Weaver
CONSTRUCTION MANAGEMENT
3679 S Huron Street, Suite 404 Englewood, Colorado 80110
Phone: (303) 789-4111 FAX: (303) 789-4310

# SUBMITTAL TRANSMITAL

September 10, 2012
**WCM Submittal No: 11377-001**

PROJECT: **Harold Thompson Regional WRF**
Birdsall Rd.
Fountain, CO 80817
Job No. 2908

ENGINEER: **GMS, Inc.**
611 No. Weber St., #300
Colorado Springs, CO 80903
719-475-2935 Roger Sams

OWNER: **Lower Fountain Metropolitan Sewage Disposal District**
901 S. Santa Fe Ave.
Fountain, CO 80817
719-382-5303 James Heckman

CONTRACTOR: **Tideflex Technologies**
600 N. Bell Ave.
Carnegie, PA 51066
Jeff Kelly jkelly@redvalve.com

SUBJECT: Submittal for Coarse Bubble Diffuser Systems for Aerobic Digesters No. 1, 2 & 3
**Requesting Review Response by 9/19/12.**

SPEC SECTION: 11377

PREVIOUS SUBMISSION DATES:

DEVIATIONS FROM SPEC: ___ YES _X_ NO

CONTRACTOR'S STAMP: This submittal has been reviewed by Weaver Construction Management and, unless indicated otherwise, has been found to be in conformance with the intent of the contract documents.

| Contractor's Stamp: | Engineer's Stamp: |
|---|---|
| Date: 9/10/12<br>Reviewed by: John Jacob<br>( ) Reviewed Without Comments<br>(X) Reviewed With Comments | |

ENGINEER'S COMMENTS:_____

# CERTIFICATE OF CONFORMANCE

| | | | |
|---|---|---|---|
| **Company:** | Weaver Construct. Mgmnt. | **Date:** | 09/07/2012 |
| **P.O. No.:** | 9103-11377 | **S.O. No.:** | OP# 10372 |

This is to certify that all products manufactured by Red Valve Company, Tideflex Technologies[1] or RKL Controls[1] for this order and referenced below, [ X ] will be [ ] were manufactured[2] in the USA, and in compliance with the requirements of the above referenced Purchase Order and the applicable codes, standards and specifications referenced therein.

| S.O. It. No. | Part Number | Description | Qty. |
|---|---|---|---|
| | | | |
| | undetermined | Coarse Bubble Aeration Systems | 3 |
| | | For Aerobic Digesters No.1, No.2, No.3 | |
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Project/Job: Harold D. Thompson Regional Water Reclamation Facility

[1] A division of Red Valve Company, Inc.

[2] Manufacturing facilities are located in Carnegie, Pennsylvania, USA, and Gastonia, North Carolina, USA.

Approved By: Jeffrey T. Kelly
Aeration Systems Product Manager

Date: September 7, 2012

*This Certificate of Conformance is prepared in good faith and is limited to those plans and specifications received. Red Valve Company, Inc. does not assume responsibility for any other codes, standards or specification sections if not submitted or received at the time of quotation or order.*

# INSTALLATION PLANS

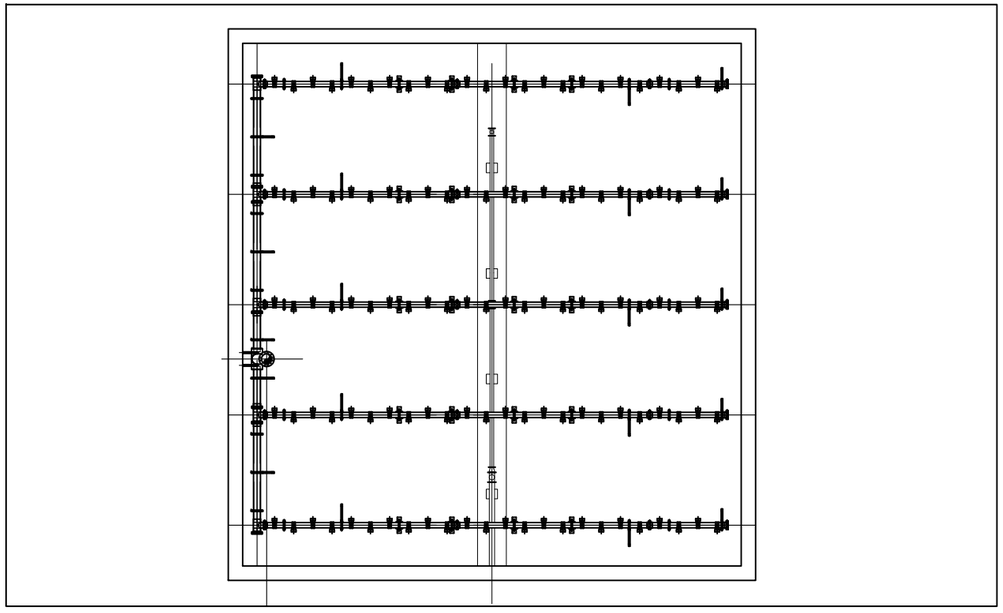
## TIDEFLEX DIFFUSED AERATION SYSTEM

HAROLD D. THOMPSON REGIONAL WATER RECLAMATION FACILITY

LOWER FOUNTAIN METROPOLITAN SEWAGE DISPOSAL DISTRICT

AEROBIC DIGESTERS NO.1, NO.2, NO.3

ORDER NO. 10372



| DRAWING No. | SHEET No. | SYSTEM DRAWINGS |
|---|---|---|
| AS12–10372 | 1 OF 5 | DIFFUSED AERATION SYSTEM – TITLE SHEET |
| AS12–10372 | 2 OF 5 | AERATION SYSTEM – ASSEMBLY PLAN |
| AS12–10372 | 3 OF 5 | AERATION SYSTEM – SECTION VIEW "A–A" |
| AS12–10372 | 4 OF 5 | AERATION SYSTEM – SECTION VIEW "B–B" |
| AS12–10372 | 5 OF 5 | PIPE SUPPORT LOCATIONS AND INFO |
| | | |
| | | APPENDIX DRAWINGS |
| A–103.01.010 | 1 OF 1 | DROP PIPE WALL BRACKET – INSTALLATION DETAILS |
| A–104.00.010 | 1 OF 1 | HORIZONTAL PIPE SUPPORT ASSEMBLY – INSTALLATION PROCEDURES |
| A–104.02.011 | 1 OF 2 | COARSE BUBBLE DIFFUSER AND SADDLE ASSEMBLY SECTIONS |
| A–104.02.011 | 2 OF 2 | COARSE BUBBLE DIFFUSER AND SADDLE ASSEMBLY SECTIONS |
| A–104.06.020 | 1 OF 1 | HORIZONTAL PIPE SUPPORT ASSEMBLY – BASE EXTENSION TYPE |
| A–104.07.011 | 1 OF 1 | HORIZONTAL PIPE SUPPORT STABILIZER BAR DETAILS |
| A–107.01.010 | 1 OF 1 | EXPANSION JOINT INSTALLATION PROCEDURES |
| | | |
| | | |

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
| A | JTK | 09/06/12 | | | ISSUE FOR APPROVAL |



S.O.#:

QUOTE #: 10372

DWG. NOTES:

Tideflex® Technologies
A Division of Red Valve Company, Inc.,
TIDEFLEX TECHNOLOGIES
AIR DIFFUSER SYSTEM
600 North Bell Ave.
Carnegie, PA 15106 USA
Phone: 412–279–0044
Fax: 412–279–5410
Website: WWW.TIDEFLEX.COM
Email: INFO@TIDEFLEX.COM

TITLE SHEET
COARSE BUBBLE AERATION SYSTEMS
AEROBIC DIGESTERS NO.1, NO.2, NO.3

CONSULTANT:

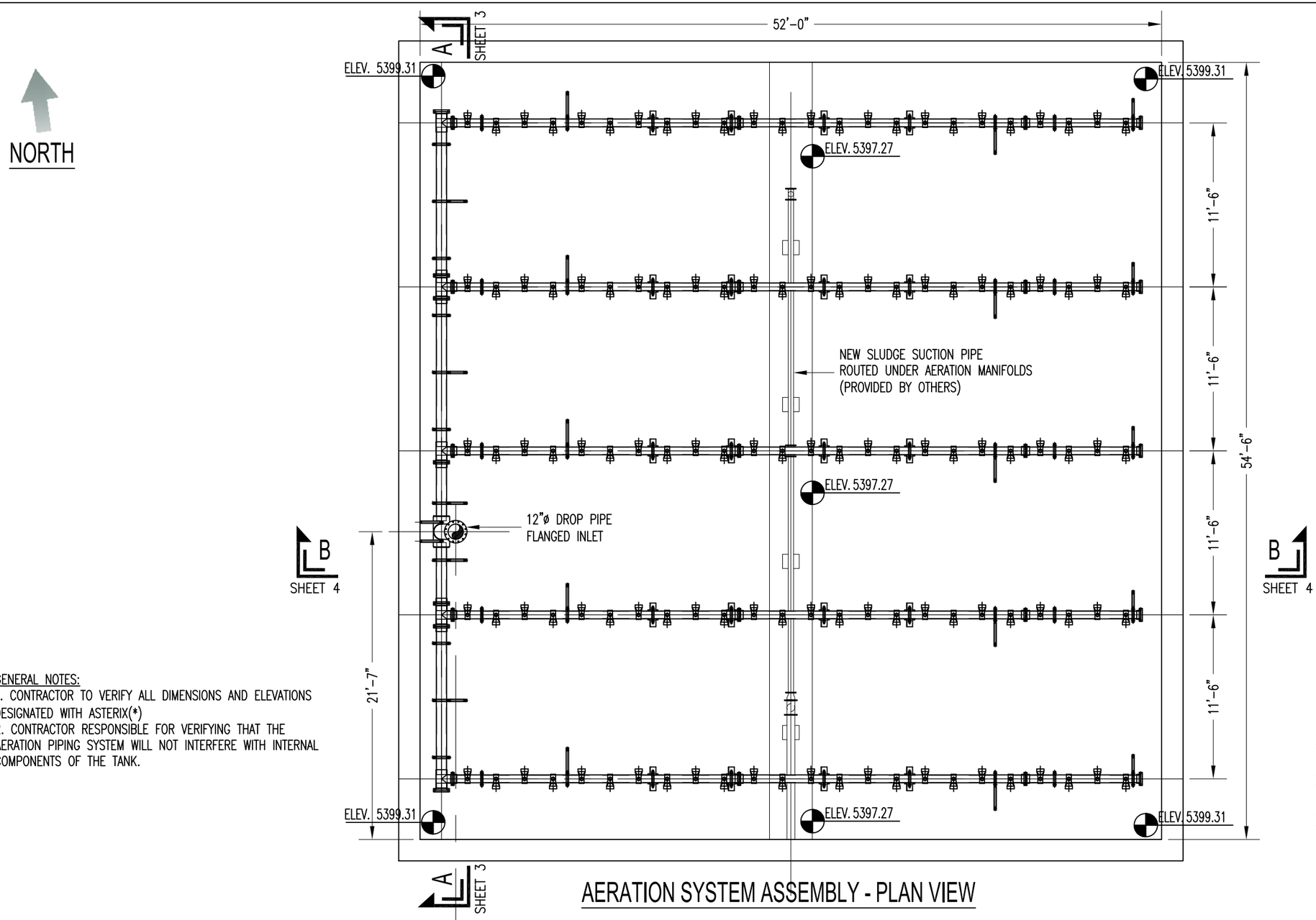
APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: 1:1 PLOT SCALE: 1:1

