with 25 lbs. of 3/8" pea gravel. The aggregate must be nonreactive, clean, well-graded, saturated surface dry, have low absorption and high density, and comply with ASTM C33 size number 8 per Table 2. Add the pea gravel after the water and SikaGrout 212.</p>
Application	<p>Within 15 minutes after mixing, place grout into forms in normal manner to avoid air entrapment. Vibrate, pump, or ram grout as necessary to achieve flow or compaction. SikaGrout 212 must be confined in either the horizontal or vertical direction leaving minimum exposed surface. SikaGrout 212 is an excellent grout for pumping, even at high flow. For pump recommendations, contact Technical Service. Wet cure for a minimum of 3 days or apply a curing compound which complies with ASTM C-309 on exposed surfaces.</p>
Tooling and Finishing	<p>After grout has achieved final set, remove forms, trim or shape exposed grout shoulders to designed profile.</p>
Limitations	<ul style="list-style-type: none"> ■ Minimum ambient and substrate temperature 40°F and rising at time of application. ■ Minimum application thickness: 1/2 in. ■ Typical maximum application thickness (neat) is 2", however, thicker applications can be achieved. Contact Sika's Technical Services Department (800-933-7452) for further information. ■ Do not use as a patching or overlay mortar or in unconfined areas. ■ Material must be placed within 15 minutes of mixing. ■ As with all cement based materials, avoid contact with aluminum to prevent adverse chemical reaction and possible product failure. Insulate potential areas of contact by coating aluminum bars, rails, posts etc. with an appropriate epoxy such as Sikadur Hi-Mod 32.
Caution	<p>WARNING: IRRITANT. Contains Quartz (SiO₂) (CAS:14808-60-7) and Portland Cement (CAS:65997-15-1). Causes skin/respiratory tract irritation. Causes severe eye irritation. May cause eye injury, effect may be delayed. Harmful if swallowed.</p> <p>WARNING. This product contains a chemical known in the State of California to cause cancer.</p>
First Aid	<p>Eyes - Hold eyelids apart and flush thoroughly with water for 15 minutes. Skin - Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water. Inhalation - remove to fresh air. Ingestion - Do not induce vomiting. Dilute with water. Contact physician. IN ALL CASES CONTACT A PHYSICIAN IMMEDIATELY IF SYMPTOMS PERSIST.</p>
Handling and Storage	<p>Suspect carcinogen - contains portland cement and crystalline silica. Skin and eye irritant. Avoid breathing dust. May cause delayed lung injury (silicosis). IARC lists crystalline silica as having sufficient evidence of carcinogenicity in laboratory animals and limited evidence of carcinogenicity in humans. NTP also lists crystalline silica as a suspect carcinogen.</p> <p>Avoid direct eye contact. Wear personal protective equipment (chemical resistant goggles/gloves/clothing) to prevent contact with skin or eyes. Use only in well ventilated areas. Open doors and windows during use. Use properly fitted NIOSH respirator if ventilation is poor. Wash thoroughly with soap and water after use. Remove contaminated clothing and launder before reuse.</p>
Clean Up	<p>Use personal protective equipment (chemical resistant goggles/gloves/clothing). Without direct contact, sweep up spilled or excess product and place in suitable sealed container. Dispose of in accordance with current applicable local, state and federal regulations. Uncured material can be removed with water. Cured material can only be removed mechanically.</p>

KEEP CONTAINER TIGHTLY CLOSED • KEEP OUT OF REACH OF CHILDREN • NOT FOR INTERNAL CONSUMPTION • FOR INDUSTRIAL USE ONLY

All information provided by Sika Corporation ("Sika") concerning Sika products, including but not limited to, any recommendations and advice relating to the application and use of Sika products, is given in good faith based on Sika's current experience and knowledge of its products when properly stored, handled and applied under normal conditions in accordance with Sika's instructions. In practice, the differences in materials, substrates, storage and handling conditions, actual site conditions and other factors outside of Sika's control are such that Sika assumes no liability for the provision of such information, advice, recommendations or instructions related to its products, nor shall any legal relationship be created by or arise from the provision of such information, advice, recommendations or instructions related to its products. The user of the Sika product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with the full application of the product(s). Sika reserves the right to change the properties of its products without notice. All sales of Sika product(s) are subject to its current terms and conditions of sale which are available at www.sikausa.com or by calling 800-933-7452.

Prior to each use of any Sika product, the user must always read and follow the warnings and instructions on the product's most current Technical Data Sheet, product label and Material Safety Data Sheet which are available online at www.sikausa.com or by calling Sika's Technical Service Department at 800-933-7452. Nothing contained in any Sika materials relieves the user of the obligation to read and follow the warnings and instruction for each Sika product as set forth in the current Technical Data Sheet, product label and Material Safety Data Sheet prior to product use.

LIMITED WARRANTY: Sika warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Technical Data Sheet if used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor. **NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKASHALLNOTBELIABLEUNDERANYLEGALTHEORYFOR SPECIALOR CONSEQUENTIAL DAMAGES. SIKASHALLNOTBERESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.**

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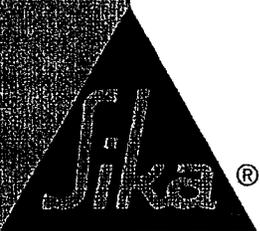
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Rapid Set® Concrete Mix — DATASHEET

Very Fast-Setting Concrete

PRODUCT DESCRIPTION:

When mixed with water CONCRETE MIX produces a workable, high quality concrete material that is ideal where fast strength gain, high durability and low shrinkage are desired. Apply CONCRETE MIX in thicknesses from 2-in to 24-in. Durable in wet environments. *SETS IN 15 MINUTES & IS READY FOR TRAFFIC IN 1-HOUR.* One 60-lb. bag of Rapid Set® CONCRETE MIX will yield approximately 0.5 cubic feet.

USES:

CONCRETE MIX is a multipurpose, Fast-Setting product that can be used for repair and construction of pavements, formed work, footings, setting posts, industrial floors, machine bases, and concrete repair.

COMPOSITION:

Rapid Set® CONCRETE MIX is a high performance blend of Rapid Set® hydraulic cement and quality aggregates. CONCRETE MIX is non-metallic and no chlorides are added. Rapid Set® CONCRETE MIX is similar in appearance to portland cement concrete and may be applied using similar methods.

COLOR: [Light Grey]

The final color of CONCRETE MIX may vary due to application techniques and environmental conditions.

LIMITATIONS:

Not intended for applications thinner than 2-in, for thin sections use Rapid Set® Cement ALL or Rapid Set® Mortar Mix. For applications where bonding is important, at least one test section should be prepared to evaluate the suitability of the materials and procedures.

TECHNICAL DATA:

- **Set Time**
ASTM C-191(Mod.) at 70°F
Initial Set 15-minutes
Final Set 35-minutes
- **Compressive Strength**
ASTM C-109 Mod.
Age: Compressive Strength:
1-hour* 2800-psi
3-hour 3600 -psi
7-day 5000 -psi
28-day 6000-psi
- **Flexural Strength**
ASTM C-78 Mod.

2-hour* 420-psi
1-day 650-psi
28-day 750-psi

* After Final Set.

Using CONCRETE MIX

SURFACE PREPARATION:

Where bonding is important, the adjacent surfaces shall be clean, sound and free from any materials that may inhibit bond such as oil, asphalt, curing compounds, acids, dirt and loose debris. Roughen surfaces and remove all unsound concrete. Immediately prior to placement the repair surface shall be thoroughly saturated with no standing water.

MIXING:

The use of a power driven mechanical mixer, such as a mortar mixer or a drill mounted mixer, is recommended. Organize work so that all personnel and equipment are in place before mixing. Use clean Potable water. Rapid Set® CONCRETE MIX may be mixed using 3 to 5 quarts of water per 60 lb. bag. Use less water to achieve higher strengths. Do NOT exceed 5 quarts of water per bag. For increased fluidity and workability use Rapid Set® FLOW CONTROL® plasticizing admixture from the Concrete Pharmacy®. Place the desired quantity of mix water into the mixing container. While the mixer is running add Rapid Set® CONCRETE MIX. Mix for the minimum amount of time required to achieve a lump-free, uniform consistency (usually 1 to 3 minutes). Do NOT re-temper.

PLACEMENT:

Rapid Set® CONCRETE MIX may be placed using traditional methods. Organize work so that all personnel and equipment are ready before placement. Place, consolidate and screed quickly to allow for maximum finishing time. Do NOT wait for bleed water, apply final finish as soon as possible. Rapid Set® CONCRETE MIX may be troweled, floated or broom finished. On flat work Do NOT install in layers, install full depth sections and progress horizontally. Do NOT install on frozen surfaces. Use a method of consolidation that eliminates air voids. To extend working time use Rapid Set® SET CONTROL® set retarding admixture.

CURING:

Water cure all Rapid Set® CONCRETE MIX installations. Begin curing as soon as the surface has lost its moist sheen. Keep exposed surfaces wet for a minimum of 1 hour. When experiencing extended setting times, due to cold temperature or the use of retarder, longer cure times may be required. The objective of water curing shall be to maintain a continuously wet surface until the product has achieved sufficient strength.

TEMPERATURE:

Warm environmental and materials temperatures will reduce the working time of CONCRETE MIX. To compensate for warm temperatures, keep material cool and use chilled mix water. Temperatures below 70°F (21°C) will decrease the rate of strength gain and CONCRETE MIX should not be applied if surface or ambient temperature is below 45°F (7.2°C).

LIMITED WARRANTY:

CTS Cement Manufacturing Corporation warrants its material to be of good quality, and, at its sole option, within one year from date of sale, will replace defective materials or refund the purchase price thereof and such replacement or refund shall be the limit of CTS's responsibility. Except for the foregoing, all warranties, express or implied including merchantability and fitness for a particular purpose are excluded. CTS shall not be liable for any consequential, incidental, or special damages arising directly or indirectly from the use of the material.

CAUTION:

CONCRETE MIX contains cementitious materials and may cause irritation to lungs, eyes and skin. Avoid contact. Use only in adequate ventilation. Do NOT breath dust. Wet mixture may cause burns. Wear suitable gloves, eye protection and protective clothing. In case of skin contact, wash thoroughly with soap and water. In case of eye contact, flush immediately and repeatedly with large quantities of water and get prompt medical attention. In case of difficulty breathing, remove person to fresh air. If difficulty breathing persists, seek medical attention.

HIT-RE 500 Epoxy Adhesive Anchoring System 3.2.5

Guide specifications

Master format section:

Previous 2004 Format

03250 03 16 00 Concrete anchors

Related Sections:

03200 03 20 00 Concrete reinforcing

05050 05 50 00 Metal fabrications

05120 05 10 00 Structural metal framing

Injectable adhesive shall be used for installation of all reinforcing steel dowels or threaded anchor rods and inserts into existing concrete. Adhesive shall be furnished in side-by-side refill packs which keep component A and component B separate. Side-by-side packs shall be designed to compress during use to minimize waste volume. Side-by-side packs shall also be designed to accept static mixing nozzle which thoroughly blends component A and component B and allows injection directly into drilled hole. Only injection tools and static mixing nozzles as supplied by manufacturer shall be used. Manufacturer's instructions shall be followed. Injection adhesive shall be formulated to include resin and hardener to provide optimal curing speed as well as high strength and stiffness. Typical curing time at 68°F (20°C) shall be approximately 12 hours.

Injection adhesive shall be HIT-RE 500 as furnished by Hilti.

Anchor rods shall be end stamped to show the grade of steel and overall rod length. Anchor rods shall be manufactured to meet the following requirements:

1. ISO 898 Class 5.8
2. ASTM A193, Grade B7 high strength carbon steel anchor;
3. AISI 304 or AISI 316 stainless steel, meeting the requirements of ASTM F593 condition CW.

Special order length HAS Rods may vary from standard product.

Nuts and washers Shall be furnished to meet the requirements of the above anchor rod specifications.

3.2.5

3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

3.2.5.2 Material specifications

Table 1 - Material properties of fully cured HIT-RE 500 adhesive

Bond Strength ASTM C882-91 ¹ 2 day cure	12.4 MPa	1,800 psi
7 day cure	12.4 MPa	1,800 psi
Compressive Strength ASTM D695-96 ¹	82.7 MPa	12,000 psi
Compressive Modulus ASTM D695-96 ¹	1,493 MPa	0.22 x 10 ⁶ psi
Tensile Strength 7 day ASTM D638-97	43.5 MPa	6,310 psi
Elongation at break ASTM D638-97	2.0%	
Heat Deflection Temperature ASTM D848-95	63°C	146°F
Absorption ASTM D570-95	0.06%	
Linear Coefficient of Shrinkage on Cure ASTM D2566-86	0.004	
Electrical resistance DIN IEC 93 (12.93)	6.6 x 10 ¹³ Ω/m	1.7 x 10 ¹² Ω/in.

¹ Minimum values obtained as the result of tests at 23°F, 40°F and 60°F.

HAS-E carbon steel specifications

Carbon steel rods conform to ISO 898 class 5.8 with a minimum tensile strength of 72.5 ksi (500 MPa) and a minimum yield strength of 58 ksi (400 MPa).

HAS-E nuts conform to SAE J995 Grade 5

HAS-E washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS-E rod, nut and washer has an electroplated zinc coating conforming to ASTM B633, SC 1

HAS Super high strength specifications

Carbon steel rods manufactured from ASTM A193, Grade B7, with a minimum tensile strength of 125 ksi (862 MPa) and a minimum yield strength of 105 ksi (724 MPa).

HAS Super nuts conform to SAE J995 Grade 5

HAS Super washers conform to ASTM F884, HV, and ANSI B18.22.1 Type A Plain.

HAS Super rods, nuts and washers, except the 7/8-in. diameter, have an electroplated zinc coating conforming to ASTM B633, SC 1
7/8-in. HAS Super rods, nuts and washers are hot-dip galvanized in accordance with ASTM A153

HAS-R 304 stainless steel specifications

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 304 stainless steel conforming to ASTM F593 Condition CW with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 304 stainless steel conforming to ASTM F593 Condition CW with a minimum tensile strength of 85 ksi (586 MPa) and a minimum yield strength of 45 ksi (310 MPa).

AISI Type 304 stainless steel nuts conform to ASTM F594

AISI Type 304 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

HAS-R 316 stainless steel specifications

3/8-, 1/2- and 5/8-in. rods manufactured from AISI Type 316 stainless steel with a minimum tensile strength of 100 ksi (689 MPa) and a minimum yield strength of 65 ksi (448 MPa).

3/4-, 1- and 1 1/4-in. rods are manufactured from AISI Type 316 stainless steel conforming to ASTM F593 Condition CW or cold worked.

AISI Type 316 stainless steel nuts conform to ASTM F594

AISI Type 316 stainless steel washers conform to ASTM A240 and ANSI B18.22.1 Type A Plain.

HIS-N and HIS-NR internally threaded insert specifications

3/8-in. HIS-N is manufactured from 11MnPb30+C carbon steel conforming to DIN 10277-3 with a minimum tensile strength of 71.1 ksi (490 MPa) and a minimum yield strength of 59.5 ksi (410 MPa).

1/2-, 5/8- and 3/4-in. HIS-N is manufactured from 11MnPb30+C carbon steel conforming to DIN 10277-3 with a minimum tensile strength of 66.7 ksi (460 MPa) and a minimum yield strength of 54.4 ksi (375 MPa).

HIS-NR is manufactured from X5CrNiMo 17122 K700 stainless steel conforming to DIN EN 10088-3 with a minimum tensile strength of 101.5 ksi (700 MPa) and a minimum yield strength of 50.8 ksi (350 MPa).