DWG. BY: DATE:

DWG. NO. AS12-10372

SHEET 1 OF 5




AEROBIC DIGESTER NO.1

AEROBIC DIGESTER NO.2

AEROBIC DIGESTER NO.3

## AERATION SYSTEM ASSEMBLY - PLAN VIEW

GENERAL NOTES:
1. CONTRACTOR TO VERIFY ALL DIMENSIONS AND ELEVATIONS DESIGNATED WITH ASTERIX(*)
2. CONTRACTOR RESPONSIBLE FOR VERIFYING THAT THE AERATION PIPING SYSTEM WILL NOT INTERFERE WITH INTERNAL COMPONENTS OF THE TANK.

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
| A | JTK | 09/06/12 | | | ISSUE FOR APPROVAL |



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AERATION SYSTEM - ASSEMBLY PLAN
HAROLD D. THOMPSON RWRF
AEROBIC DIGESTERS NO.1, NO.2, NO.3

CONSULTANT:

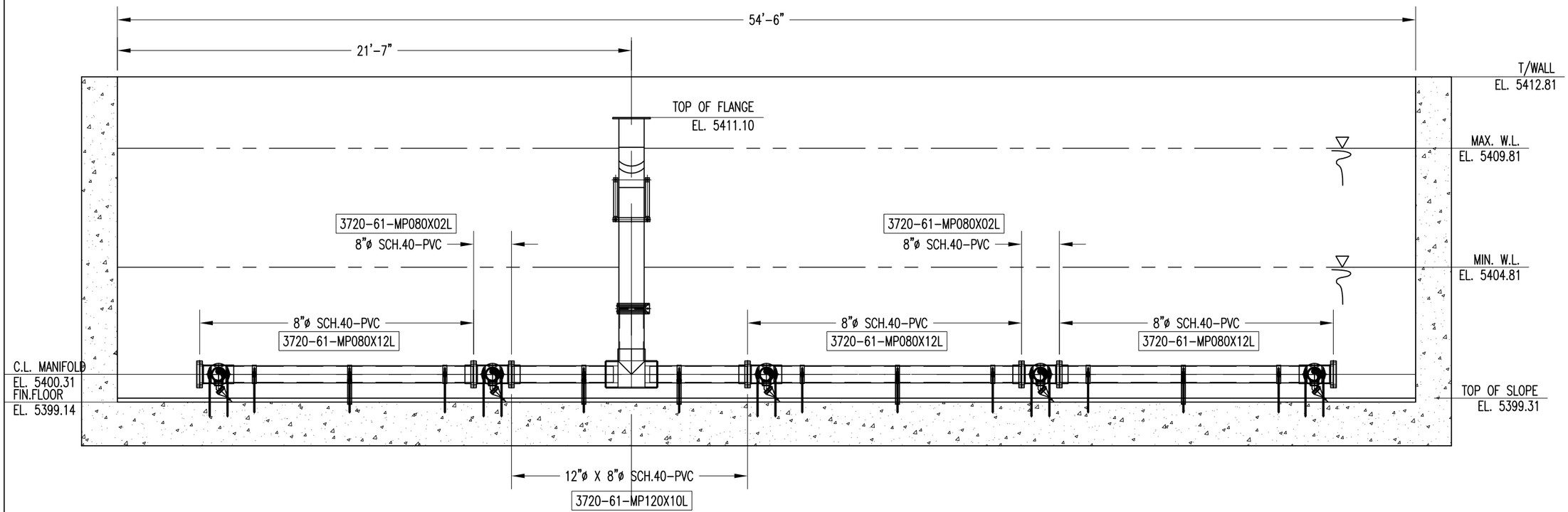
APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: FULL PLOT SCALE:

DWG. BY: DATE:

DWG. NO. AS12-10372

SHEET 2 OF 5




## SECTION VIEW "A-A"

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
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AERATION SYSTEM - SECTION VIEW
HAROLD D. THOMPSON RWRF
AEROBIC DIGESTERS NO.1, NO.2, NO.3

CONSULTANT:

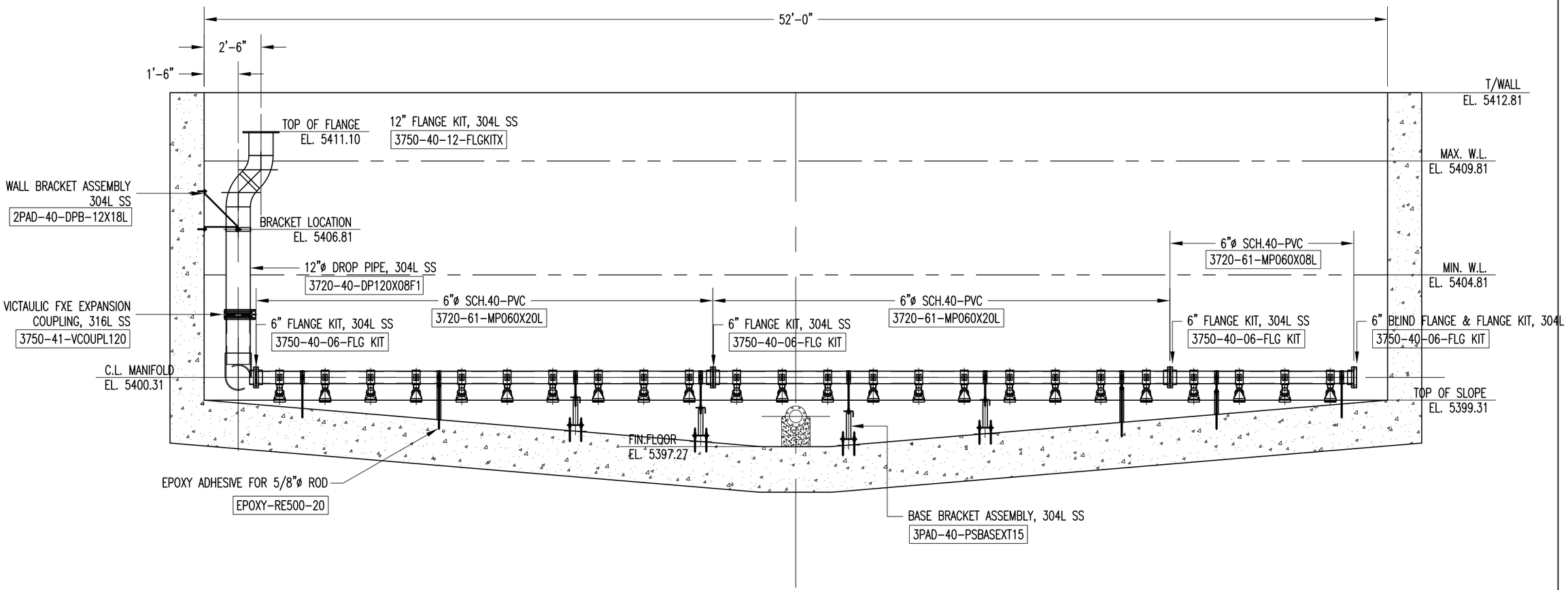
APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: FULL PLOT SCALE:

DWG. BY: DATE:

DWG. NO. AS12-10372

SHEET 3 OF 5




## SECTION VIEW "B-B"

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
| A | JTK | 09/06/12 | | | ISSUE FOR APPROVAL |



S.O.#: | QUOTE #: 10372

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AERATION SYSTEM - SECTION VIEW
HAROLD D. THOMPSON RWRF
AEROBIC DIGESTERS NO.1, NO.2, NO.3

CONSULTANT:
APPLICATION: DIFFUSED AERATION SYSTEM
CAD SCALE: FULL | PLOT SCALE:
DWG. BY: | DATE:
DWG. NO. AS12-10372
SHEET 4 OF 5

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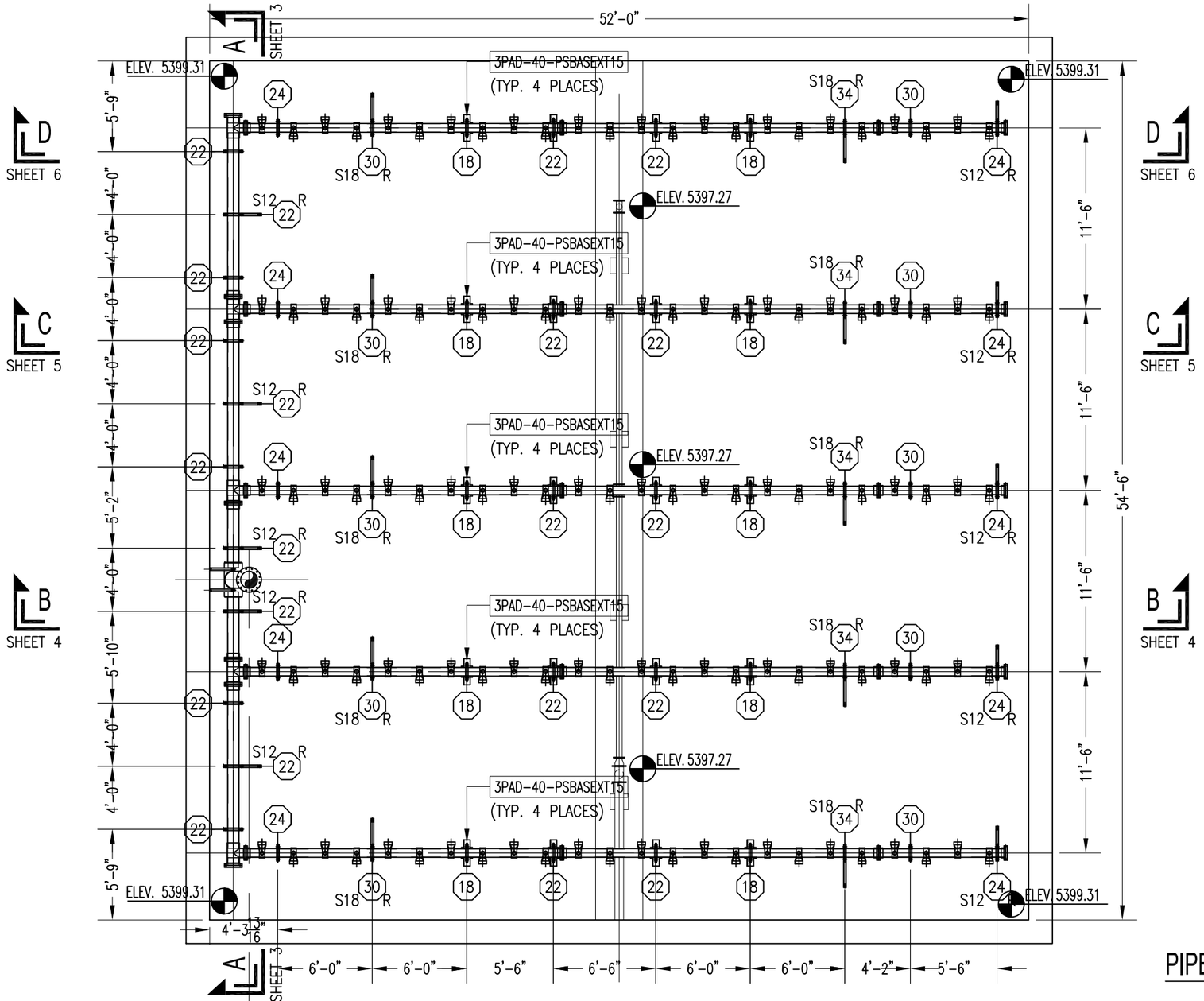


STABILIZER BAR & SIZE

S18 R — RESTRAINING PLATE

24

LENGTH OF THREADED ROD

PIPE SUPPORT TAG KEY

## PIPE SUPPORT LOCATIONS

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
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PIPE SUPPORT LOCATIONS AND INFO
HAROLD D. THOMPSON RWRF
AEROBIC DIGESTERS NO.1, NO.2, NO.3

CONSULTANT:

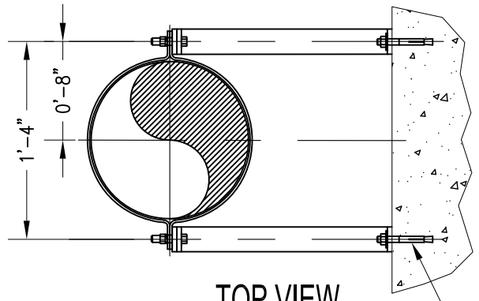
APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: FULL PLOT SCALE:

DWG. BY: DATE:

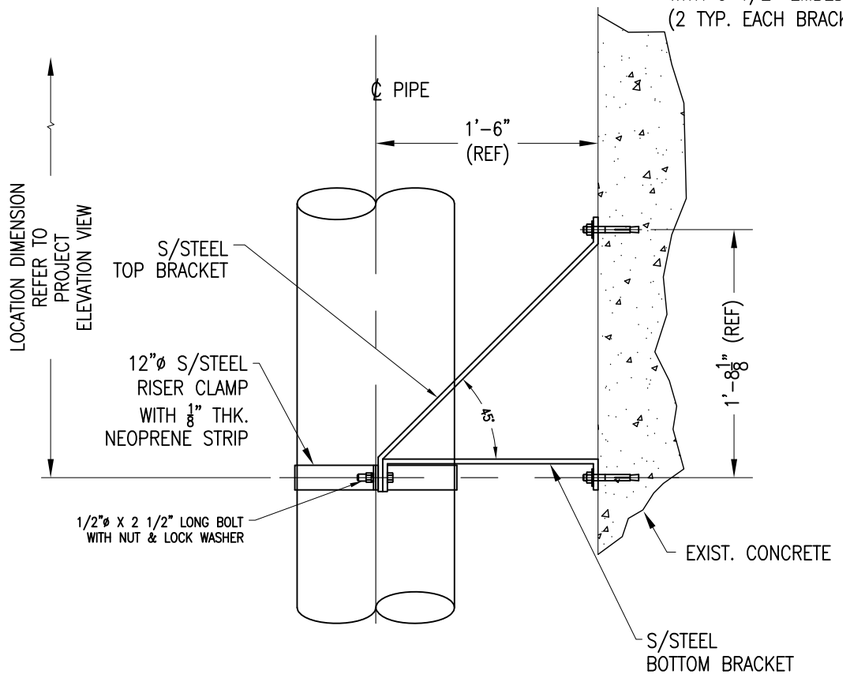
DWG. NO. AS12-10372

SHEET 5 OF 5




TOP VIEW

1/2"ø HILTI KWIK BOLT
WITH 3 1/2" EMBEDMENT
(2 TYP. EACH BRACKET)




12"Ø DROP PIPE
DROP PIPE SUPPORT ASSEMBLY
2PAD-40-DPB-12X18L

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
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Email: INFO@TIDEFLEX.COM

# DROP PIPE WALL BRACKET INSTALLATION DETAILS

CONSULTANT:

APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: PLOT SCALE:

DWG. BY: DATE:

DWG. NO. A-103.01.010

SHEET 1 OF 1

## SUPPORT DESIGNATIONS

SHOWN ON PLAN AND ELEVATION SHEETS

(XX) DENOTES ROD LENGTH "C" REQUIRED

R (XX) DENOTES LOCATION FOR RESTRAINING PLATE

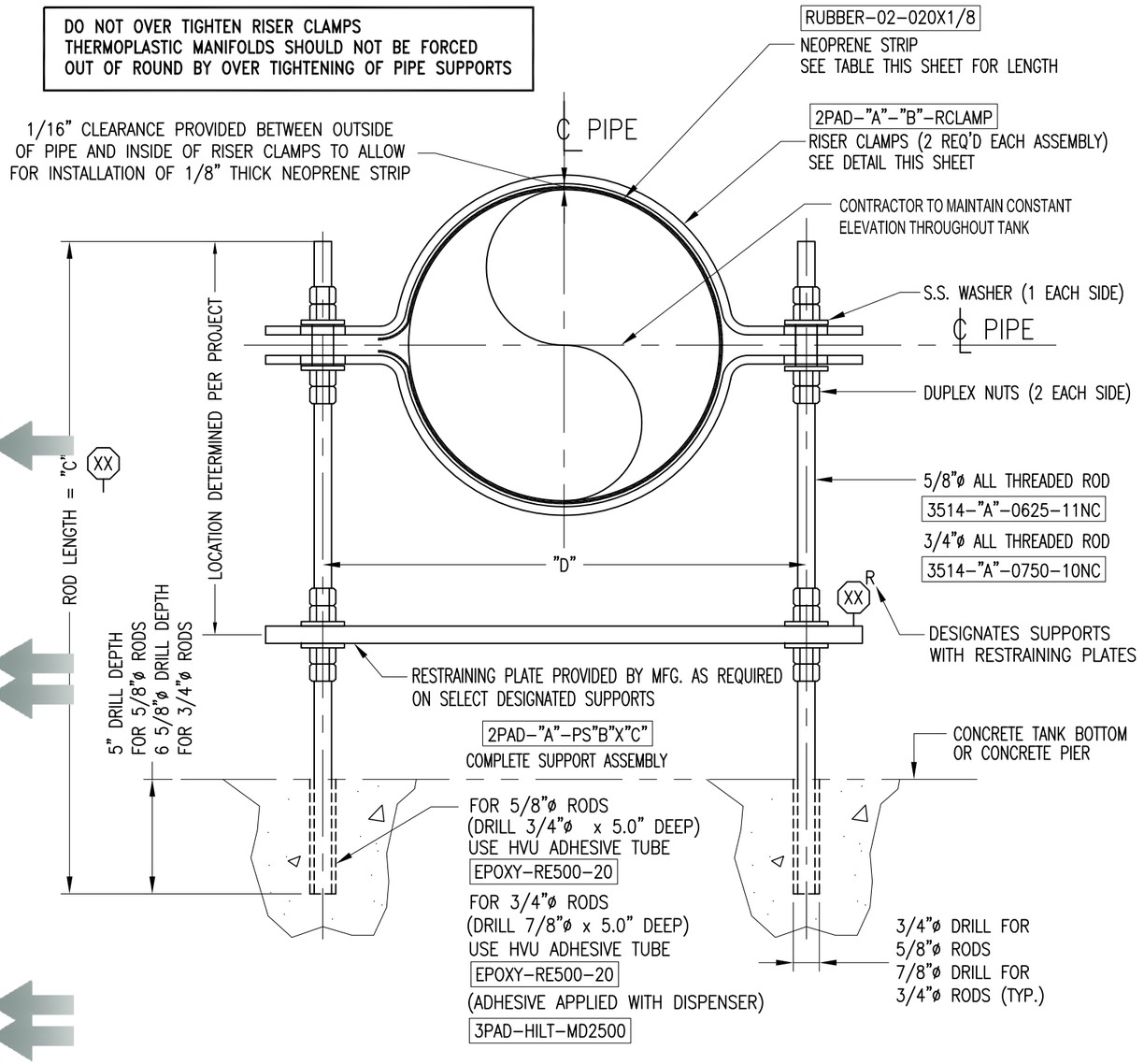
(00) DENOTES PIER HEIGHT "H" REQUIRED

S (XX) DENOTES LOCATION FOR STABALIZER BAR

| NOMINAL PIPE SIZE | PIPE SIZE O.D. | ROD DIA. | NEOPRENE STRIP LENGTH | PART NUMBER |
|---|---|---|---|---|
| 2" | 2.375" | 0.625" | 7.00" | RUBBER-02-020X1/8 |
| 2.5" | 2.875" | 0.625" | 8.25" | RUBBER-02-020X1/8 |
| 3" | 3.50" | 0.625" | 10.50" | RUBBER-02-020X1/8 |
| 4" | 4.50" | 0.625" | 13.75" | RUBBER-02-020X1/8 |
| 6" | 6.625" | 0.625" | 20.50" | RUBBER-02-020X1/8 |
| 8" | 8.625" | 0.75" | 26.75" | RUBBER-02-020X1/8 |
| 10" | 10.750" | 0.75" | 33.25" | RUBBER-02-020X1/8 |
| 12" | 12.750" | 0.75" | 39.75" | RUBBER-02-020X1/8 |
| 14" | 14.00" | 0.75" | 43.75" | RUBBER-02-020X1/8 |