HIT-RE 500 Epoxy Adhesive Anchoring System 3.2.5

3.2.5.3 Technical Data

Table 2 - HAS rod installation specifications installed with HIT-RE 500 adhesive anchor system

Setting Information	Symbol	Units	Nominal anchor diameter						
			3/8	1/2	5/8	3/4	7/8	1	1-1/4
Drill bit diameter ¹	d_o	in.	7/16	9/16	11/16	13/16	15/16	1-1/16	1-1/2
Standard effective embedment	$h_{ef, std}$	in. (mm)	3-1/2 (90)	4-1/4 (110)	5 (125)	6-5/8 (170)	7-1/2 (190)	8-1/4 (210)	12 (305)
Installation torque embedment $\geq h_{ef, std}$	T_{inst}	ft-lb (Nm)	18 (24)	30 (41)	75 (102)	150 (203)	175 (237)	235 (319)	400 (540)
Installation torque embedment $< h_{ef, std}$	T_{ret}	ft-lb (Nm)	15 (20)	20 (27)	50 (68)	105 (142)	125 (169)	165 (224)	280 (375)
Minimum concrete member thickness	h_{min}	in. (mm)	$h_{ef}+2$ $h_{ef}+51$					$h_{ef}+2-1/4$ $h_{ef}+57$	$h_{ef}+3$ $h_{ef}+76$

1 Hole may be drilled with rotary hammer drill or Hilti DD EC-1 Diamond Coring System.

Table 3 - HIS-N and HIS-RN installation specifications with HIT-RE 500 adhesive anchor system

Setting Information	Symbol	Units	Thread size			
			3/8-16 UNC	1/2-13 UNC	5/8-11 UNC	3/4-10 UNC
Outside diameter of insert	d	in.	0.65	0.81	1.00	1.09
Nominal bit diameter ¹	d_o	in.	11/16	7/8	1-1/8	1-1/4
Standard effective embedment	$h_{ef, std}$	in. (mm)	4-3/8 (110)	5 (125)	6-5/8 (170)	8-1/4 (210)
Bolt engagement	minimum	h_s	3/8	1/2	5/8	3/4
		maximum	15/16	1-3/16	1-1/2	1-7/8
Installation torque	T_{inst}	ft-lb (Nm)	18 (24)	30 (41)	75 (102)	150 (203)
minimum concrete member thickness	h_{min}	in. (mm)	5.9 (150)	6.7 (170)	9.1 (230)	10.6 (270)

1 Hole may be drilled with rotary hammer drill or Hilti DD EC-1 Diamond Coring System.

Table 4 - Rebar installation specifications with HIT-RE 500 adhesive anchor system

Setting Information	Symbol	Units	Rebar size								
			No. 3	No. 4	No. 5	No. 6	No. 7	No. 8	No. 9	No. 10	No. 11
Drill bit diameter ^{1,2}	d_o	in.	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2	1-3/4

1 Rebar diameters may vary. Use the smallest diameter drill bit which will accommodate the rebar.

2 Hole may be drilled with rotary hammer drill or Hilti DD EC-1 Diamond Coring System.

Figure 1— HAS rod specifications

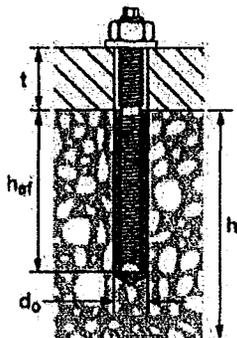
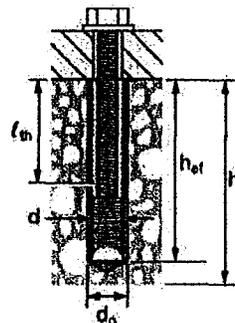


Figure 2— HIS-N and HIS-RN specifications



Combined shear and tension loading

$$\left(\frac{N_d}{N_{rec}} \right)^{5/3} + \left(\frac{V_d}{V_{rec}} \right)^{5/3} \leq 1.0$$

3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

Table 5 - HIT-RE 500 allowable and ultimate bond/concrete capacity for HAS rods in normal weight concrete^{1,2,3,4}

Nominal anchor diameter in.	Effective embedment in. (mm)	HIT-RE 500 Allowable bond/concrete capacity				HIT-RE 500 Ultimate bond/concrete capacity			
		Tensile		Shear		Tensile		Shear	
		$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)	$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)	$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)	$f'_c = 2000$ psi (13.8 MPa) lb (kN)	$f'_c = 4000$ psi (27.6 MPa) lb (kN)
3/8	1-3/4 (44)	645 (2.9)	1,095 (4.9)	1,510 (6.7)	2,135 (9.5)	2,580 (11.5)	4,370 (19.4)	4,530 (20.2)	6,405 (28.4)
	3-3/8 (86)	2,190 (9.7)	2,585 (11.5)	3,155 (14.0)	4,460 (19.8)	8,760 (39.0)	10,345 (46.0)	9,460 (42.1)	13,380 (59.5)
	4-1/2 (114)	2,420 (10.8)	2,585 (11.5)	4,855 (21.6)	6,860 (30.5)	9,685 (43.1)	10,335 (46.0)	14,560 (64.8)	20,580 (91.5)
1/2	2-1/4 (57)	1,130 (5.0)	1,965 (8.7)	2,510 (11.2)	3,550 (15.8)	4,530 (20.2)	7,860 (35.0)	7,525 (33.5)	10,640 (47.3)
	4-1/2 (114)	4,045 (18.0)	5,275 (23.5)	5,610 (25.0)	7,935 (35.3)	16,185 (72.0)	21,095 (93.8)	16,820 (74.8)	23,800 (105.9)
	6 (152)	4,775 (21.2)	5,380 (23.9)	8,635 (38.4)	12,210 (54.3)	19,095 (84.9)	21,520 (95.7)	25,900 (115.2)	36,620 (162.9)
5/8	2-7/8 (73)	1,690 (7.5)	3,045 (13.5)	5,245 (23.3)	7,420 (33.0)	6,770 (30.1)	12,175 (54.2)	15,735 (70.0)	22,250 (99.0)
	5-5/8 (143)	6,560 (29.2)	7,355 (32.7)	8,760 (39.0)	12,395 (55.1)	26,240 (116.7)	29,420 (130.9)	28,280 (126.9)	37,180 (165.4)
	7-1/2 (190)	7,320 (32.6)	7,515 (33.4)	13,615 (60.6)	19,080 (84.9)	29,290 (130.3)	30,060 (133.7)	40,480 (180.1)	57,240 (254.6)
3/4	3-3/8 (86)	2,310 (10.3)	4,515 (20.1)	7,335 (32.6)	10,370 (46.1)	9,250 (41.1)	18,065 (80.4)	22,000 (97.9)	31,108 (138.4)
	6-3/4 (172)	8,670 (38.6)	10,755 (47.8)	12,615 (56.1)	17,840 (79.4)	34,685 (154.3)	43,020 (191.4)	37,840 (168.3)	53,520 (238.1)
	9 (229)	10,385 (46.2)	12,995 (57.8)	19,430 (86.4)	27,470 (122.2)	41,535 (184.8)	51,985 (231.2)	58,280 (259.2)	82,400 (366.5)
7/8	4 (101)	3,005 (13.4)	5,665 (25.2)	7,795 (34.7)	11,020 (49.0)	12,030 (53.5)	22,670 (100.8)	23,375 (104.0)	33,050 (147.0)
	7-7/8 (200)	12,495 (55.6)	15,875 (70.6)	17,175 (76.4)	24,280 (108.0)	49,975 (222.3)	63,495 (282.4)	51,520 (229.2)	72,860 (324.1)
	10-1/2 (267)	14,705 (65.4)	16,185 (72.0)	26,440 (117.6)	37,390 (166.3)	58,820 (261.6)	64,730 (287.9)	79,320 (352.6)	112,160 (498.9)
1	4-1/2 (114)	3,945 (17.5)	8,440 (37.5)	10,035 (44.6)	14,190 (63.1)	15,790 (70.2)	33,765 (150.2)	30,104 (133.9)	42,565 (189.3)
	9 (229)	13,845 (61.6)	17,365 (77.2)	22,435 (99.8)	31,720 (141.1)	55,380 (246.3)	69,465 (309.0)	67,300 (299.4)	95,160 (423.3)
	12 (305)	17,935 (79.8)	17,935 (79.8)	34,535 (153.6)	48,830 (217.2)	71,740 (319.1)	71,740 (319.1)	103,600 (460.8)	146,480 (651.6)
1-1/4	5-5/8 (143)	5,760 (25.8)	12,815 (57.0)	14,760 (65.7)	20,870 (92.8)	23,045 (102.5)	51,270 (228.1)	44,280 (197.0)	62,610 (278.5)
	11-1/4 (286)	24,610 (109.5)	31,620 (140.7)	35,050 (155.9)	49,570 (220.5)	9,8430 (437.8)	126,480 (562.6)	105,140 (467.7)	148,710 (661.5)
	15 (381)	34,130 (151.8)	35,270 (156.9)	53,960 (240.0)	76,300 (339.4)	136,525 (607.3)	141,090 (627.6)	161,880 (720.1)	228,900 (1018.2)

- 1 Influence factors for spacing and/or edge distance are applied to allowable concrete/bond values above, and then compared to the steel value. The lesser of the values is to be used for the design.
- 2 Average ultimate concrete shear capacity based on Strength Design Method for standard and deep embedment and based on testing for shallow embedment.
- 3 All values based on holes drilled with carbide bit and installed per manufacturer's instructions. Ultimate tensile concrete/bond loads represent the average values obtained in testing.
- 4 For underwater applications with a maximum depth of 165 ft (50 m), reduce the tabulated concrete/bond values 30% to account for reduced mechanical properties of saturated concrete.

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Table 6 - Allowable steel strength for carbon steel and stainless steel HAS rods¹

Nominal anchor diameter in.	HAS-E ISO 898 Class 5.8		HAS Super ASTM A193 B7		HAS SS AISI 304/316 SS	
	Tensile	Shear	Tensile	Shear	Tensile	Shear
	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)	lb (kN)
3/8	2,640 (11.7)	1,360 (6.0)	4,555 (20.3)	2,345 (10.4)	3,645 (16.2)	1,875 (8.3)
1/2	4,700 (20.9)	2,420 (10.8)	8,100 (36.0)	4,170 (18.5)	6,480 (28.8)	3,335 (14.8)
5/8	7,340 (32.7)	3,780 (16.8)	12,655 (56.3)	6,520 (29.0)	10,125 (45.0)	5,215 (23.2)
3/4	10,570 (47.0)	5,445 (24.2)	18,225 (81.1)	9,390 (41.8)	12,390 (55.1)	6,385 (28.4)
7/8	14,385 (64.0)	7,410 (33.0)	24,805 (110.3)	12,780 (56.9)	16,865 (75.0)	8,690 (38.6)
1	18,790 (83.6)	9,680 (43.0)	32,400 (144.1)	16,690 (74.2)	22,030 (98.0)	11,350 (50.5)
1-1/4	29,360 (130.8)	15,125 (67.3)	50,620 (225.2)	26,080 (116.0)	34,425 (153.1)	17,735 (78.9)

¹ Steel strength as defined in AISC Manual of Steel Construction (ASD):

Tensile = $0.33 \times F_u \times \text{Nominal Area}$

Shear = $0.17 \times F_u \times \text{Nominal Area}$

Table 7 - Ultimate steel strength for carbon steel and stainless steel HAS rods¹

Nominal anchor diameter in.	HAS-E ISO 898 Class 5.8			HAS Super ASTM A193 B7			HAS SS AISI 304/316 SS		
	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)	Yield lb (kN)	Tensile lb (kN)	Shear lb (kN)
3/8	4,495 (20.0)	6,005 (26.7)	3,605 (16.0)	8,135 (36.2)	10,350 (43.4)	6,210 (27.6)	5,035 (22.4)	8,280 (36.8)	4,970 (22.1)
1/2	8230 (36.6)	10,675 (47.5)	6,405 (28.5)	14,900 (66.3)	18,405 (79.0)	11,040 (49.1)	9,225 (41.0)	14,720 (65.5)	8,835 (39.3)
5/8	13110 (58.3)	16,680 (74.2)	10,010 (44.5)	23,730 (105.6)	28,760 (126.7)	17,260 (76.8)	14,690 (65.3)	23,010 (102.4)	13,805 (61.4)
3/4	19,400 (86.3)	24,020 (106.9)	14,415 (64.1)	35,120 (156.2)	41,420 (185.7)	24,850 (110.5)	15,050 (66.9)	28,165 (125.3)	16,800 (75.2)
7/8	26,780 (119.1)	32,695 (145.4)	19,620 (87.3)	48,480 (215.7)	56,370 (256.9)	33,825 (150.5)	20,775 (92.4)	38,335 (170.5)	23,000 (102.3)
1	35,130 (156.3)	42,705 (190.0)	25,625 (114.0)	63,600 (282.9)	73,630 (337.0)	44,180 (196.5)	27,255 (121.2)	50,070 (222.7)	30,040 (133.6)
1-1/4	56,210 (250.0)	66,730 (296.8)	40,035 (178.1)	101,755 (452.6)	115,050 (511.8)	69,030 (307.1)	43,610 (194.0)	78,235 (348.0)	46,940 (208.8)

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¹ Steel strength as defined in AISC Manual of Steel Construction 2nd Ed. (LRFD):

Yield = $F_y \times \text{tensile stress area}$

Tensile = $0.75 \times F_u \times \text{nominal area}$

Shear = $0.45 \times F_u \times \text{nominal area}$

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Table 8 - HIT-RE 500 allowable bond or concrete capacity and steel strength for HIS-N and HIS-RN inserts¹

Thread size in.	Effective embedment in. (mm)	HIT-RE 500 allowable bond/concrete capacity ²		Steel bolt strength ²			
		Tensile (13.8 MPa) lb (kN)	Shear (13.8 MPa) lb (kN)	ASTM A325 carbon steel		ASTM F593 stainless steel	
				Tensile lb (kN)	Shear lb (kN)	Tensile lb (kN)	Shear lb (kN)
3/8-16 UNC	4-3/8 (110)	2,870 (12.8)	1,565 (7.0)	4,370 (19.4)	2,250 (10.0)	3,645 (16.2)	1,875 (8.3)
1/2-13 UNC	5 (127)	4,530 (20.1)	2,890 (12.9)	7,775 (34.6)	4,005 (17.8)	6,480 (28.8)	3,335 (14.8)
5/8-11 UNC	6-5/8 (168)	8,255 (36.7)	4,635 (20.6)	12,150 (54.0)	6,260 (27.8)	10,125 (45.0)	5,215 (23.2)
3/4-10 UNC	8-1/4 (210)	9,030 (40.1)	6,695 (29.8)	17,945 (77.8)	9,010 (40.1)	12,395 (55.1)	6,385 (28.4)

Table 9 - HIT-RE 500 ultimate bond or concrete capacity and steel strength for HIS-N and HIS-RN inserts¹

Thread size in.	Effective embedment in. (mm)	HIT-RE 500 ultimate bond/concrete capacity		Ultimate bolt strength ²			
		Tensile (13.8 MPa) lb (kN)	Shear (13.8 MPa) lb (kN)	ASTM A325 carbon steel		ASTM F593 stainless steel	
				Tensile lb (kN)	Shear lb (kN)	Tensile lb (kN)	Shear lb (kN)
3/8-16 UNC	4-3/8 (110)	11,480 (51.0)	6,260 (27.8)	9,935 (44.2)	5,960 (26.5)	8,280 (36.8)	4,970 (22.1)
1/2-13 UNC	5 (127)	18,115 (80.5)	11,565 (51.4)	17,665 (78.6)	10,600 (47.2)	14,720 (65.5)	8,835 (39.3)
5/8-11 UNC	6-5/8 (168)	33,025 (146.9)	18,550 (82.5)	27,610 (122.8)	16,565 (73.7)	23,010 (102.4)	13,805 (61.4)
3/4-10 UNC	8-1/4 (210)	36,125 (160.6)	26,775 (119.1)	39,760 (176.9)	23,855 (108.1)	28,165 (125.3)	16,900 (75.1)

1 Use lower value of either allowable bond/concrete capacity or steel strength. Minimum concrete compressive strength f'_c is 2,000 psi.

2 Steel values in accordance with AISC

ASTM A325 bolts $F_y = 92 \text{ ksi}$, $F_u = 120 \text{ ksi}$
 ASTM F593 (AISI 304/316) $F_y = 65 \text{ ksi}$, $F_u = 100 \text{ ksi}$ for 3/8- through 5/8 in.
 $F_y = 45 \text{ ksi}$, $F_u = 85 \text{ ksi}$ for 3/4-in.

Allowable load values $Tension = 0.33 \times F_u \times A_{nom}$
 $Shear = 0.17 \times F_u \times A_{nom}$

Ultimate load values $Tension = 0.75 \times F_u \times A_{nom}$
 $Shear = 0.45 \times F_u \times A_{nom}$

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Table 10 - HIT-RE 500 ultimate bond capacity and steel strength for rebar in concrete

Rebar size	Effective embedment In. (mm)	Concrete compressive strength						Grade 60 rebar	
		$f'_c = 2000 \text{ psi (13.8 MPa)}$			$f'_c = 4000 \text{ psi (27.6 MPa)}$			Yield strength lb (kN)	Tensile strength lb (kN)
		Ultimate bond strength lb (kN)	Embed. to develop yield strength ¹ in. (mm)	Embed. to develop tensile strength ¹ in. (mm)	Ultimate bond strength lb (kN)	Embed. to develop yield strength ¹ in. (mm)	Embed. to develop tensile strength ¹ in. (mm)		
#3	3-3/8 (86)	10,105 (45.0)	2-1/4 (57)	3-3/8 (86)	10,810 (48.1)	2-1/8 (54)	3-1/4 (84)	6,600 (29.4)	9,900 (44.0)
	4-1/2 (114)	10,920 (48.6)			10,810 (48.1)				
#4	4-1/2 (114)	15,980 (71.1)	3-3/8 (86)	5-5/8 (143)	18,540 (82.5)	3 (76)	4-3/8 (111)	12,000 (53.4)	18,000 (80.1)
	6 (152)	18,830 (83.8)			18,655 (83.0)				
#5	5-5/8 (143)	20,630 (91.8)	5-1/8 (130)	8-7/8 (225)	27,790 (123.6)	3-7/8 (98)	5-3/4 (146)	18,600 (82.7)	27,900 (124.1)
	7-1/2 (191)	24,870 (110.6)			27,790 (128.6)				
#6	6-3/4 (171)	33,695 (149.9)	5-3/8 (136)	9-3/8 (238)	44,675 (198.7)	4 (102)	6 (152)	26,400 (117.4)	39,600 (176.2)
	9 (229)	38,960 (173.3)			44,870 (200.0)				
#7	7-7/8 (200)	40,525 (180.3)	7 (178)	12-3/8 (314)	59,340 (264.0)	4-7/8 (124)	7-1/4 (184)	36,000 (160.1)	54,000 (240.2)
	10-1/2 (267)	48,460 (215.6)			61,720 (274.8)				
#8	9 (229)	63,940 (284.4)	8-1/4 (210)	12-7/8 (327)	72,820 (323.9)	5-7/8 (149)	8-7/8 (225)	47,400 (210.9)	71,100 (316.3)
	12 (305)	69,610 (309.7)			72,950 (324.5)				
#9	10-1/8 (257)	72,245 (321.4)	8-1/2 (216)	13 (330)	81,235 (361.4)	7-1/2 (191)	12 (305)	60,000 (266.9)	90,000 (400.4)
	13-1/2 (343)	94,205 (419.1)			84,015 (373.7)				
#10	11-1/4 (286)	92,000 (409.3)	9-3/8 (238)	17-7/8 (454)	96,725 (430.3)	8-7/8 (225)	14 (356)	76,200 (339.0)	114,300 (508.5)
	15 (381)	95,850 (426.4)			97,070 (431.8)				
#11	12-3/8 (314)	118,615 (527.6)	9-7/8 (251)	18-3/4 (476)	123,120 (547.7)	9-1/2 (241)	16-1/2 (419)	93,600 (416.4)	140,400 (624.6)
	16-1/2 (419)	123,570 (549.7)			123,790 (550.7)				

¹ Based on comparison of average ultimate adhesive bond test values versus minimum yield and ultimate tensile strength of rebar. For more information, contact Hilli.

Table 11 - HIT-RE 500 ultimate tensile bond strength for smooth epoxy coated dowel bars in concrete¹

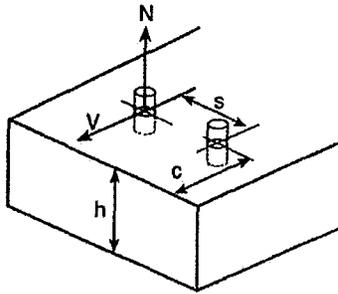
Dowel bar diameter in.	Nominal bit diameter in.	Embedment depth in. (mm)	Ultimate tensile load lb (kN)
1	1-1/8	9 (229)	40,385 (179.7)
1-1/4	1-3/8		
1-1/2	1-5/8		

¹ Minimum concrete compressive strength is 2,400 psi.

3.2.5

3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

Figure 3 - Anchor spacing and edge distance in concrete



Anchor spacing adjustment factors

- s = Actual spacing
- h_{ef} = Actual embedment
- $s_{min} = 0.5 h_{ef}$
- $s_{cr} = 1.5 h_{ef}$

Edge distance adjustment factors

- c = Actual edge distance
- h_{ef} = Actual embedment
- $c_{min} = 0.5 h_{ef}$ Tension and shear
- $c_{cr} = 1.5 h_{ef}$ Tension
- $c_{cr} = 2.0 h_{ef}$ Shear
- I = Perpendicular to edge
- II = Parallel to edge

Note: Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

<p>Spacing tension/shear</p> $s_{min} = 0.5 h_{ef}$ $s_{cr} = 1.5 h_{ef}$ $f_A = 0.3(s/h_{ef}) + 0.55$ for $s_{cr} > s > s_{min}$
<p>Edge distance tension</p> $c_{min} = 0.5 h_{ef}$ $c_{cr} = 1.5 h_{ef}$ $f_{RN} = 0.3(c/h_{ef}) + 0.55$ for $c_{cr} > c > c_{min}$
<p>Edge distance shear I toward edge</p> $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$ $f_{RV1} = 0.54(c/h_{ef}) - 0.09$ for $c_{cr} > c > c_{min}$
<p>Edge distance shear II to or away from edge</p> $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$ $f_{RV2} = 0.36(c/h_{ef}) + 0.28$ for $c_{cr} > c > c_{min}$

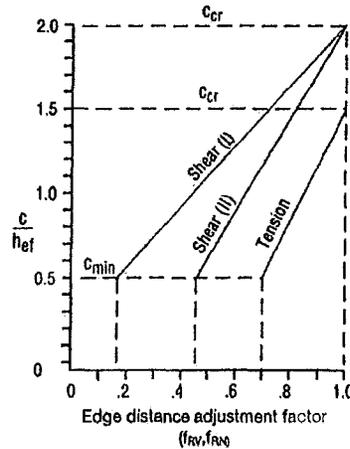
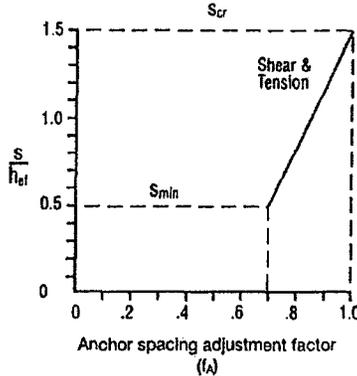


Table 12 - Load adjustment factors for 3/8-in. diameter anchors

Diameter	3/8-in.											
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (I toward edge) f_{RV1}			Edge distance shear (II to or away from edge) f_{RV2}		
Embedment depth, in.	1-3/4	3-3/8	4-1/2	1-3/4	3-3/8	4-1/2	1-3/4	3-3/8	4-1/2	1-3/4	3-3/8	4-1/2
7/8	0.70			0.70			0.18			0.46		
1	0.72			0.72			0.22			0.49		
1 11/16	0.84	0.70		0.84	0.70		0.43	0.18		0.63	0.46	
2	0.89	0.73		0.89	0.73		0.53	0.22		0.69	0.49	
2 1/4	0.94	0.75	0.70	0.94	0.75	0.70	0.60	0.27	0.18	0.74	0.52	0.46
2 5/8	1.00	0.78	0.73	1.00	0.78	0.73	0.72	0.33	0.23	0.82	0.56	0.49
3		0.82	0.75		0.82	0.75	0.84	0.39	0.27	0.90	0.60	0.52
3 1/2		0.86	0.78		0.86	0.78	1.00	0.47	0.33	1.00	0.65	0.56
4		0.91	0.82		0.91	0.82		0.55	0.39		0.71	0.60
5 1/16		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69
5 1/2			0.92			0.92		0.79	0.57		0.87	0.72
6			0.95			0.95		0.87	0.63		0.92	0.76
6 3/4			1.00			1.00		1.00	0.72		1.00	0.82
8									0.87			0.92
9									1.00			1.00

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Anchor spacing and edge distance guidelines in concrete

Table 13 - Load adjustment factors for 1/2-in. diameter anchors

Diameter	1/2-in.												
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (L toward edge) f_{RV1}			Edge distance shear (ll to or away from edge) f_{RV2}			
Embedment depth, in.	2-1/4	4-1/2	6	2-1/4	4-1/2	6	2-1/4	4-1/2	6	2-1/4	4-1/2	6	
Load adjustment factors for 5/8-in. and 3/4-in. diameter anchors	1-1/8	0.70			0.70				0.18			0.46	
	1-1/2	0.75			0.75				0.27			0.52	
	1-3/4	0.78			0.78				0.33			0.56	
	2	0.82			0.82				0.39			0.60	
	2-1/4	0.85	0.70		0.85	0.70		0.45	0.18		0.64	0.46	
	2-1/2	0.88	0.72		0.88	0.72		0.51	0.21		0.68	0.48	
	3	0.95	0.75	0.70	0.95	0.75	0.70	0.63	0.27	0.18	0.78	0.52	0.46
	3-3/8	1.00	0.78	0.72	1.00	0.78	0.72	0.72	0.32	0.21	0.82	0.55	0.48
	4		0.82	0.75		0.82	0.75	0.87	0.39	0.27	0.92	0.60	0.52
	4-1/2		0.85	0.78		0.85	0.78	1.00	0.45	0.32	1.00	0.64	0.55
	5		0.88	0.80		0.88	0.80		0.51	0.38		0.68	0.58
	6		0.95	0.85		0.95	0.85		0.63	0.45		0.76	0.64
6-3/4		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69	
7			0.90			0.90		0.75	0.54		0.84	0.70	
8			0.95			0.95		0.87	0.63		0.92	0.76	
9			1.00			1.00		1.00	0.72		1.00	0.82	
10									0.81			0.88	
11									0.90			0.94	
12									1.00			1.00	

Note: Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

Spacing tension/shear
 $s_{min} = 0.5 h_{ef}$ $s_{cr} = 1.5 h_{ef}$
 $f_A = 0.3(s/h_{ef}) + 0.55$
 for $s_{cr} > s > s_{min}$

Edge distance tension
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 1.5 h_{ef}$
 $f_{RN} = 0.3(c/h_{ef}) + 0.55$
 for $c_{cr} > c > c_{min}$

Edge distance shear ⊥ toward edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV1} = 0.54(c/h_{ef}) - 0.09$
 for $c_{cr} > c > c_{min}$

Edge distance shear ll to or away from edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV2} = 0.36(c/h_{ef}) + 0.28$
 for $c_{cr} > c > c_{min}$

Table 14 - Load adjustment factors for 5/8-in. and 3/4-in. diameter anchors

Diameter	5/8-in.												3/4-in.													
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (L toward edge) f_{RV1}			Edge distance shear (ll to or away from edge) f_{RV2}			Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (L toward edge) f_{RV1}			Edge distance shear (ll to or away from edge) f_{RV2}				
Embedment depth, in.	2-7/8	5-5/8	7-1/2	2-7/8	5-5/8	7-1/2	2-7/8	5-5/8	7-1/2	2-7/8	5-5/8	7-1/2	3-3/8	6-3/4	9	3-3/8	6-3/4	9	3-3/8	6-3/4	9	3-3/8	6-3/4	9		
Spacing (s)/edge distance (c), in.	1-7/16	0.70			0.70				0.18			0.46														
	1-11/16	0.73			0.73			0.23				0.49			0.70			0.70			0.18			0.46		
	2	0.76			0.76			0.29				0.53			0.73			0.73			0.23			0.49		
	2-13/16	0.84	0.70		0.84	0.70		0.44	0.18		0.83	0.46		0.80		0.80		0.80		0.36			0.56			
	3-3/8	0.90	0.73		0.90	0.73		0.54	0.23		0.70	0.50		0.85	0.70	0.85	0.70	0.85	0.70	0.45	0.18		0.64	0.46		
	3-3/4	0.94	0.75	0.70	0.94	0.75	0.70	0.61	0.27	0.18	0.75	0.52	0.46	0.88	0.72	0.88	0.72	0.88	0.72	0.61	0.21		0.68	0.48		
	4-5/16	1.00	0.78	0.72	1.00	0.78	0.72	0.72	0.32	0.22	0.82	0.56	0.49	0.93	0.74	0.93	0.74	0.93	0.74	0.60	0.26		0.74	0.51		
	4-1/2		0.79	0.73		0.79	0.73	0.78	0.34	0.23	0.84	0.57	0.50	0.95	0.75	0.95	0.75	0.95	0.75	0.70	0.83	0.27	0.18	0.76	0.52	0.46
	5-1/16		0.82	0.75		0.82	0.75	0.88	0.40	0.27	0.91	0.60	0.52	1.00	0.78	1.00	0.78	1.00	0.78	0.72	0.32	0.21	0.82	0.55	0.48	
	5-5/8		0.85	0.78		0.85	0.78	0.97	0.45	0.32	0.98	0.64	0.55		0.80	0.74		0.80	0.74	0.81	0.36	0.25	0.88	0.58	0.51	
	6-3/4		0.86	0.78		0.86	0.78	1.00	0.46	0.32	1.00	0.65	0.56		0.81	0.74		0.81	0.74	0.83	0.37	0.26	0.89	0.59	0.51	
	6-3/4		0.91	0.82		0.91	0.82		0.56	0.40		0.71	0.60		0.85	0.78		0.85	0.78	1.00	0.45	0.32	1.00	0.64	0.55	
	8-7/16		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69		0.93	0.83		0.93	0.83		0.59	0.42		0.73	0.62	
	10-1/8			0.96			0.96		0.88	0.64		0.93	0.77		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69	
	11-1/4			1.00			1.00		1.00	0.72		1.00	0.82			0.83			0.93		0.81	0.59		0.88	0.73	
	12									0.77			0.86			0.95			0.95		0.87	0.63		0.92	0.76	
	13-1/2									0.88			0.93			1.00			1.00		1.00	0.72		1.00	0.82	
	15									1.00			1.00											0.81	0.88	
16																							0.87	0.92		
18																							1.00	1.00		

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3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

Anchor spacing and edge distance guidelines in concrete

Table 15 - Load adjustment factors for 7/8-in. diameter anchors

Diameter	7/8-in.											
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (L toward edge) f_{RV1}			Edge distance shear (I to or away from edge) f_{RV2}		
Embedment depth, in.	4	7-7/8	10-1/2	4	7-7/8	10-1/2	4	7-7/8	10-1/2	4	7-7/8	10-1/2
Spacing (s)/Edge distance (c), in.	2	0.70		0.70			0.18			0.46		
	2-1/2	0.74		0.74			0.25			0.51		
	3	0.78		0.78			0.32			0.55		
	3-1/2	0.81		0.81			0.38			0.60		
	3-15/16	0.85	0.70	0.85	0.70		0.44	0.18		0.63	0.48	
	4-1/2	0.89	0.72	0.89	0.72		0.52	0.22		0.69	0.49	
	5	0.93	0.74	0.93	0.74		0.59	0.25		0.73	0.51	
	5-1/4	0.94	0.75	0.94	0.75	0.70	0.62	0.27	0.18	0.75	0.52	0.46
	6	1.00	0.78	1.00	0.78	0.72	0.72	0.32	0.22	0.82	0.55	0.49
	6-1/2		0.80	0.74	0.80	0.74	0.79	0.38	0.24	0.87	0.58	0.50
	7		0.82	0.75	0.82	0.75	0.86	0.39	0.27	0.91	0.60	0.52
	8		0.85	0.78	0.85	0.78	1.00	0.46	0.32	1.00	0.65	0.56
	10		0.93	0.84	0.93	0.84		0.60	0.42		0.74	0.62
	11-13/16		1.00	0.89	1.00	0.89		0.72	0.52		0.82	0.69
	12			0.89		0.89		0.73	0.53		0.83	0.69
	14			0.95		0.95		0.87	0.63		0.92	0.76
	15-3/4			1.00		1.00		1.00	0.72		1.00	0.82
	18								0.84			0.90
	20								0.84			0.97
	21								1.00			1.00

Note: Tables apply for listed embedment depths. Reduction factors for other embedment depths must be calculated using equations below.