| REFERENCE LETTER | DESCRIPTION | PART NUMBER VALUE | DEFINITION |
|---|---|---|---|
| A | MATERIAL | | |
| | | 40 | 304 STAINLESS STEEL |
| | | 41 | 316 STAINLESS STEEL |
| B | PIPE DIAMETER | | |
| | | 020 | 2"ø |
| | | 025 | 2.5"ø |
| | | 030 | 3"ø |
| | | 040 | 4"ø |
| | | 060 | 6"ø |
| | | 080 | 8"ø |
| | | 100 | 10"ø |
| | | 120 | 12"ø |
| | | 140 | 14"ø |
| C | THREADED ROD LENGTH | | |
| D | THREADED ROD SPACING | | |
| | | 020 | 6.00" |
| | | 025 | 6.00" |
| | | 030 | 6.00" |
| | | 040 | 7.00" |
| | | 060 | 9.00" |
| | | 080 | 12.00" |
| | | 100 | 14.00" |
| | | 120 | 16.00" |
| | | 140 | 18.00" |

**DO NOT OVER TIGHTEN RISER CLAMPS THERMOPLASTIC MANIFOLDS SHOULD NOT BE FORCED OUT OF ROUND BY OVER TIGHTENING OF PIPE SUPPORTS**




* FOR SS DROP-IN ANCHORS (IN LIEU OF EPOXY ADHESIVE) REFER TO IOM MANUAL APPENDIX FOR RECOMMENDED CONCRETE DRILL DIAMETER AND DEPTH.

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
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600 North Bell Ave.
Carnegie, PA 15106 USA
Phone: 412-279-0044
Fax: 412-279-5410
Website: WWW.TIDEFLEX.COM
Email: INFO@TIDEFLEX.COM

# HORIZONTAL PIPE SUPPORT ASSEMBLY INSTALLATION PROCEDURES 5/8"Ø & 3/4"Ø THREADED RODS

CONSULTANT:

APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: FULL PLOT SCALE: FULL

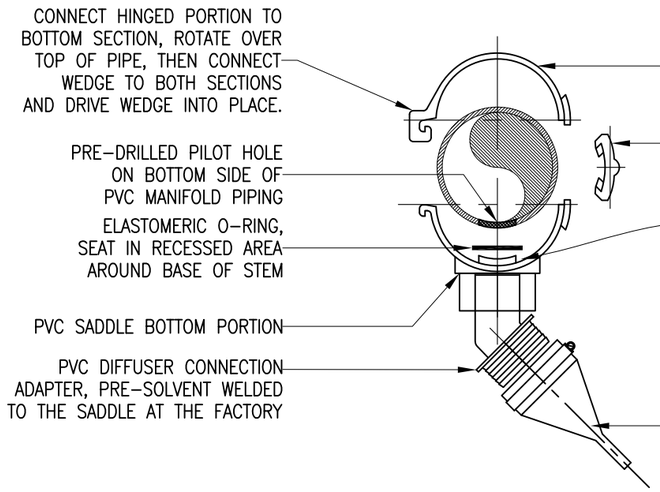
DWG. BY: DATE:

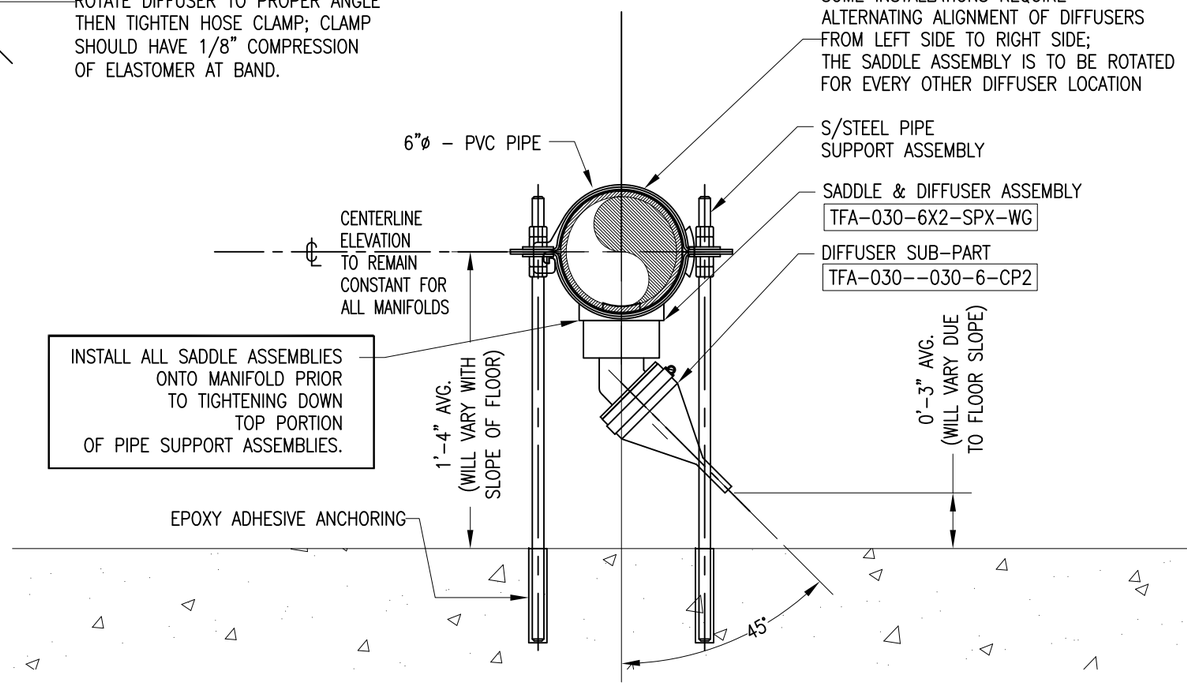
DWG. NO. A-104.00.010

SHEET 1 OF 1

# SADDLE & DIFFUSER ASSEMBLY
# FIELD INSTALLATION

STEP 1: SLIDE DIFFUSER SLEEVE ONTO BARBED ADAPTER, ALIGN, AND TIGHTEN HOSE CLAMP.
STEP 2: SEAT O-RING INTO BOTTOM PORTION OF THE SADDLE.
STEP 3: CHECK DIFFUSER SIDE LOCATION (LEFT OR RIGHT) FOR SPECIFIC CONNECTION POINT.
STEP 4: SEAT BOTTOM SADDLE PORTION LOCKING STEM INTO PILOT HOLE IN BOTTOM SIDE OF MANIFOLD. SADDLE SHOULD BE FLUSH AGAINST BOTTOM SURFACE OF MANIFOLD PIPE.
STEP 5: CONNECT TOP SADDLE PORTION HINGE TO LOWER SADDLE PORTION AT THE HINGE LOOP, ROTATE INTO PLACE ON TOP OF MANIFOLD PIPE.
STEP 6: SLIDE ECCENTRIC WEDGE ONTO TAPERED GUIDES, TAP INTO PLACE UNTIL WEDGE END FACE IS FLUSH WITH END OF SADDLE.




TYPICAL DIFFUSER SECTION

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
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DWG. NOTES:

Tideflex® Technologies
A Division of Red Valve Company, Inc.,
TIDEFLEX TECHNOLOGIES
DIFFUSED AERATION SYSTEM
600 North Bell Ave.
Carnegie, PA 15106-0548, USA
Phone: 412-279-0044
Fax: 412-279-5410
WEBSITE: WWW.TIDEFLEX.COM
EMAIL: INFO@TIDEFLEX.COM

COARSE BUBBLE DIFFUSER INSTALLATION DETAILS
DIFFUSER AND SADDLE ASSEMBLY
SECTION VIEWS

CONSULTANT:

APPLICATION: DIFFUSED AERATION SYSTEM

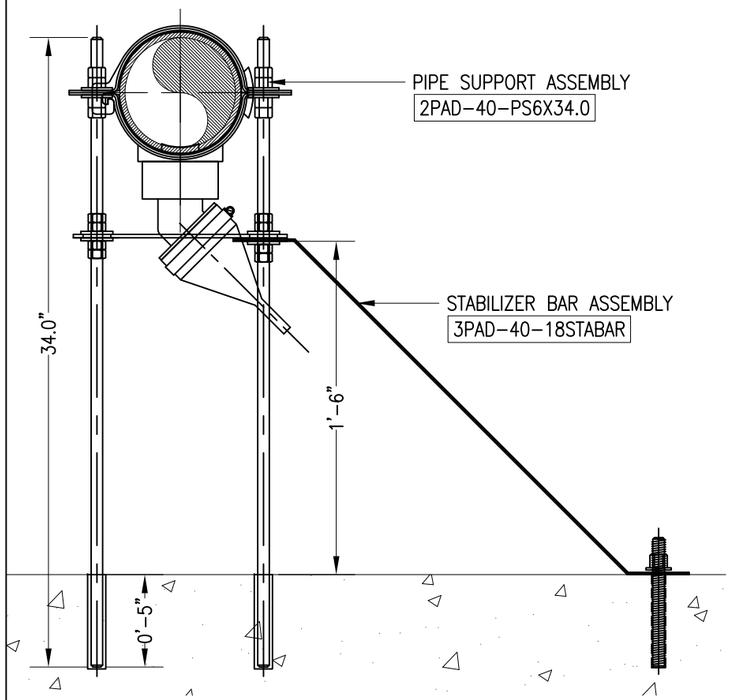
CAD SCALE: PLOT SCALE:

DWG. BY: DATE:

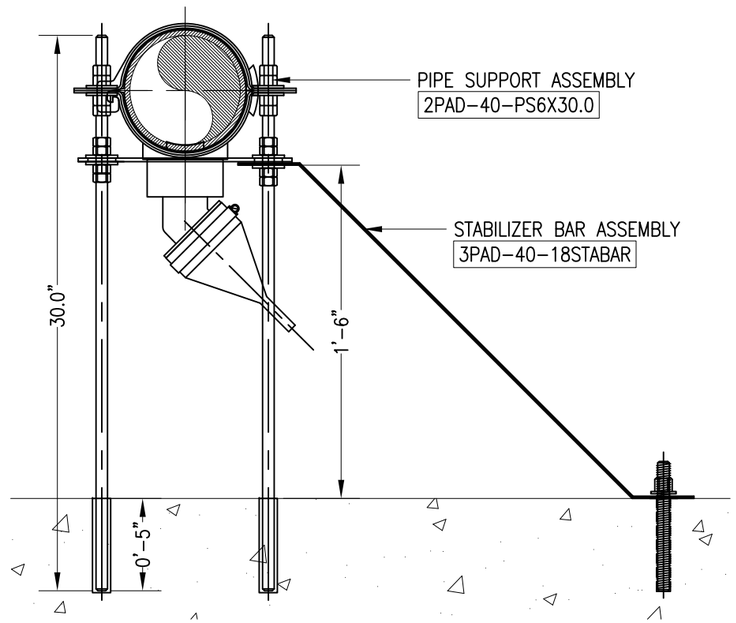
DWG. NO. A-104.02.011

SHEET 1 OF 2

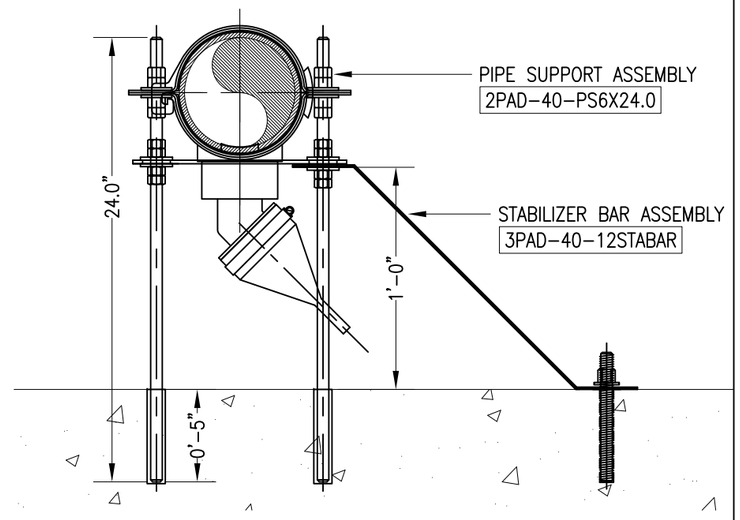
# PIPE SUPPORT STABILIZER BARS
# FIELD INSTALLATION




6"Ø X 34" PIPE SUPPORT
WITH STABILIZER BAR




6"Ø X 30" PIPE SUPPORT
WITH STABILIZER BAR




6"Ø X 24" PIPE SUPPORT
WITH STABILIZER BAR

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
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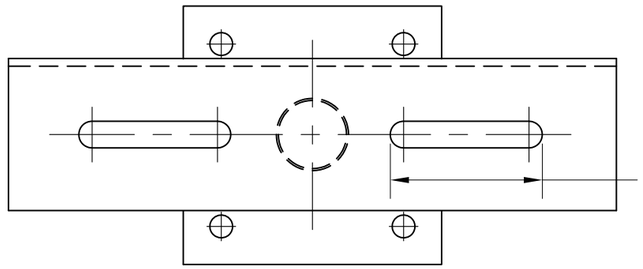
## COARSE BUBBLE DIFFUSER INSTALLATION DETAILS
## DIFFUSER AND SADDLE ASSEMBLY
## SECTION VIEWS

CONSULTANT:

APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: | PLOT SCALE: | DWG. NO. A-104.02.011 | SHEET 2 OF 2

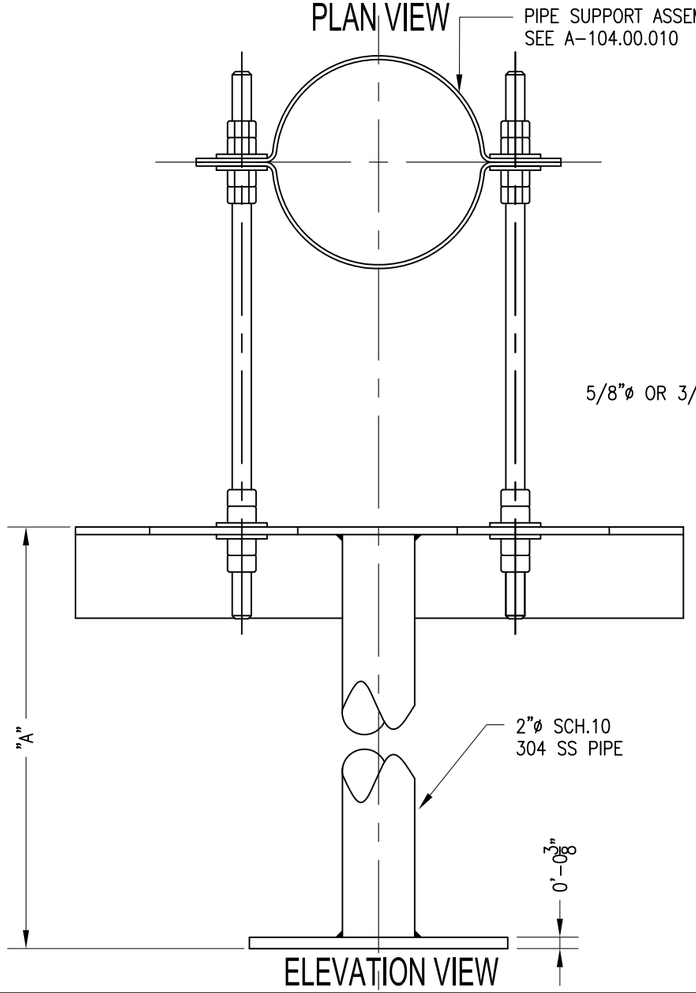
DWG. BY: | DATE:



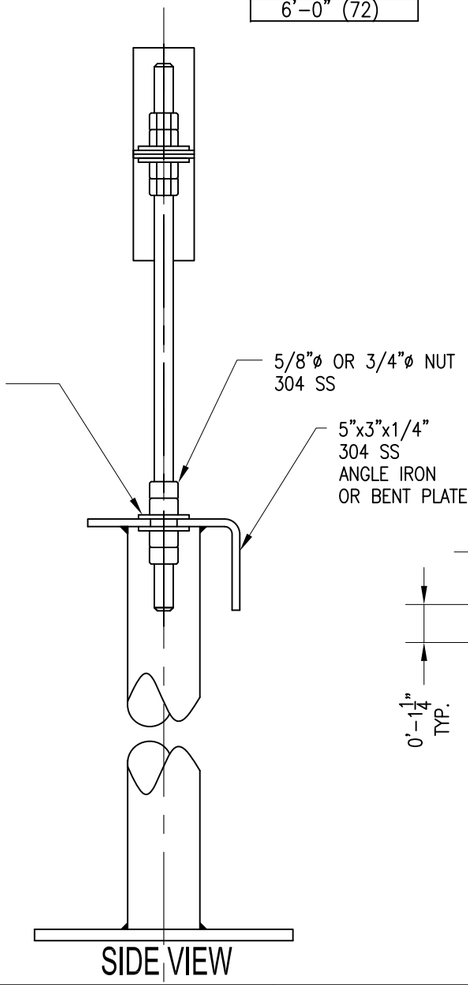
PLAN VIEW

0'-5" SLOT LENGTH FOR 3"ø THRU 10"ø PIPE SUPPORTS WITH 5/8"ø OR 3/4"ø ROD DIAMETERS

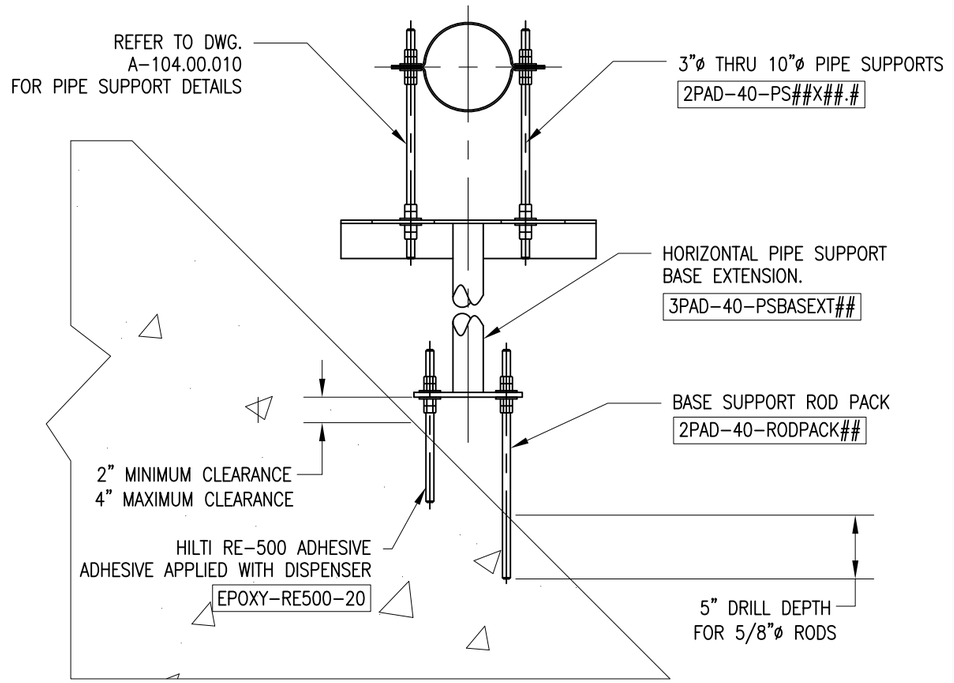
| SUPPORT LENGTH "A" |
|---|
| 1'-3" (15) |
| 2'-0" (24) |
| 2'-6" (30) |
| 3'-0" (36) |
| 3'-6" (42) |
| 4'-0" (48) |
| 4'-6" (54) |
| 5'-0" (60) |
| 5'-6" (66) |
| 6'-0" (72) |