Spacing tension/shear
 $s_{min} = 0.5 h_{ef}$ $s_{cr} = 1.5 h_{ef}$
 $f_A = 0.3(s/h_{ef}) + 0.55$
 for $s_{cr} > s > s_{min}$

Edge distance tension
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 1.5 h_{ef}$
 $f_{RN} = 0.3(c/h_{ef}) + 0.55$
 for $c_{cr} > c > c_{min}$

Edge distance shear
 L toward edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV1} = 0.54(c/h_{ef}) - 0.09$
 for $c_{cr} > c > c_{min}$

Edge distance shear
 I to or away from edge
 $c_{min} = 0.5 h_{ef}$ $c_{cr} = 2.0 h_{ef}$
 $f_{RV2} = 0.36(c/h_{ef}) + 0.28$
 for $c_{cr} > c > c_{min}$

Table 16 - Load adjustment factors for 1-in. and 1-1/4-in. diameter anchors

Diameter	1-in.												1-1/4-in.																		
	Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (L toward edge) f_{RV1}			Edge distance shear (I to or away from edge) f_{RV2}			Spacing tension/shear f_A			Edge distance tension f_{RN}			Edge distance shear (L toward edge) f_{RV1}			Edge distance shear (I to or away from edge) f_{RV2}									
Embedment depth, in.	4-1/2	9	12	4-1/2	9	12	4-1/2	9	12	4-1/2	9	12	4-1/2	9	12	5-5/8	11-1/4	15	5-5/8	11-1/4	15	5-5/8	11-1/4	15	5-5/8	11-1/4	15				
Spacing (s)/Edge distance (c), in.	2-1/4	0.70		0.70			0.18			0.46			0.70			0.70			0.18			0.46			0.70			0.46			
	2-3/4	0.73		0.73			0.24			0.50			0.70			0.70			0.18			0.46			0.70			0.46			
	3	0.75		0.75			0.27			0.52			0.71			0.71			0.20			0.47			0.71			0.47			
	4	0.82		0.82			0.39			0.60			0.76			0.76			0.29			0.54			0.76			0.54			
	4-1/2	0.85	0.70	0.85	0.70		0.45	0.18		0.84	0.48		0.79			0.79			0.34			0.57			0.79			0.57			
	5	0.88	0.72	0.88	0.72		0.51	0.21		0.88	0.48		0.82			0.82			0.39			0.60			0.82			0.60			
	5-5/8	0.93	0.74	0.93	0.74		0.59	0.25		0.73	0.51		0.85	0.70		0.85	0.70		0.45	0.18		0.84	0.46		0.85	0.70		0.84	0.46		
	6	0.95	0.75	0.95	0.75	0.70	0.63	0.27	0.18	0.78	0.52	0.46	0.87	0.71		0.87	0.71		0.49	0.20		0.66	0.47		0.87	0.71		0.66	0.47		
	6-3/4	1.00	0.78	1.00	0.78	0.72	0.72	0.32	0.21	0.82	0.55	0.48	0.91	0.73		0.91	0.73		0.56	0.23		0.71	0.50		0.91	0.73		0.71	0.50		
	7-1/2		0.80	0.74	0.80	0.74	0.81	0.36	0.25	0.88	0.58	0.51	0.95	0.75	0.70	0.95	0.75	0.70	0.83	0.27	0.18	0.78	0.62	0.46	0.95	0.75	0.70	0.78	0.62	0.46	
	8-1/4		0.83	0.76	0.83	0.76	0.90	0.41	0.28	0.94	0.61	0.53	0.99	0.77	0.72	0.99	0.77	0.72	0.70	0.31	0.21	0.81	0.54	0.48	0.99	0.77	0.72	0.81	0.54	0.48	
	9		0.85	0.78	0.85	0.78	1.00	0.45	0.32	1.00	0.64	0.55	1.00	0.79	0.73	1.00	0.79	0.73	1.00	0.34	0.23	0.88	0.57	0.50	1.00	0.79	0.73	0.88	0.57	0.50	
	10		0.88	0.80	0.88	0.80		0.51	0.36		0.68	0.58		0.82	0.75		0.82	0.75		0.39	0.27	0.92	0.60	0.52	0.82	0.75		0.92	0.60	0.52	
	11		0.92	0.83	0.92	0.83		0.57	0.41		0.72	0.61		0.84	0.77		0.84	0.77		1.00	0.44	0.31	0.98	0.63	0.54	0.84	0.77		0.98	0.63	0.54
	12		0.95	0.85	0.95	0.85		0.63	0.45		0.78	0.64		0.87	0.79		0.87	0.79		0.49	0.34	1.00	0.68	0.57	0.87	0.79		0.68	0.57		
	13-1/2		1.00	0.89	1.00	0.89		0.72	0.52		0.82	0.69		0.91	0.82		0.91	0.82		0.56	0.40		0.71	0.60		0.91	0.82		0.71	0.60	
	14			0.90		0.90		0.75	0.54		0.84	0.70		0.92	0.83		0.92	0.83		0.58	0.41		0.73	0.62		0.92	0.83		0.73	0.62	
	16-7/8			0.97		0.97		0.92	0.67		0.96	0.79		1.00	0.89		1.00	0.89		0.72	0.52		0.82	0.69		1.00	0.89		0.82	0.69	
	18			1.00		1.00		1.00	0.72		1.00	0.82		0.91			0.91			0.77	0.58		0.88	0.71		0.91			0.88	0.71	
	20								0.81			0.88					0.95			0.87	0.63		0.82	0.76					0.82	0.76	
	22-1/2								0.92			0.96					1.00			1.00	0.72		1.00	0.82					1.00	0.82	
	24								1.00			1.00								0.77			0.86						0.86		
	27																			0.88			0.93						0.93		
	30																			1.00			1.00						1.00		

HIT-RE 500 Epoxy Adhesive Anchoring System 3.2.5

Figure 4 - Resistance of HIT-RE 500 to chemicals

Chemical	Chemicals Tested	Resistant	Not Resistant
Alkaline	Concrete drilling mud (10%) pH=12.6	+	
	Concrete drilling mud (10%) pH=13.2	+	
	Concrete potash solution (10%) pH=14.0	+	
Acids	Acetic acid (10%) ¹		-
	Nitric acid (10%) ¹		-
	Hydrochloric acid (10%) 3 month -		-
	Sulfuric acid (10%)		-
Solvents	Benzyl alcohol		-
	Ethanol		-
	Ethyl acetate		-
	Methyl ethyl ketone (MEK)		-
	Trichloroethylene		-
	Xylene (mixture)	+	
Chemicals used on job sites	Concrete plasticizer	+	
	Diesel oil	+	
	Oil	+	
	Petrol	+	
	Oil for form work (forming oil)	+	
Environmental chemicals	Salt water	+	
	de-mineralized water	+	
	salt spraying test	+	
	SO ₂	+	
	Environment/weather	+	

1 Concrete was dissolved by acid.

Samples of the HIT-RE 500 resin were immersed in the various chemical compounds for up to one year. At the end of the test period, the samples were analyzed. Any samples showing no visible damage and having less than a 25% reduction in bending (flexural) strength were classified as Resistant. Samples that were heavily damaged or destroyed were classified as Not Resistant.

Note: In actual use, the majority of the resin is encased in the base material, leaving very little surface area exposed.

Table 17 - Full cure time

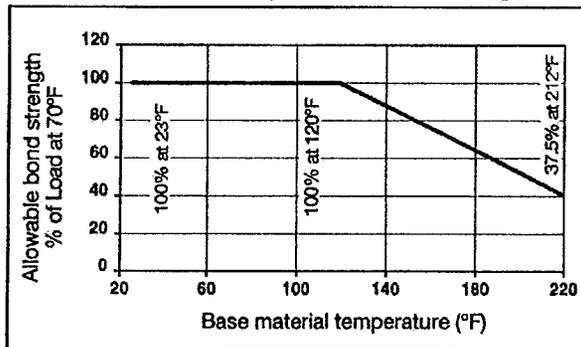
Base material temperature		Approximate full curing time
°F	°C	
23	-5	72 h
32	0	50 h
50	10	24 h
68	20	12 h
86	30	8 h
104	40	4 h

Table 18 - Initial cure time to develop 25% of bond strength

Base material temperature		Approximate initial cure time
°F	°C	
23	-5	36 h
32	0	25 h
50	10	12 h
68	20	6 h
86	30	4 h
104	40	2 h

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Figure 5 - Influence of temperature on bond strength^{1,2}



- 1 Test procedure involves the concrete being held at the elevated temperature for 24 hours then removing it from the controlled environment and testing to failure.
- 2 Long term creep test in accordance with ICC-ES Acceptance Criteria AC508 is available; please contact Hilti Technical Services.

Table 19 - Gel time

Base material temperature		Approximate gel time
°F	°C	
23	-5	4 h
32	0	3 h
50	10	2 h
68	20	30 min
86	30	20 min
104	40	12 min

- 1 Minimum product temperature must be maintained above 41°F (5°C) prior/during installation.
- 2 Gel times and full cure times are approximate.

3.2.5 HIT-RE 500 Epoxy Adhesive Anchoring System

3.2.5.4 Installation Instructions

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.us.hilti.com (US) and www.hilti.ca (Canada). Because of the possibility of changes, always verify that downloaded IFU are current when used. Proper installation is critical to achieve full performance. Training is available on request. Contact Hilti Technical Services for applications and conditions not addressed in the IFU.

HIT-RE 500 Volume

Table 20 - Threaded rod installation

Nominal anchor diameter in.	Nominal bit diameter in.	Adhesive volume required per inch of embedment in ³
1/4	5/16	0.055
3/8	7/16	0.095
1/2	9/16	0.133
5/8	3/4	0.261
3/4	7/8	0.326
7/8	1	0.391
1	1-1/8	0.478
1-1/4	1-3/8	0.626

The useable volume of HIT-RE 500 refill cartridge is 16.5 in³ (270 ml)

The useable volume of HIT-RE 500 medium refill is 26.9 in³ (440 ml)

The useable volume of HIT-RE 500 medium refill is 81.8 in³ (1340 ml)

Example:

5/8-in. diameter rod with an embedment of 10 inches:

$$10 \text{ in.} \times 0.26 \text{ in}^3/\text{in.} = 2.6 \text{ in}^3/\text{fastening}$$

$$16.5 \text{ in}^3/\text{cartridge} \div 2.6 \text{ in}^3/\text{fastening} \approx 6 \text{ fastenings/cartridge}$$

$$81.8 \text{ in}^3/\text{cartridge} \div 2.6 \text{ in}^3/\text{fastening} \approx 31 \text{ fastenings/cartridge}$$

Table 21 - Rebar Installation¹

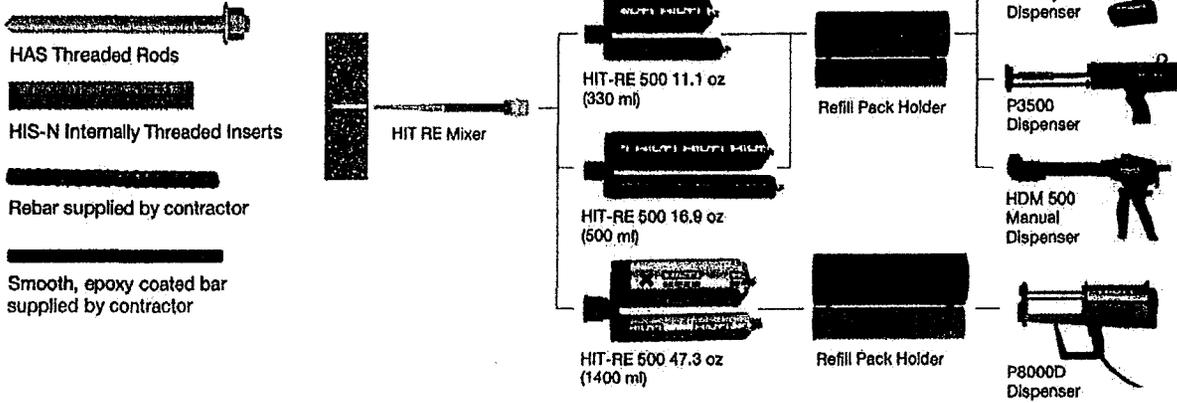
Rebar Size	Nominal bit ¹ diameter in.	Adhesive volume required per inch of embedment in ³
#3	1/2	0.110
#4	5/8	0.146
#5	3/4	0.176
#6	7/8	0.218
#7	1	0.252
#8	1-1/8	0.299
#9	1-3/8	0.601
#10	1-1/2	0.659
#11	1-3/4	1.037

¹ Rebar diameter may vary. Use smallest drill bit which will accommodate rebar.

HIT-RE 500 Epoxy Adhesive Anchoring System 3.2.5

3.2.5.5 Ordering information¹

Fastener components



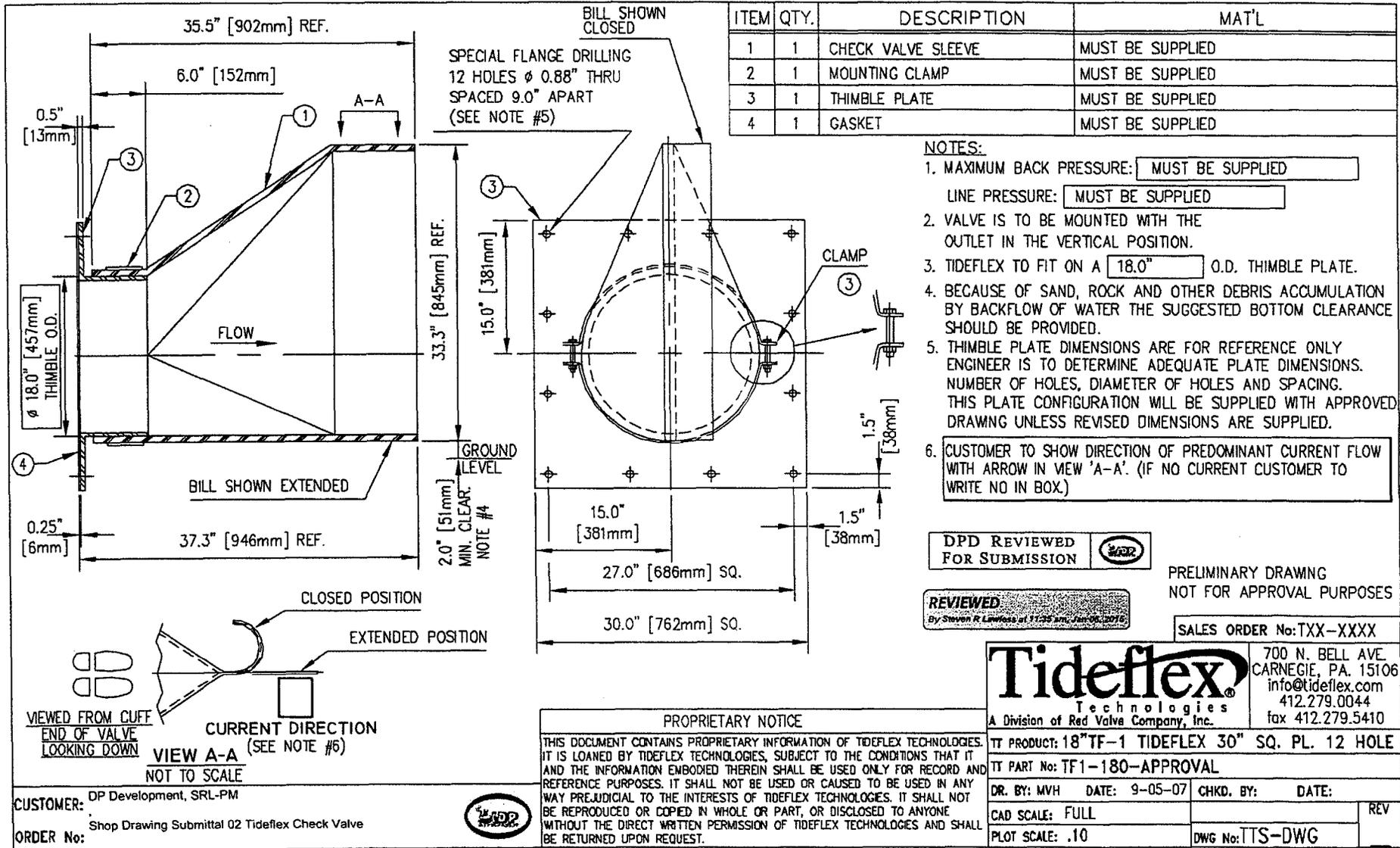
HIT-RE 500 Epoxy Adhesive

Order information

Description	Package contents	Qty of foil packs
HIT-RE 500 (11.1 fl oz/330 ml)	Includes (1) refill pack and (1) mixer with filler tube	1
HIT-RE 500 MC Master Carton (11.1 fl oz/330 ml)	Includes (25) refill packs and (25) mixer with filler tube	25
HIT-RE 500 (16.9 fl oz/500 ml)	Includes (20) refill packs and (20) mixer with filler tube	20
HIT-RE 500 (47.3 fl oz/1400 ml)	Includes (4) jumbo refill packs and (4) mixer	4

¹ For complete information about Hilti anchors, adhesive anchoring dispensers, drilled hole preparation and other adhesive anchoring accessories, see HIT-HY 200 Anchoring System, Section 3.2.3.5 Ordering Information.

3.2.5



ITEM	QTY.	DESCRIPTION	MAT'L
1	1	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	1	MOUNTING CLAMP	MUST BE SUPPLIED
3	1	THIMBLE PLATE	MUST BE SUPPLIED
4	1	GASKET	MUST BE SUPPLIED

- NOTES:**
- MAXIMUM BACK PRESSURE: MUST BE SUPPLIED
LINE PRESSURE: MUST BE SUPPLIED
 - VALVE IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION.
 - TIDEFLEX TO FIT ON A 18.0" O.D. THIMBLE PLATE.
 - BECAUSE OF SAND, ROCK AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED.
 - THIMBLE PLATE DIMENSIONS ARE FOR REFERENCE ONLY ENGINEER IS TO DETERMINE ADEQUATE PLATE DIMENSIONS. NUMBER OF HOLES, DIAMETER OF HOLES AND SPACING. THIS PLATE CONFIGURATION WILL BE SUPPLIED WITH APPROVED DRAWING UNLESS REVISED DIMENSIONS ARE SUPPLIED.
 - CUSTOMER TO SHOW DIRECTION OF PREDOMINANT CURRENT FLOW WITH ARROW IN VIEW 'A-A'. (IF NO CURRENT CUSTOMER TO WRITE NO IN BOX.)

DPD REVIEWED FOR SUBMISSION

REVIEWED By Steven R. Lawless at 11:35 AM, Jan 06, 2016

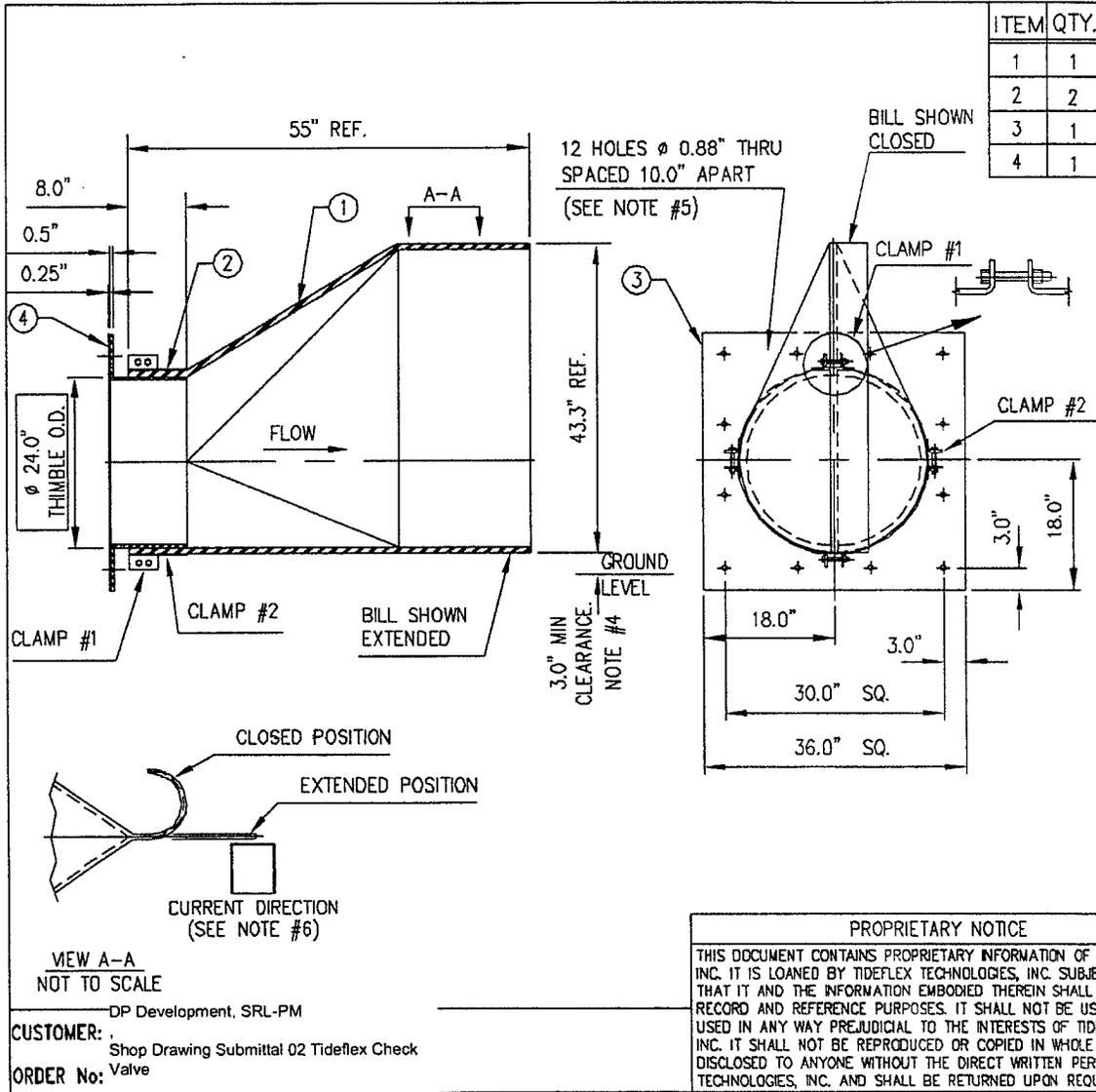
PRELIMINARY DRAWING NOT FOR APPROVAL PURPOSES

SALES ORDER No: TXX-XXXX

Tideflex Technologies
A Division of Red Valve Company, Inc.
700 N. BELL AVE. CARNEGIE, PA. 15106
info@tideflex.com 412.279.0044
fax 412.279.5410

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TIT PRODUCT: 18" TF-1 TIDEFLEX 30" SQ. PL. 12 HOLE			
TIT PART No: TF1-180-APPROVAL			
DR. BY: MVH	DATE: 9-05-07	CHKD. BY:	DATE:
CAD SCALE: FULL			REV
PLOT SCALE: .10		DWG No: TTS-DWG	



ITEM	QTY.	DESCRIPTION	MAT'L
1	1	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	2	MOUNTING CLAMP	MUST BE SUPPLIED
3	1	THIMBLE PLATE	MUST BE SUPPLIED
4	1	GASKET	MUST BE SUPPLIED

- NOTES:**
1. MAXIMUM BACK PRESSURE - LINE PRESSURE -
 2. TIDEFLEX IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION.
 3. TIDEFLEX TO FIT ON A O.D. THIMBLE PLATE
 4. BECAUSE OF SAND, ROCK AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED.
 5. THIMBLE PLATE DIMENSIONS ARE FOR REFERENCE ONLY. ENGINEER IS TO DETERMINE ADEQUATE PLATE DIMENSIONS NUMBER OF HOLES, DIAMETER OF HOLES AND SPACING. THIS PLATE CONFIGURATION WILL BE SUPPLIED WITH APPROVED DRAWING UNLESS REVISED DIMENSIONS ARE SUPPLIED.
 6. CUSTOMER TO SHOW DIRECTION OF PREDOMINANT CURRENT FLOW WITH ARROW IN VIEW 'A-A'. (IF NO CURRENT CUSTOMER TO WRITE NO IN BOX.)

PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

SALES ORDER NO: TXX-XXXX

		300 BILMAR DR. PITTSBURGH, PA. 15205 412-919-0919	
		TT PRODUCT: 24" TF-1 TIDEFLEX W/ 36" SQ. PLATE	
TT PART NO: TF1-240-APPROVAL			
DR. BY: MVH	DATE: 8-25-05	CHKD. BY:	DATE:
CAD SCALE: FULL		REV	
PLOT SCALE: .0625		DWG NO: TTS-DWG	

PROPRIETARY NOTICE

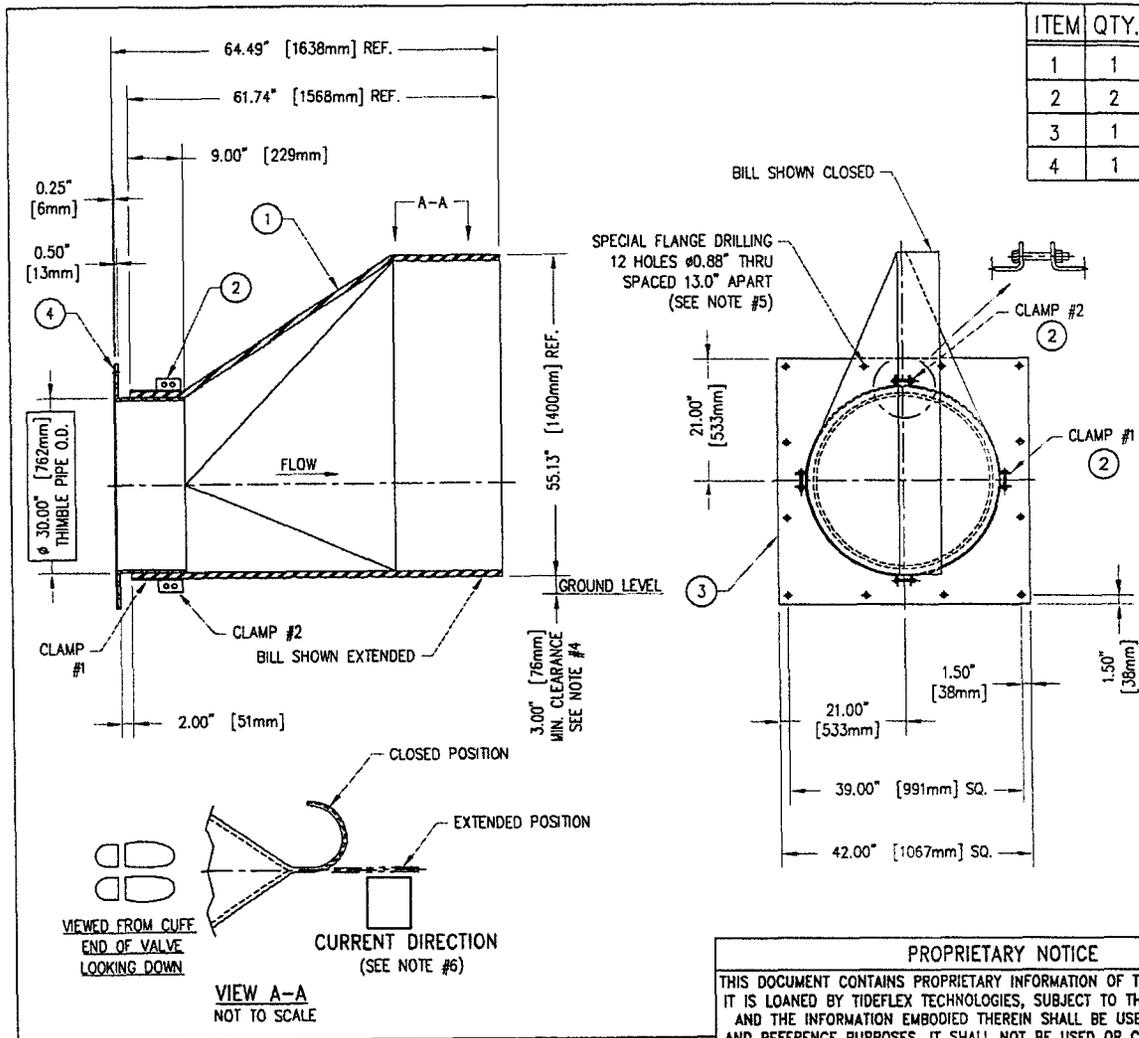
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VIEW A-A
NOT TO SCALE

DP Development, SRL-PM

CUSTOMER: Shop Drawing Submittal 02 Tideflex Check Valve

ORDER No:



ITEM	QTY.	DESCRIPTION	MAT'L
1	1	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	2	MOUNTING CLAMPS	MUST BE SUPPLIED
3	1	THIMBLE PLATE	MUST BE SUPPLIED
4	1	GASKET	MUST BE SUPPLIED

- NOTES:**
1. MAXIMUM BACK PRESSURE - **MUST BE SUPPLIED**
LINE PRESSURE - **MUST BE SUPPLIED**
 2. VALVE IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION
 3. TIDEFLEX TO FIT ON A **30.0" O.D.** THIMBLE PLATE
 4. BECAUSE OF SAND, ROCK AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED
 5. THIMBLE PLATE DIMENSIONS ARE FOR REFERENCE ONLY ENGINEER IS TO DETERMINE ADEQUATE PLATE DIMENSIONS NUMBER OF HOLES, DIAMETER OF HOLES AND SPACING. THIS PLATE CONFIGURATION WILL BE SUPPLIED WITH APPROVED DRAWING UNLESS REVISED DIMENSIONS ARE SUPPLIED
 6. CUSTOMER TO SHOW DIRECTION OF PREDOMINANT CURRENT FLOW WITH ARROW IN VIEW 'A-A'. (IF NO CURRENT CUSTOMER TO WRITE NO IN BOX.)

PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

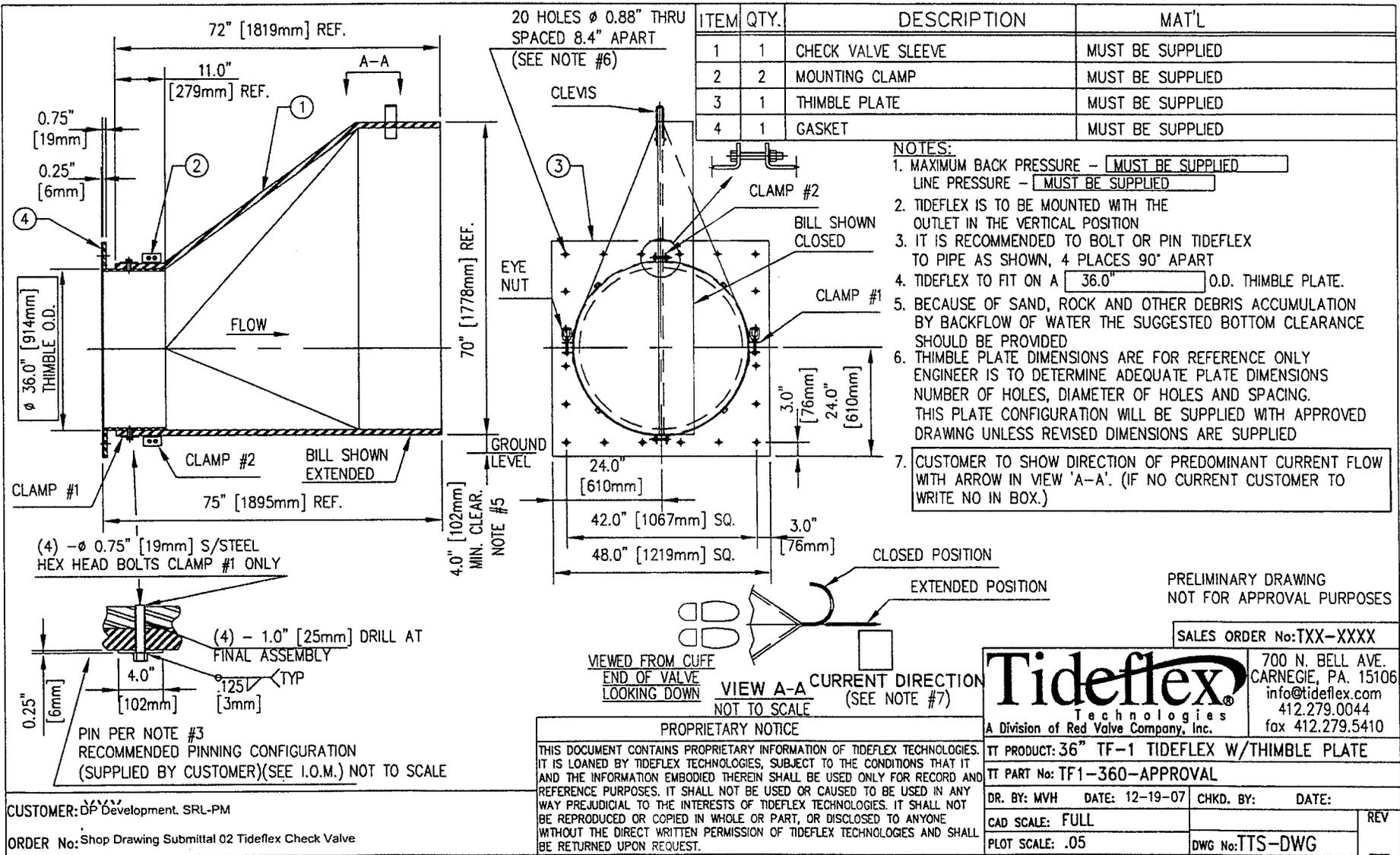
OPPORTUNITY No: XXXX	SALES ORDER No: TXX-XXXX
Tideflex Technologies	
A Division of Red Valve Company, Inc.	
600 N. BELL AVE. CARNEGIE, PA. 15106 info@tideflex.com 412.279.0044 fax 412.279.5410	

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CUSTOMER: DP Development, SRL-PM
Shop Drawing Submittal 02 Tideflex Check Valve
ORDER No:

TT PRODUCT: 30" TF-1 TIDEFLEX 42" SQ. PL. 12 HOLES	
TT PART No: TF1-300-APPROVAL	
DR. BY: KEC	DATE: 12-18-13
CHKD. BY:	DATE:
CAD SCALE: FULL	REV
PLOT SCALE: .05	DWG No: TTS-DWG



ITEM	QTY.	DESCRIPTION	MAT'L
1	1	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	2	MOUNTING CLAMP	MUST BE SUPPLIED
3	1	THIMBLE PLATE	MUST BE SUPPLIED
4	1	GASKET	MUST BE SUPPLIED

- NOTES:**
1. MAXIMUM BACK PRESSURE - MUST BE SUPPLIED
LINE PRESSURE - MUST BE SUPPLIED
 2. TIDEFLEX IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION
 3. IT IS RECOMMENDED TO BOLT OR PIN TIDEFLEX TO PIPE AS SHOWN, 4 PLACES 90° APART
 4. TIDEFLEX TO FIT ON A O.D. THIMBLE PLATE.
 5. BECAUSE OF SAND, ROCK AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED
 6. THIMBLE PLATE DIMENSIONS ARE FOR REFERENCE ONLY ENGINEER IS TO DETERMINE ADEQUATE PLATE DIMENSIONS NUMBER OF HOLES, DIAMETER OF HOLES AND SPACING. THIS PLATE CONFIGURATION WILL BE SUPPLIED WITH APPROVED DRAWING UNLESS REVISED DIMENSIONS ARE SUPPLIED
 7. CUSTOMER TO SHOW DIRECTION OF PREDOMINANT CURRENT FLOW WITH ARROW IN VIEW 'A-A'. (IF NO CURRENT CUSTOMER TO WRITE NO IN BOX.)

PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

SALES ORDER No: TXX-XXXX

700 N. BELL AVE.
CARNEGIE, PA. 15106
info@tideflex.com
412.279.0044
fax 412.279.5410

Tideflex
Technologies
A Division of Red Valve Company, Inc.

TT PRODUCT: 36" TF-1 TIDEFLEX W/THIMBLE PLATE

TT PART No: TF1-360-APPROVAL

DR. BY: MVH DATE: 12-19-07 CHKD. BY: DATE:

CAD SCALE: FULL

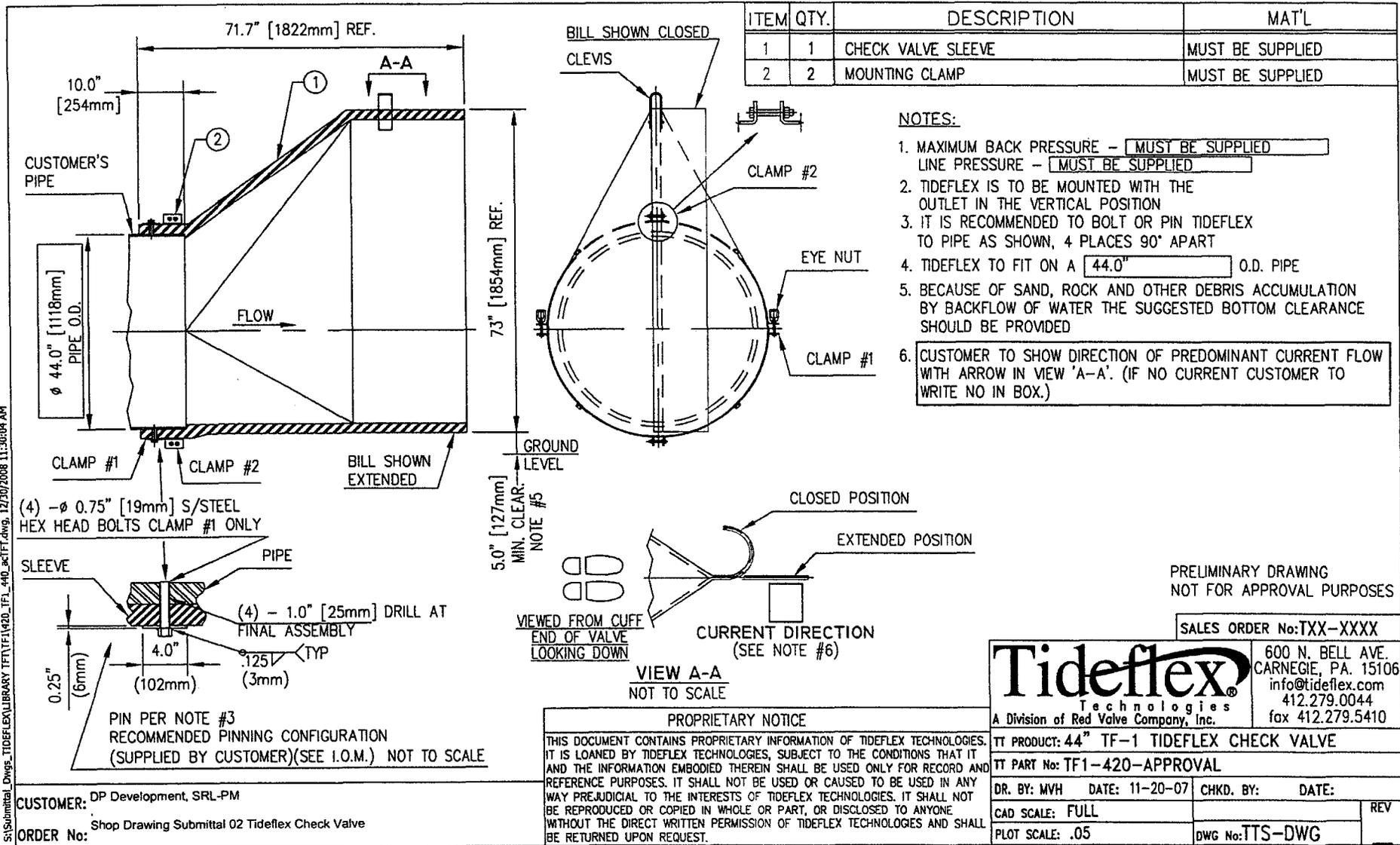
PLOT SCALE: .05 DWG No: TTS-DWG

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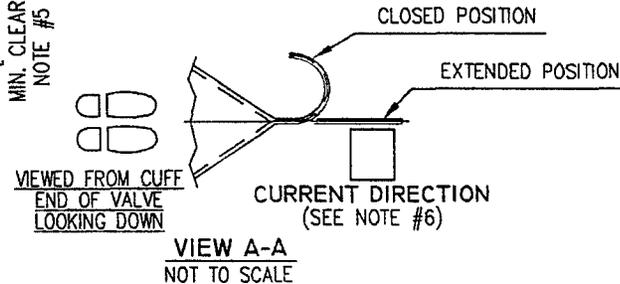
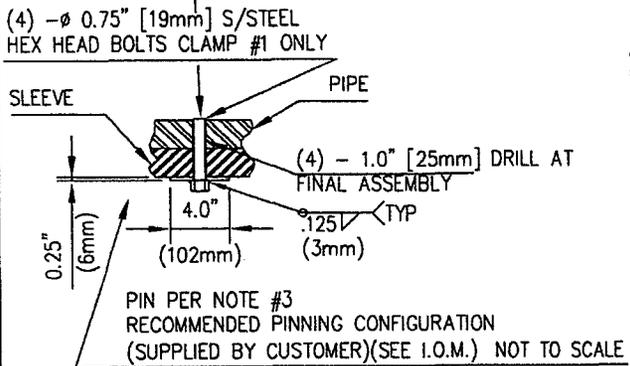
CUSTOMER: DP Development. SRL-PM
ORDER No: Shop Drawing Submittal 02 Tideflex Check Valve

S:\Submittal_Dwg\TIDEFLEX\LIBRARY\TFT\TF1-420_TF1_440_ACT.dwg, 12/30/2008 11:30:04 AM



ITEM	QTY.	DESCRIPTION	MAT'L
1	1	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	2	MOUNTING CLAMP	MUST BE SUPPLIED

- NOTES:**
1. MAXIMUM BACK PRESSURE - LINE PRESSURE -
 2. TIDEFLEX IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION
 3. IT IS RECOMMENDED TO BOLT OR PIN TIDEFLEX TO PIPE AS SHOWN, 4 PLACES 90° APART
 4. TIDEFLEX TO FIT ON A O.D. PIPE
 5. BECAUSE OF SAND, ROCK AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED
 6. CUSTOMER TO SHOW DIRECTION OF PREDOMINANT CURRENT FLOW WITH ARROW IN VIEW 'A-A'. (IF NO CURRENT CUSTOMER TO WRITE NO IN BOX.)



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PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

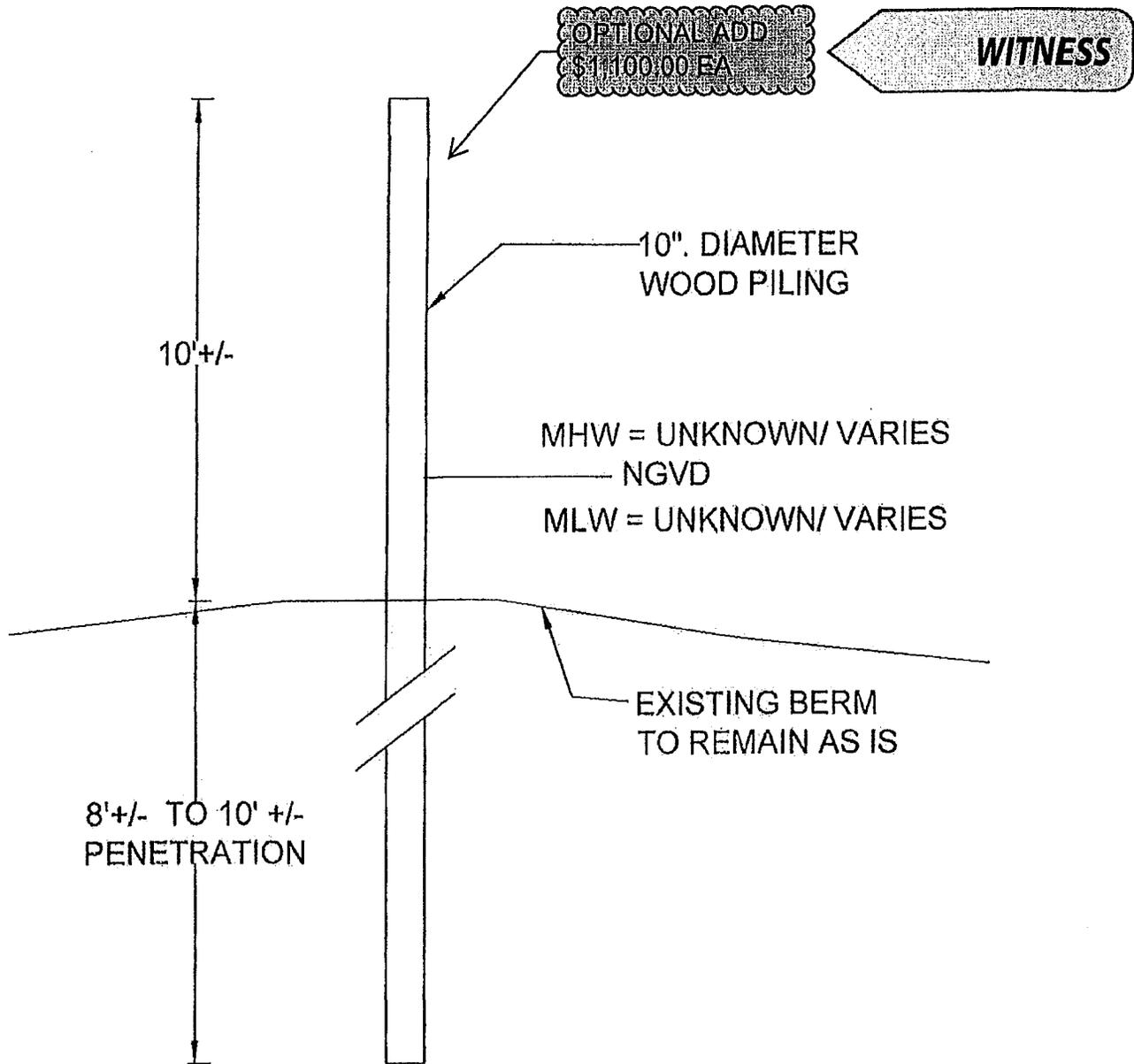
SALES ORDER No: TXX-XXXX

Tideflex
Technologies
A Division of Red Valve Company, Inc.