ELEVATION VIEW




SIDE VIEW




INSTALLATION DETAIL

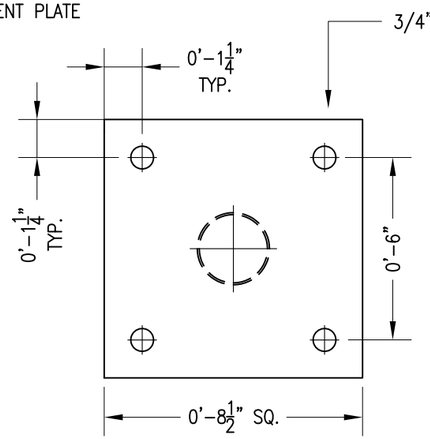



PLATE DETAIL

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
| A | JTK | 09/06/12 | | | ISSUE FOR APPROVAL |



S.O.#:

QUOTE #: 10372

DWG. NOTES:

Tideflex® Technologies
A Division of Red Valve Company, Inc.,
TIDEFLEX TECHNOLOGIES
DIFFUSED AERATION SYSTEM
600 North Bell Ave.
Carnegie, PA 15106 USA
Phone: 412-279-0044
Fax: 412-279-5410
Website: WWW.TIDEFLEX.COM
Email: INFO@TIDEFLEX.COM

# FABRICATED SUPPORT EXTENSION HORIZONTAL PIPE SUPPORT ASSEMBLIES FOR PIPE SUPPORT BRACKETS 3"Ø - 10"Ø

CONSULTANT:

APPLICATION: DIFFUSED AERATION SYSTEM

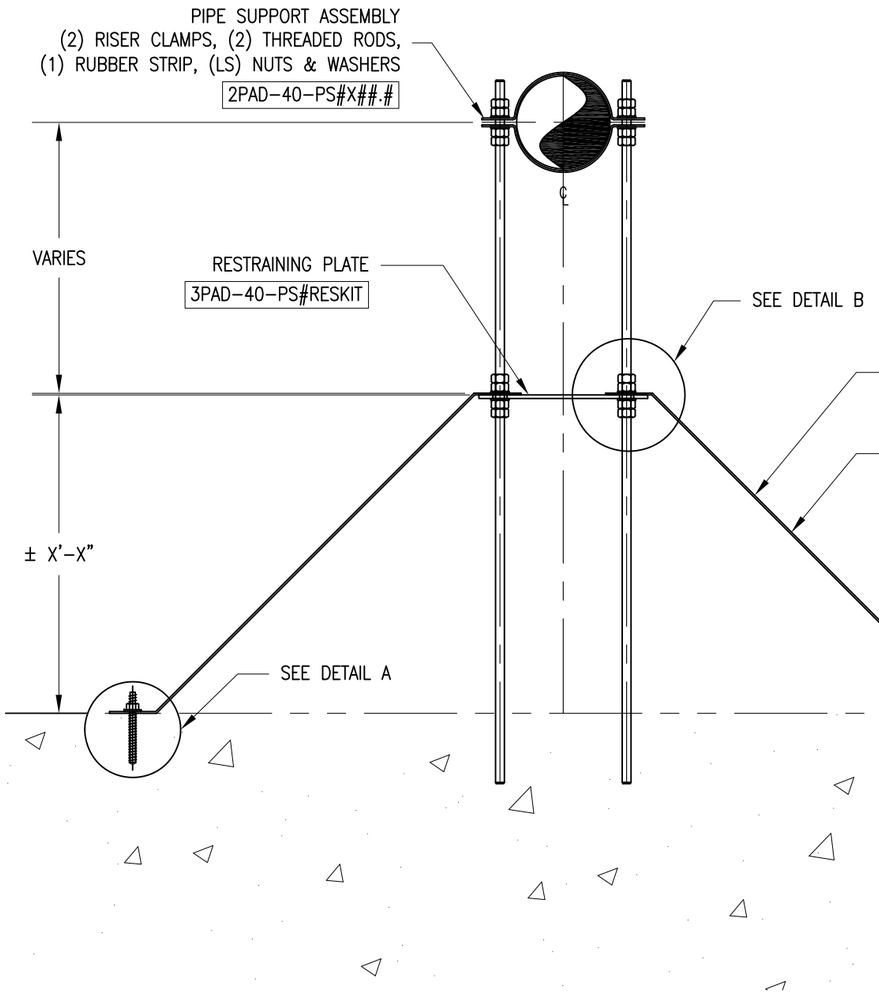
CAD SCALE: FULL PLOT SCALE: FULL

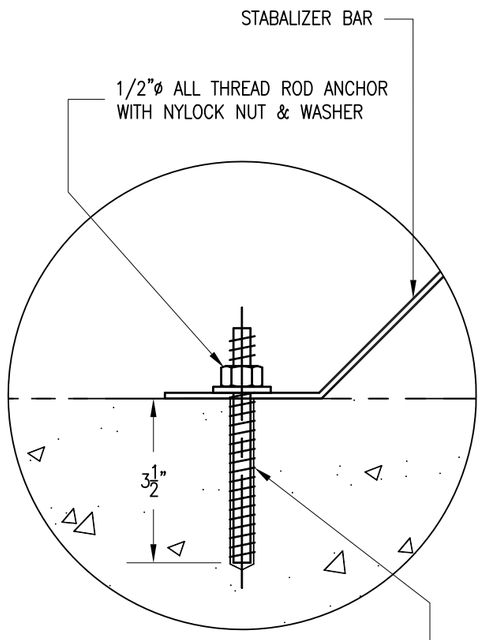
DWG. BY: DATE:

DWG. NO. A-104.06.020

SHEET 1 OF 1

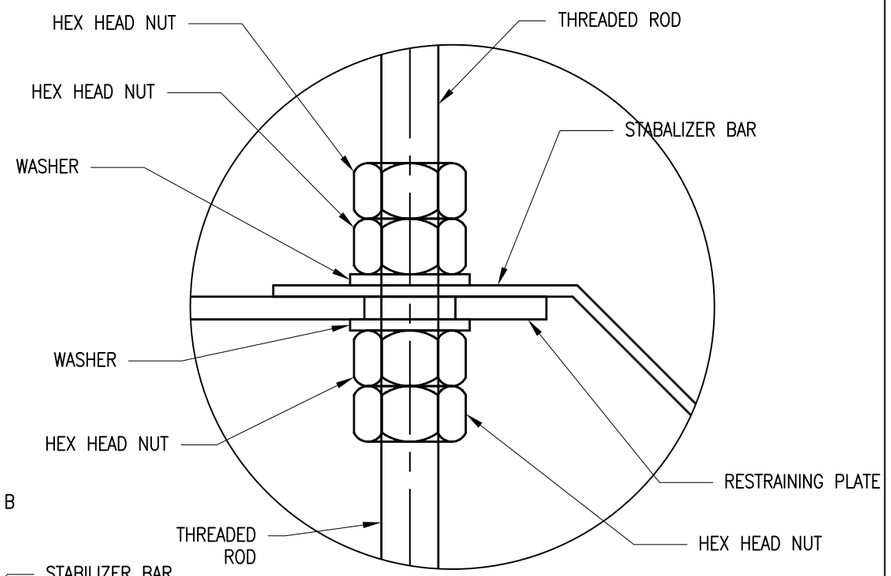
# PIPE SUPPORT - STABILIZER BAR INSTALLATION DETAILS




## DETAIL A

ADD EPOXY ADHESIVE PROVIDED BY AERATION EQUIPMENT SUPPLIER. SAME EPOXY AS IS USED ON PIPE SUPPORT RODS.




## DETAIL B

STABILIZER BAR KIT MAY BE SINGLE BAR OR DOUBLE BAR CONFIGURATION

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
| A | JTK | 09/06/12 | | | ISSUE FOR APPROVAL |



S.O.#: | QUOTE #: 10372

DWG. NOTES:

Tideflex® Technologies
A Division of Red Valve Company, Inc.,
TIDEFLEX TECHNOLOGIES
DIFFUSED AERATION SYSTEM
600 North Bell Ave.
Carnegie, PA 15106 USA
Phone: 412–279–0044
Fax: 412–279–5410
Website: WWW.TIDEFLEX.COM
Email: INFO@TIDEFLEX.COM

# HORIZONTAL PIPE SUPPORT STABILIZER BAR INSTALLATION PROCEDURES 5/8"Ø & 3/4"Ø THREADED RODS

CONSULTANT:

APPLICATION: DIFFUSED AERATION SYSTEM

CAD SCALE: FULL PLOT SCALE: FULL

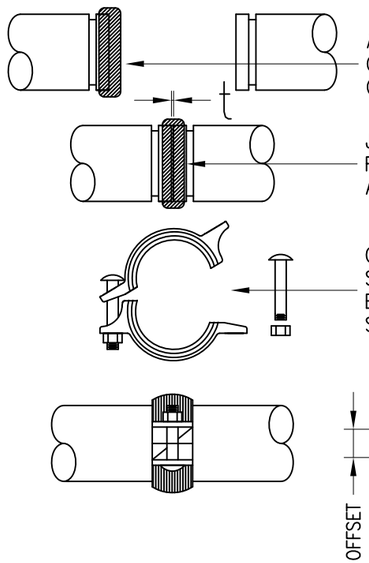
DWG. BY: DATE:

DWG. NO. A-104.07.011

SHEET 1 OF 1

| PIPE SIZE O.D. | SS RIGID VICTAULIC COUPLING PART NUMBER | ALLOWABLE PIPE SEP. "t" | BOLT TORQUE FT-LBS |
|---|---|---|---|
| 2.375" | 3750-41-VCP-RIG020 | 0.05" | 18-27 |
| 2.875" | 3750-41-VCP-RIG025 | 0.05" | 18-27 |
| 3.50" | 3750-41-VCP-RIG030 | 0.05" | 45-50 |
| 4.50" | 3750-41-VCP-RIG040 | 0.19" | 45-50 |
| 5.00" | 3750-41-VCP-RIG050 | 0.25" | 75-100 |
| 6.625" | 3750-41-VCP-RIG060 | 0.25" | 125-200 |
| 8.625" | 3750-41-VCP-RIG080 | 0.25" | 200-300 |
| 10.75" | 3750-41-VCP-RIG100 | 0.25" | 200-300 |
| | | | |

## VICTAULIC 489 SERIES




APPLY SILICONE TO INSIDE OF GASKET AND SLIDE ONTO GROOVED PIPE END.