600 N. BELL AVE.
CARNEGIE, PA. 15106
info@tideflex.com
412.279.0044
fax 412.279.5410

TT PRODUCT: 44" TF-1 TIDEFLEX CHECK VALVE	
TT PART No: TF1-420-APPROVAL	
DR. BY: MVH	DATE: 11-20-07
CHKD. BY:	DATE:
CAD SCALE: FULL	REV
PLOT SCALE: .05	DWG No: TTS-DWG

10" DIA. WOOD PILINGS



GENERAL NOTES:

1. WOOD PILING TO BE 10" DIA. CCA TREATED.
2. PILES DRIVEN TO A MINIMUM DEPTH OF 8' INTO STRATA
3. IF HARD STRATA IS ENCOUNTERED MIN. DEPTH 2' INTO ROCK.
4. DRAWINGS NOT TO SCALE.

DPD REVIEWED
FOR SUBMISSION

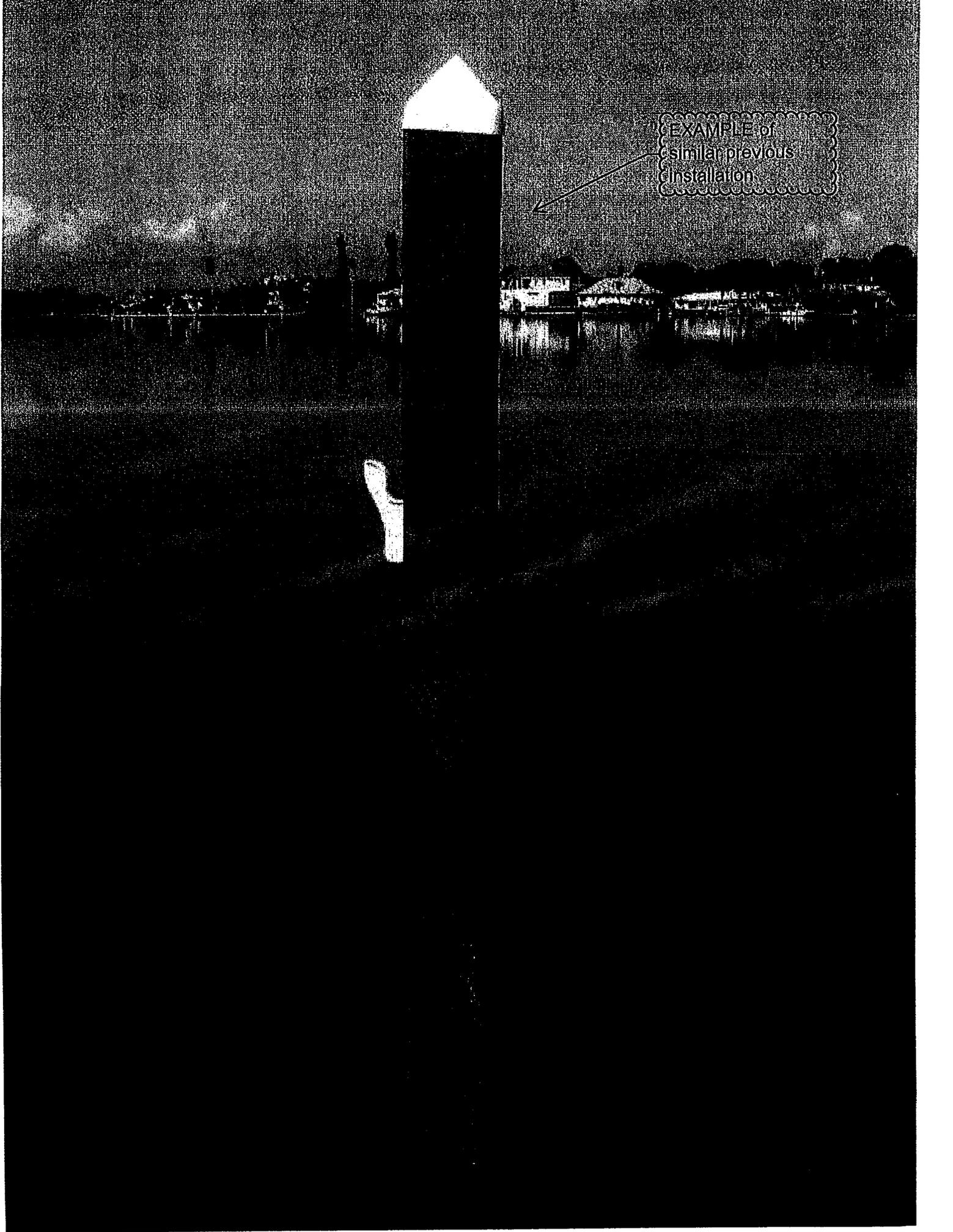


Shop Drawing Submittal 03 Wood Piling

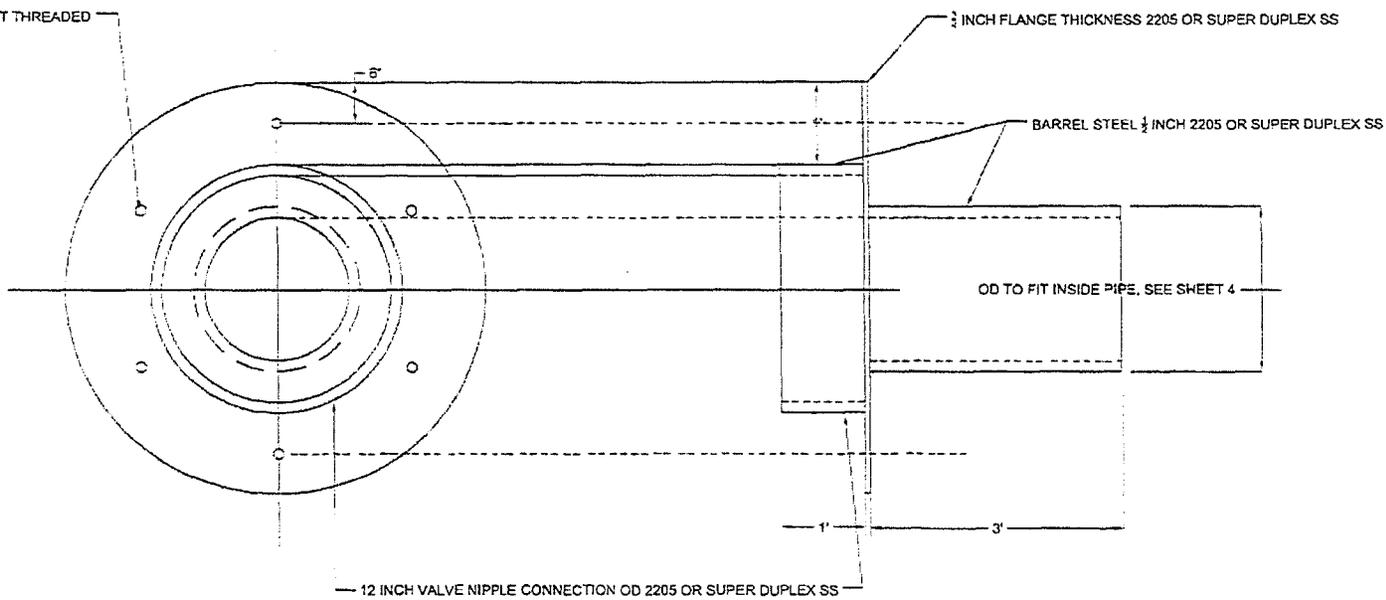
REVIEWED

By Steven R Lawless at 11:58 am, Jan 06, 2015

EXAMPLE of
similar previous
installation



3/8 INCH BORED HOLES NOT THREADED



General Notes

REVIEWED
By Steven R Lawless at 12:05 pm, Jan 05, 2015

DPD
SUBMITTAL

**DPD REVIEWED
FOR SUBMISSION**

Plongard Deane This Week
1/5/2015 12:05 PM
P. O. Box 22-1950
HOLLAND, FL 33071
ORTHOGONAL VIEW OF INSERT

No	Revision/Issue	Date

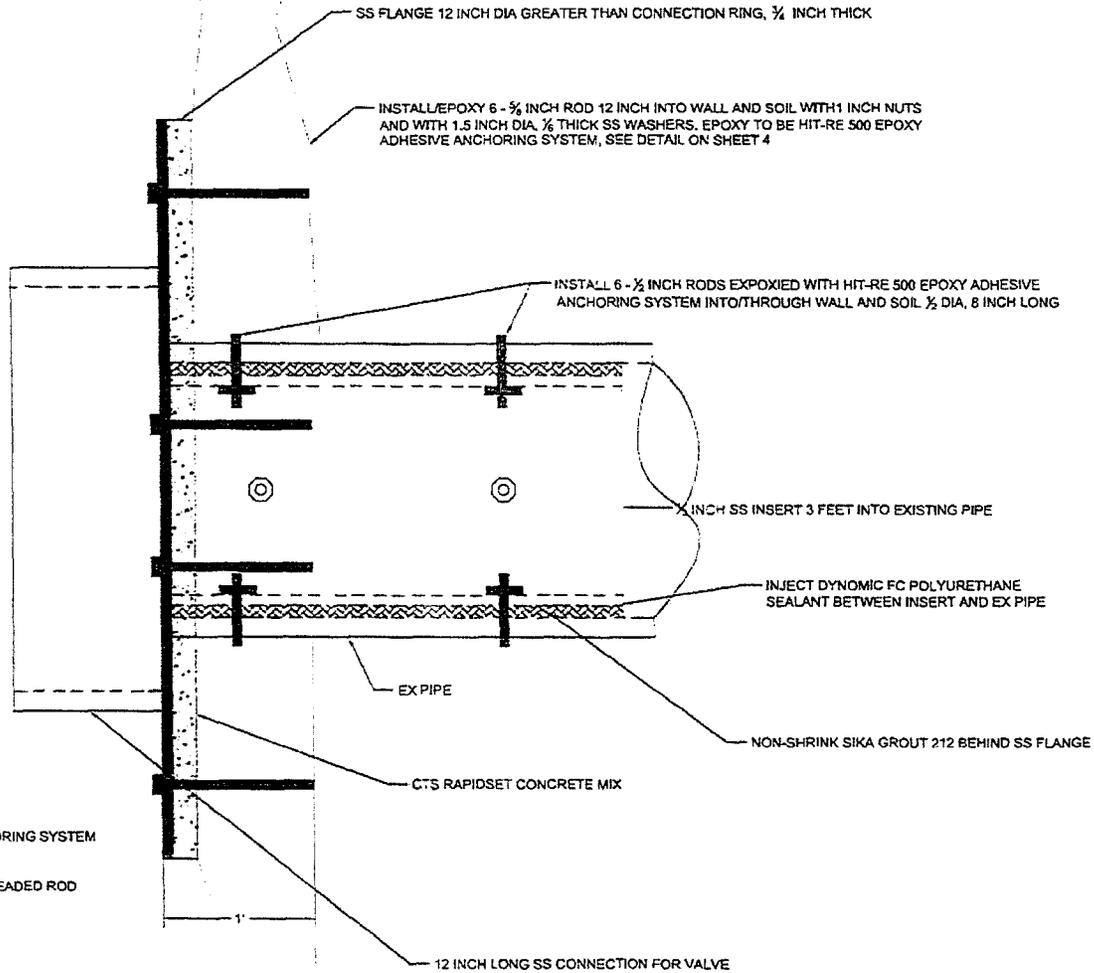
Public Utility Management & Planning
Services Inc.
P.O. Box 22-1950
Holliston, FL 33071

Dr. Frederick B. Deane, P.E.
PE # 43335

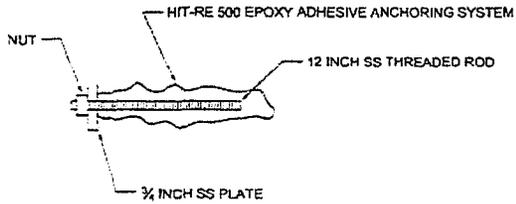
1/5/2015

As Noted

SEE SEPARATE SHEETS FOR CONCRETE SPECS, EPOXY SPECS, AND TYPE OF VALVE AND SPECS



DETAIL OF THREADED ROD INSTALLATION



General Notes

REVIEWED
By Steven R Lawless at 12:05 pm, Jan 08, 2015



DPD REVIEWED FOR SUBMISSION

Pompano Beach Fire Valve
Revision 01
Revised by: Steven R. Lawless, P.E.
CRITICAL VIEW OF INSTALLED INSERT

No.	Revision	Date

Public Utility Management & Consulting
Lynchburg, VA
P.O. Box 221100
Richmond, VA 23222

Project: Fire Valve
Sheet: 02 of 05
Date: 1/8/2015

Scale: As Shown
Date: 1/8/2015
Sheet: 02 of 05

PIPE DIMENSIONS			
SITE	EX PIPE NOM. DIA	DIA OF EXT OF (ID)	OD FLANGE NIPPLE
	INCH	INCH	INCH
2	24	22	24
3	30	28	30
5	36	33.50	36

SPECIFICATION SUMMARY

- INSERT/FLANGE ASSEMBLY 2205 DUPLEX OR SUPER DUPLEX SS
- 6 (OR 8 FOR 36 IN) FLANGE FACE BOLTS TO BE 12 INCH LONG, 5/8 IN DIA SS, FULLY THREADED AND EPOXIED INTO WALL AND SOIL, WITH 1 IN X 5/8 THREADED NUTS
- INTERNAL BOLTING TO BE 8 8 IN LONG, 1/2 IN DIA THREADED EPOXIED THROUGH EXISTING FIBERGLASS INSERT, PIPE AND SURROUNDING SOIL WITH 1/2 IN THREADED NUTS
- EPOXY TO BE HIT-RE 500 EPOXY ADHESIVE ANCHORING SYSTEM
- GROUT TO BE SIKAGROUT 212
- CEMENT FOR FLANGE TO WALL TO BE RAPID SET CONCRETE MIX