JOIN GROOVED PIPE ENDS; REFER TO TABLE FOR ALLOWABLE CLEARANCE.

OPEN COUPLING ONE SIDE, SEAT TWO HALVES ON GASKET EXTERIOR AND TIGHTEN BOLTS. SEE TABLE FOR REQUIRED TORQUES.

OFFSETS SHOULD BE EQUAL ON BOTH SIDES OF COUPLING.

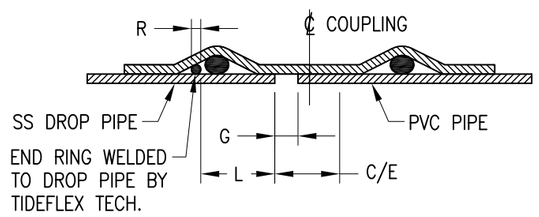
## SS RIGID COUPLING FOR GROOVED END PIPE

CLOSURE TOOL REQUIRED FOR INSTALLATION OF COUPLING
TOOLS PROVIDED BY TIDEFLEX WILL BE INVOICED UNLESS RETURNED
TOOLS CAN BE PURCHASED FROM VICTAULIC DEPEND-O-LOK
800-841-6624 ATLANTA, GEORGIA, USA

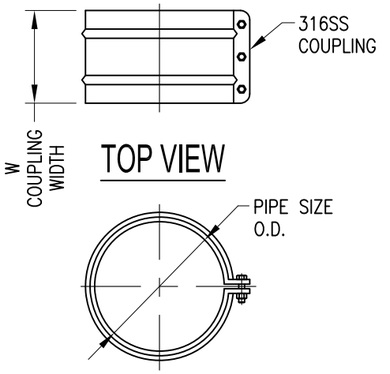
| PIPE SIZE O.D. | SS FXE VICTAULIC COUPLING PART NUMBER |
|---|---|
| 2.375" | 3750-41-VCOUPL020 |
| 2.875" | 3750-41-VCOUPL025 |
| 3.50" | 3750-41-VCOUPL030 |
| 4.50" | 3750-41-VCOUPL040 |
| 6.625" | 3750-41-VCOUPL060 |
| 8.625" | 3750-41-VCOUPL080 |
| 10.75" | 3750-41-VCOUPL100 |
| 12.00" | 3750-41-VCOUPL120 |
| 14.00" | 3750-41-VCOUPL140 |

TABLE GLOSSARY
L - DISTANCE FROM END OF PIPE TO NEAR EDGE OF END RING.
R - DIAMETER OF END RING.
G - GAP, AT INSTALLATION, BETWEEN PIPE ENDS.
C/E - TOTAL OF CONTRACTION AND EXPANSION

| PIPE SIZE O.D. | DIM "L" | DIM "R" | DIM "G" | DIM "C/E" | DIM "W" |
|---|---|---|---|---|---|
| 2.375"-4.50" | 1.125" | 0.125" | 0.375" | 0.75" | 5.00" |
| 6.625" | 1.75" | 0.188" | 0.375" | 1.25" | 7.50" |
| 8.625"-14.00" | 2.00" | 0.25" | 0.625" | 1.75" | 10.00" |




## INSTALLATION DETAIL




## DROP PIPE EXPANSION CLAMP
## VICTAULIC - DEPEND-O-LOK BRAND

| REV | BY | DATE | ECO# | CHK'D | DESCRIPTION |
|---|---|---|---|---|---|
| A | JTK | 09/06/12 | | | ISSUED FOR APPROVAL |



S.O.#:

QUOTE #: 10372

DWG. NOTES:

Tideflex® Technologies
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Email: INFO@TIDEFLEX.COM

EXPANSION JOINT INSTALLATION DETAILS
STAINLESS STEEL RIGID COUPLING
STAINLESS STEEL EXPANSION COUPLING

CONSULTANT:
APPLICATION: DIFFUSED AERATION SYSTEM
CAD SCALE: FULL PLOT SCALE: FULL
DWG. BY: DATE:
DWG. NO. A-107.01.010
SHEET 1 OF 1

# Tideflex® Diffused Aeration Systems

## APPENDIX B – DESIGN CALCULATIONS

# *Diffused Aeration System Modeling Program*

**Harold D. Thompson Regional Water Reclamation Facility**
**Aerobic Digesters No. 1,2,3 - Coarse Bubble Aeration & Mixing Systems**

## 1.8% Solids - O2 & Mixing

| | |
|---|---|
| Facility: | Harold D. Thompson Regional Water Reclamation Facility |
| Location: | Fountain, Colorado |
| Contact: | Lower Fountain Metropolitan Sewage Disposal District |
| Email: | |
| Consulting Firm: | GMS, Inc. |
| Location: | Colorado Springs, CO |
| Contact: | Mark Morton |
| Email: | mamorton@gmsengr.com |
| Tideflex Representative: | ICS Sales, Inc. |
| Location: | Westminister, CO |
| Contact: | Ted Whitfield |
| Revision Date: | 9/5/2012 12:23 |
| Revision Description: | Revision 3 - Final Design |


Tideflex® Technologies

**600 N. Bell Avenue**
**Carnegie, PA 15106**
info@tideflex.com
**PHONE (412) 279-0044**
**FAX (412) 279-5410**

**Harold D. Thompson Regional Water Reclamation Facility**
**Aerobic Digesters No. 1,2,3 - Coarse Bubble Aeration & Mixing Systems**

## Input Data & Design Parameters for Biological / Chemical Process Systems

| | | | | | | |
|---|---|---|---|---|---|---|
| **Influent / Effluent Concentrations** | | | | | | |
| Design Plant Flowrate | 0.0 | gpd | 0.00 | m3/day | | |
| Design COD influent concentration | 0.0 | mg/l | | | | |
| Design COD effluent concentration | 0.0 | mg/l | | | | |
| Design BOD influent concentration | 0.0 | mg/l | **1.8% Solids - O2 & Mixing** | | | |
| Design BOD effluent concentration | 0.0 | mg/l | | | | |
| Design NH4 influent concentration | 0.0 | mg/l | | | | |
| Design NH4 effluent concentration | 0.0 | mg/l | | | | |
| **Owner / Engineer Provided Design Values** | | | | | | |
| Pre-Determined AOR Value to be Applied | 1,594.2 | lbs/day | 723.1 | kg/day | | |
| Oxygen Uptake Rate satisfied at design airflow rate | 11.872 | mg/l/hr | | | | |
| **Process Design Values** | | | | | | |
| Lbs of Oxygen required per lb. Of BOD removed | 1.10 | lbs O2/lb BOD | 0.499 | kg O2/kg BOD | | |
| Lbs of Oxygen Required per lb. Of NH3 removed | 4.30 | lbs O2/lb BOD | 1.950 | kg O2/kg BOD | | |
| MLSS Concentration for Activated Sludge Process | 0 | mg/l | | | | |
| Food to BioMass ratio F/M | 0.20 | | | | | |
| Sludge Process Solids Concentration | 1.80 | % Solids | | | | |
| **Oxygen Transfer Efficiency Values** | | | | | | |
| Diffuser distance from bottom of tank | 0.25 | ft. | 0.1 | m | | |
| Diffuser Depth (Dp) | 10.3 | ft. | 3.1 | m | | |
| Site Elevation above Mean Sea Level | 5,413.0 | ft. | 1,649.9 | m | | |
| Barometric Pressure at Site (Pa) | 24.19 | in Hg | 11.88 | psia | 81.930 | kPa |
| Barometric Pressure at Mean Sea Level (Pmsl) | 29.92 | in Hg | 14.70 | psia | 101.320 | kPa |
| Process Water Salinity | 0.00 | ppt | | | | |
| Surface Oxygen Saturation at 20 C (Cs) | 9.09 | mg/l | | | | |
| Surface Oxygen Saturation at Temp (Cst) | 8.58 | mg/l | | | | |
| Residual Dissolved Oxygen Level (DO) | 2.00 | mg/l | | | | |
| Waste Water Temperature (T) | 73.4 | F | 23.0 | C | | |
| **Diffuser Variables** | Fine Bubble | | Coarse Bubble | | | |
| Model Number | TFX-40 | | TFA-3.00 | | | |
| Alpha Factor | 0.45 | Alpha Factor | 0.35 | @ 1.8% Solids | | |
| Beta Factor | 0.950 | Beta Factor | 0.950 | | | |
| Theta Factor | 1.024 | Theta Factor | 1.024 | | | |
| Depth Correction Factor (f) | 0.40 | | 0.25 | | | |
| Corrected Saturation at Std. for Depth (Css) | 10.19 | mg/l | 9.78 | mg/l | | |
| Corrected Saturation at Temp. for Depth (Csw) | 7.98 | mg/l | 7.59 | mg/l | | |
| **Blower Parameters** | | | | | | |
| Inlet Blower Air Temperature at the Site | 100 | F | 37.7 | C | | |
| Saturated Vapor Pressure at Site Temperature | 0.9503 | psia | 6.552 | kPa | | |
| Relative Humidity at the Site | 50% | | | | | |
| Applied Blower Efficiency | 70% | | | | | |
| Pressure at Standard Conditions | 14.70 | psia | 101.354 | kPa | | |
| Temperature at Standard Conditions | 68 | F | 20.0 | C | | |
| Saturated Vapor Pressure at Standard Temperature | 0.3391 | psia | 2.338 | kPa | | |
| Relative Humidity at Standard Conditions | 36% | | | | | |
| Density of Air at Standard Conditions | 0.075 | lbs/ft^3 | 1.201 | kg/m3 | | |
| Density of Air Correction factor | 0.7378 | | | | | |
| Corrected Density of Air at Site Elevation & Temp | 0.0553 | lbs/ft^3 | 0.886 | kg/m3 | | |
| **Input Parameters for Post Aeration Systems** | | | | | | |
| Solution Transfer Efficiency Factor | 0.00 | Range (1.30 - 1.60) | | | | |
| Influent Dissolved Oxygen Concentration | 0.00 | mg/l | | | | |
| Required Effluent Dissolved Oxygen Concentration | 0.00 | mg/l | | | | |