DATE: 1/06

REVIEWED
By Steven R Lawless at 12:04 pm, Jan 06, 2015



**DPD REVIEWED
FOR SUBMISSION**

Porcupine Branch TPA Varies
Revised On: 1/6/15
DPDIAL SHEET

No.	Revision/Issue	Date

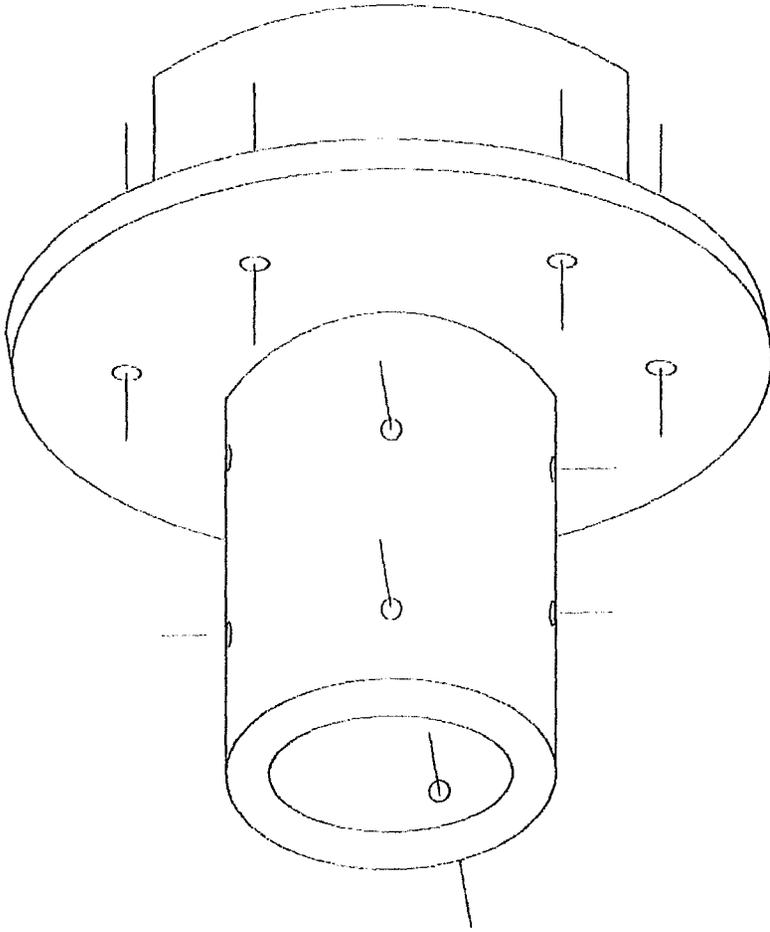
For more information:
Public Utility Management & Planning
Services Inc.
P.O. Box 20760
Tallahassee, FL 32302

Dr. Frederick A. Brundage, P.E.
3174 42332

1/6/2015

As Noted

04



05 1/27/2016 As Shown	P.E. R. LAWLESS 10000 S.W. 11th Street Fort Lauderdale, FL 33308	[Redacted] [Redacted] [Redacted]	Pompano Beach Title Values Riverside Dr. Pompano Beach, FL 33071 ISOMETRIC VIEW	REVIEWED By Steven R Lawless at 12:04 pm, Jan 06, 2016	
			DPD REVIEWED FOR SUBMISSION		

2205 Duplex Stainless Steel



Description

The 2205 S.S. (UNS S31803) alloy is probably the most recognized and widely used of the many duplex stainless steels. As the name duplex implies, it has a dual phase microstructure of both austenite and ferrite. In other words, duplex alloys have the strength of ferritic (400 series) S.S. while retaining the corrosion resistance of the austenitic (300 series) S.S.

Corrosion Resistance

The duplex stainless steels have general corrosion resistance comparable to 316 S.S. and even exceed it in many applications. In addition, their particular combination of higher chromium, molybdenum and nitrogen gives the duplexes more resistance to localized forms of corrosion such as pitting, crevice and stress corrosion cracking. Since 2205 lacks the copper addition of CD4MCuN, it would not be expected to do as well as CD4MCuN in sulfuric acid.

Mechanical Properties

Like all duplex stainless steels, 2205 has approximately twice the yield strength of 316 stainless and it is also about 50% harder. In addition, it has a slightly higher modulus of elasticity than 316 S.S. which means it is stiffer, thus less deflection can be expected.

Specifications

The 2205 alloy is available in various product forms:

DPD REVIEWED
FOR SUBMISSION



Bar ASTM A276 or A479 grade S31803
Castings ASTM A890 grade 4A
Tube ASTM A789
Pipe ASTM A790
Plate ASTM A240
Werkstoff-Nr. 1.4462 DIN X 2 CrNiMoN 22 5 3

REVIEWED

By Steven R Lawless at 12:06 pm, Jan 06, 2016

Chemical Composition

	<u>2205</u>	<u>316</u>	<u>CD4MCuN</u>
Chromium	21-23	16-18	24.5-26.5
Nickel	4.5-6.5	10-14	4.7-6.0
Molybdenum	2.5-3.5	2.0-3.0	1.7-2.3
Copper	---	---	2.7-3.3
Silicon	1.0	1.0	1.0
Manganese	2.0	2.0	1.0
Carbon	.03	.08	.04
Nitrogen	.08-.20	---	.1-.25
Iron	Bal	Bal	Bal

Mechanical Properties (Annealed)

	<u>2205</u>	<u>316</u>	<u>CD4MCuN</u>
Yield Strength, ksi (Mpa)	65 (450)	30 (205)	70 (485)
Tensile Strength, ksi (Mpa)	90 (620)	75 (215)	100 (690)
% Elongation	25	30	16

Flowserve Corporation, 2200 East Monument Avenue, Dayton, Ohio 45402, (937) 226-4000

Duplex 2507

Duplex 2507 is a super duplex stainless steel designed for applications which demand exceptional strength and corrosion resistance. Alloy 2507 has 25% chromium, 4% molybdenum, and 7% nickel. This high molybdenum, chromium and nitrogen content results in excellent resistance to chloride pitting and crevice corrosion attack and the duplex structure provides 2507 with exceptional resistance to chloride stress corrosion cracking.

Usage of Duplex 2507 should be limited to applications below 600° F (316° C). Extended elevated temperature exposure can reduce both the toughness and corrosion resistance of alloy 2507.

Duplex 2507 possesses excellent mechanical properties. Often a light gauge of 2507 material can be used to achieve the same design strength of a thicker nickel alloy. The resulting savings in weight can dramatically reduce the overall cost of fabrication.

Corrosion Resistance

2507 Duplex is highly resistant to uniform corrosion by organic acids such as formic and acetic acid. It is also highly resistant to inorganic acids, especially if they contain chlorides. Alloy 2507 is highly resistant to carbide-related intergranular corrosion. Due to the ferritic portion of the duplex structure of the alloy it is very resistant to stress corrosion cracking in warm chloride containing environments. Through additions of chromium, molybdenum and nitrogen localized corrosion such as pitting and crevice attack are improved. Alloy 2507 has excellent localized pitting resistance.

What are the characteristics of Duplex 2507?

- High resistance to chloride stress corrosion cracking
- High Strength
- Superior resistance to chloride pitting and crevice corrosion
- Good general corrosion resistance
- Suggested for applications up to 600° F
- Low rate of thermal expansion
- Combination of properties given by austenitic and ferritic structure
- Good weldability and workability

Chemical Composition, %

Cr	Ni	Mo	C	N	Mn
24.0-26.0	6.0-8.0	3.0-5.0	0.030 Max	.24-.32	1.20 Max
Si	Cu	P	S	Fe	
0.80 Max	0.50 Max	0.035 Max	0.020 Max	Balance	

ASTM Specifications

Pipe Smls	Pipe Welded	Tube Smls	Tube Welded	Sheet/Plate	Bar	Flanges & Fittings
A790	A790	A789	A789	A240	A276	A182

Zeron 100 Super Duplex Stainless Steel

Zeron 100, super duplex stainless steel, is a highly alloyed stainless steel designed for use in aggressive environments. High strength, toughness, excellent corrosion resistance and its resistance to corrosion in a wide range of organic and inorganic acids are just a few characteristics that make this duplex stainless steel attractive to a variety of industries. Lastly, it is highly resistant to strong alkalis and resists corrosion in many non-oxidizing acids.

Usage of this super duplex stainless steel is not recommended when it involves extended exposure to temperatures greater than 572° F. This exposure causes a substantial reduction in toughness.

Notice the chemical composition of duplex 2507 and Zeron 100 are similar however; Zeron 100 contains slightly more copper. The copper content (min. 0.5, max 1.0) permits excellent resistance to corrosion in many non-oxidizing acids.

What are the characteristics of Zeron 100, super duplex stainless steel?

- Guaranteed corrosion performance (PREn ≥ 40)
- High resistance to pitting and crevice corrosion
- Excellent resistance to stress corrosion cracking in both chloride and sour environments
- High resistance to erosion corrosion and corrosion fatigue
- Excellent mechanical properties
- Possibility for weight reduction over austenitic, standard duplex and nickel base alloys
- Good weldability

Chemical Composition, %

Cr	Ni	Mo	C	W	Cu
24.0-26.0	6.0-8.0	3.0-4.0	0.030 Max	0.5-1.0	0.50-1.0
N	Mn	Si	P	S	Fe
0.2-0.3	1.00 Max	1.0 Max	0.03 Max	0.01 Max	Balance

ASTM Specifications

Pipe & Tube	Sheet/Plate	Bar
A790, A928, A789	A240	A276

Mechanical Properties

Room Temperature, Solution Annealed Condition

Tensile Strength, ksi	.2% Yield Strength, ksi	% Elongation in 50mm	Hardness Max.
109	80	25	28 HRC

Zeron® 100 is a registered trademark of RA Materials.

EXHIBIT "B"

CONDITIONS OF THE CONTRACT

1. The plans prepared by DP Development of the Treasure Coast, LLC and Public Utility Management & Planning Services Inc have been or will be paid for by owner.
2. Owner has the right to approve in writing the materials, systems and finishes involved in the project.
3. Work days are Monday through Friday, excluding holidays. Neither owner nor contractor shall offer workers any beer or other alcoholic beverages while on the jobsite.
4. Owner carries insurance policies of its own, but this shall not diminish this contract's requirement concerning insurance to be furnished by contractor.
5. Owner shall pay for electricity, water and other usual utilities furnished to the jobsite during construction of the work.
6. Except as provided in the contract or allowed by law, owner shall not stop or obstruct contractor in performing the work.
7. All notices to contractor shall be given to contractor at the address, fax or phone number set forth at the beginning of this contract. All notices to owner shall be given to owner's agent at the address set forth at the beginning of this contract and to any other persons as owner from time to time designates in writing to contractor.
8. Owner shall remove-or cover its items of personal property that remain on the jobsite during construction. Owner and contractor shall take reasonable precautions to protect those items.
9. All demolished material will be the property of contractor unless owner expressly states otherwise.
10. Contractor is responsible for cleanup of construction materials and trash on a regular basis so as not to be illegal or unsightly. Site and interior will be left broom clean only.

DPD Conditions added → #11 to 12

#11 The terms and conditions of the DPD PROPOSAL 14-170 in response to Request for Proposal E-53-14 PROCUREMENT AND INSTALLATION SERVICES FOR STORMWATER OUTFALL CHECK VALVES Dated July 24, 2014 \$169,125.00 are hereby incorporated and made part of the construction agreement.

#12

Any costs resulting from Army Corp of Engineering or any other agency regarding permits, impacts, private property, or other similar incidental fees are explicitly excluded

EXHIBIT "C"

CONTRACT BREAKDOWN

#	Description	Quantity	Unit	Unit Price	Extension
1	General Conditions	1	LS	\$38,125.00	\$38,125.00
2	601 South Riverside Drive	1	LS	\$6,000.00	\$6,000.00
3	301 South Riverside Drive	1	LS	\$24,000.00	\$24,000.00
4	303 North Riverside Drive	1	LS	\$41,500.00	\$41,500.00
5	521 North Riverside Drive	1	LS	\$18,500.00	\$18,500.00
6	615 North Riverside Drive	1	LS	\$41,000.00	\$41,000.00
7	Wood Piling Bollards	10	EA	\$1,100.00	\$11,000.00
8	Public Utility Management Added Engineering Fees	1	LS	\$3,250.00	\$3,250.00
TOTAL		\$183,375.00			

EXHIBIT "D"
PARTIAL WAIVER OF LIEN AND
AFFIDAVIT OF PAYMENT

State of Florida
County of _____

The undersigned, DP Development of the Treasure Coast, LLC, has performed work under a contract with CITY OF POMPANO BEACH with respect to the renovation of the POMPANO E-53-14 PROCUREMENT AND INSTALLATION SERVICES FOR STORMWATER OUTFALL CHECK VALVES located on owner's grounds on :

601 South Riverside Drive, 301 South Riverside Drive, 303 North Riverside Drive, 521 North Riverside Drive, 615 North Riverside Drive, Broward County, Florida, legally described on the attachment to this contract.

The undersigned, for good and valuable consideration in the amount of \$_____, the receipt of which is acknowledged by the undersigned, waives, releases, discharges and relinquishes forever all construction, mechanics and other liens, rights of lien and claims of any kind on or against owner and owner's above-described real property on account of all work, labor, services and materials furnished for or incorporated into the real property by the undersigned or anyone claiming by, through or under the undersigned prior to and through the following partial completion date:

Partial Completion Date: _____

The undersigned further certifies that the consideration moving to the undersigned for executing this instrument has been mutually given and accepted as absolute payment and not as a conditional or part payment or as security for payment and constitutes payment in full for all work, labor, material and services furnished prior to and through the partial completion date.

The undersigned certifies that all persons who have furnished work, labor, material or services to the property prior to and through the partial completion date at the request or order of the undersigned have been paid *in full*, except for the following: _____

This instrument is executed on _____.

AFFIANT:

BY: _____
PRINT NAME: _____
TITLE: _____

The foregoing instrument was acknowledged before me on the ____ day of _____, 20__, by _____ as _____ of _____ He/she is personally known to me or has produced _____ as identification..

NOTARY SEAL:

NOTARY PUBLIC, STATE OF FLORIDA

Print Name

(Commission Number)

EXHIBIT "E"

FINAL WAIVER OF LIEN AND
AFFIDAVIT OF PAYMENT

State of Florida
County of _____

The undersigned, DP Development of the Treasure Coast, LLC, has performed work under a contract with CITY OF POMPANO BEACH with respect to the renovation of the POMPANO E-53-14 PROCUREMENT AND INSTALLATION SERVICES FOR STORMWATER OUTFALL CHECK VALVES located on owner's grounds on :

601 South Riverside Drive, 301 South Riverside Drive, 303 North Riverside Drive, 521 North Riverside Drive, 615 North Riverside Drive, Broward County, Florida, legally described on the attachment to this contract.

The undersigned, for good and valuable consideration in the amount of \$ _____, the receipt of which is acknowledged by the undersigned, waives, releases, discharges and relinquishes forever all construction, mechanics' and other liens, rights of lien and claims of any kind on or against owner and owner's above-described real property on account of all work, labor, services and materials furnished or to be furnished for or incorporated into the real property by the undersigned or anyone claiming by, through or under the undersigned.

The undersigned further certifies that the consideration moving to the undersigned for executing this instrument has been mutually given and accepted as absolute payment and not as a conditional or part payment or as security for payment and constitutes payment in full for all work, labor, material and services furnished or to be furnished.

The undersigned certifies that all persons who have furnished or shall furnish work, labor, material or services to the property at the request or order of the undersigned have been paid in full.

This instrument is executed on _____.

AFFIANT:

BY: _____
PRINT NAME: _____
TITLE: _____

The foregoing instrument was acknowledged before me on the ____ day of _____, 20____, by _____ as _____ of _____ He/she is personally known to me or has produced _____ as identification..

NOTARY SEAL:

NOTARY PUBLIC, STATE OF FLORIDA

Print Name

(Commission Number)