*Disclaimer: The calculations, projections and values produced within this model are based upon the applied site specific values as shown on the Input Data page and any other related pages. These site specific values may have been provided by the facility owner, consulting engineer or derived from industry standards. Any variance in these values will effect the projections produced within this model. This model is intended to provide design guidance related to the operation of the Tideflex System and/or Tideflex components. Air Diffuser data applied within the model is derived from certified performance curves for headloss and oxygen transfer capacity under standard conditions for ASCE testing. All conversions applied within the model for determining the effectiveness in specific process fluids, as compared to clean water testing, are intended as a projection of the actual conditions expected. Tideflex Technologies shall not be responsible for the accuracy of these projected conditions.*

**Harold D. Thompson Regional Water Reclamation Facility**
**Aerobic Digesters No. 1,2,3 - Coarse Bubble Aeration & Mixing Systems**

## RECTANGULAR TANK DIMENSIONS

### US UNITS

| Tank | Length feet | Width feet | Water Depth feet | V-Bottom Depth feet | Aeration Surface Area sq. ft. | V-Bottom Volume cubic feet | Aeration Dimensional Volume cubic feet | Aeration Liquid Volume gallons | Percentage of AOR Distrib. |
|---|---|---|---|---|---|---|---|---|---|
| AD-01 | 54.75 | 52.00 | 10.50 | 0.00 | 2,847 | 0.00 | 29,894 | 223,603 | 33% |
| AD-02 | 54.75 | 52.00 | 10.50 | 0.00 | 2,847 | 0.00 | 29,894 | 223,603 | 33% |
| AD-03 | 54.75 | 52.00 | 10.50 | 0.00 | 2,847 | 0.00 | 29,894 | 223,603 | 33% |
| | | | | | 8,541 sq.ft. | | 89,681 cuft | 670,810 gallons | 100% |

### SI UNITS

| Tank | Length meters | Width meters | Water Depth meters | V-Bottom Depth meters | Aeration Surface Area sq. meters | V-Bottom Volume meter^3 | Aeration Dimensional Volume cubic meters | Aeration Liquid Volume liters | Percentage of AOR Distrib. |
|---|---|---|---|---|---|---|---|---|---|
| AD-01 | 16.69 | 15.85 | 3.20 | 0.00 | 264 | 0.00 | 846 | 846,339 | 33% |
| AD-02 | 16.69 | 15.85 | 3.20 | 0.00 | 264 | 0.00 | 846 | 846,339 | 33% |
| AD-03 | 16.69 | 15.85 | 3.20 | 0.00 | 264 | 0.00 | 846 | 846,339 | 33% |
| | | | | | 793 sq.m. | | 2,539 cu.m | 2,539,016 L | 100% |

**Harold D. Thompson Regional Water Reclamation Facility**
**Aerobic Digesters No. 1,2,3 - Coarse Bubble Aeration & Mixing Systems**

**Selected - Actual Oxygen Required (AOR)**
**Based on an Maximum Value listed below**

| | | | | | | |
|---|---|---|---|---|---|---|
| **AOR1** | AOR as Specified by Owner/Engineer | **1,594** | lbs./day | **723** | kg./day | **1.8% Solids - O2 & Mixing** |
| **AOR2** | AOR for BOD & NH3 Removal | **0** | lbs./day | **0** | kg/day | |
| **AOR3** | AOR for COD Removal | **0** | lbs./day | **0** | kg/day | |
| **AOR4** | AOR for Post Aeration | **0** | lbs./day | **0** | kg/day | |
| **AOR5** | AOR for Aerobic Digestion | **0** | lbs./day | **0** | kg./day | |
| **AOR6** | AOR per Uptake Rate | **1,594** | lbs./day | **723** | kg/day | |
| | Oxygen Uptake Rate Applied | **11.87** | mg/l/hr | | | |
| | **AOR Applied for Design*** | **1,594** | lbs./day | **723** | kg/day | |
| | **AOR Conversion** | **66.43** | lbs/hr (24 hr. day) | **30.13** | kg/hr (24 hr. day) | |

* (Maximum Value of AOR1, AOR2, AOR3, AOR4, AOR5 & AOR6)

**Harold D. Thompson Regional Water Reclamation Facility**
**Aerobic Digesters No. 1,2,3 - Coarse Bubble Aeration & Mixing Systems**

## COARSE BUBBLE DIFFUSER SYSTEM
## Number of Coarse Bubble Diffusers and Total Airflow Required

AOR = Actual Oxygen Transferred into wastewater solution
SOTR = Oxygen transfer rate based on clean water

**Diffuser Model TFA-3.00**

AOR / SOTR Ratio **20.0%**

| Tank No. | AOR kg/hr | AOR lbs/hr | SOTR kg/hr | SOTR lbs/hr | Airflow Nm3/hr | Airflow scfm | Airflow per Diffuser scfm | Airflow per Diffuser Nm3/hr | Efficiency per foot depth | Total Diffuser Efficiency | Coarse Bubble Diffusers Required |
|---|---|---|---|---|---|---|---|---|---|---|---|
| AD-01 | 10.04 | 22.14 | 50.18 | 110.63 | 2,149.81 | 1,265.19 | 10.5 | 17.915 | 0.825% | 8.46% | 120.0 |
| AD-02 | 10.04 | 22.14 | 50.18 | 110.63 | 2,149.81 | 1,265.19 | 10.5 | 17.915 | 0.825% | 8.46% | 120.0 |
| AD-03 | 10.04 | 22.14 | 50.18 | 110.63 | 2,149.81 | 1,265.19 | 10.5 | 17.915 | 0.825% | 8.46% | 120.0 |
| | **30.13 kg/hr** | **66.43 lbs/hr** | **150.54 kg/hr** | **331.88 lbs/hr** | **6,449.42 Nm3/hr** | **3,795.56 scfm** | | | | | **360 units** |

**1.8% Solids - O2 & Mixing**

MLSS Concentration for Activated Sludge Process = 0 mg/l
Sludge Process Solids Concentration = 1.80 % Solids

**Harold D. Thompson Regional Water Reclamation Facility**
**Aerobic Digesters No. 1,2,3 - Coarse Bubble Aeration & Mixing Systems**

## COARSE BUBBLE DIFFUSER SYSTEM
## BLOWER REQUIREMENTS - CONVERSION FOR SITE AIR DENSITY, HUMIDITY & TEMPERATURE

**1.8% Solids - O2 & Mixing**

| | | | | |
|---|---|---|---|---|
| Total Airflow Required for the Process = | 3,795.6 | scfm | 6,449 | Nm3/hr |
| Number of Operating Blowers = | 3.0 | | | |
| **Airflow per Blower =** | **1,265.2** | **scfm** | **2,150** | **Nm3/hr** |
| Mass Rate = | 95.16 | lbs/min | | |
| Barometric Pressure at Site = | 11.88 | psia | 0.820 | Bar |
| Inlet Blower Air Temperature at the Site = | 100 | F | 37.74 | C |
| Saturated Vapor Pressure at Site Temperature = | 0.9503 | psia | 6.552 | kPa |
| Relative Humidity at the Site = | 50% | | | |
| Applied Blower Efficiency = | 70% | | | |
| Pressure at Standard Conditions = | 14.70 | psia | 101.354 | kPa |
| Temperature at Standard Conditions = | 68 | F | 19.98 | C |
| Saturated Vapor Pressure at Standard Temperature = | 0.3391 | psia | 2.338 | kPa |
| Relative Humidity at Standard Conditions = | 36% | | | |
| Density of Air at Standard Conditions = | 0.075 | lbs/ft^3 | 1.201 | kg/m3 |
| Headloss - Hydrostatic = | 123.00 | in. | 3.124 | m |
| Headloss - Drop Pipe Section = | 4 | in. | 0.102 | m |
| Headloss - Longest Manifold Piping Section = | 4 | in. | 0.102 | m |
| Headloss - Unit Diffuser = | 6 | in. | 0.152 | m |
| Orifice Diam. = | 0.500 | in. | 12.700 | mm |
| Headloss - Diffuser Orifice = | 3 | in. | 0.076 | m |
| Total Headloss = | 140.00 | in. | 3.556 | m |
| Absolute Pressure at Top of Drop Leg = | 16.92 | psia | 116.680 | kPa |
| **Gauge Pressure at Top of Drop Leg =** | 5.04 | psig | 34.750 | kPa |
| R = | 1.3429 | | | |
| Discharge Air Temperature = | 184.2 | F | 84.5 | C |
| Blower Airflow at Site Conditions = | 1,714.8 | acfm | 2,914 | am3/hr |
| Blower Brake HP = | 49.0 | HP | 36.6 | kW |

| | | | | |
|---|---|---|---|---|
| Absolute Pressure at Top of Drop Leg = | 1.167 | Bar | | |
| Gauge Pressure at Top of Drop Leg = | 0.348 | Bar | | |

*The calculations shown on this page are for the purpose of estimating the diffuser system operating head at the top of the drop pipe and also estimating the airflow requirement after adjusting for site elevation, relative humidity, inlet air temperature, and estimated blower operating efficiency. Actual blower performance may differ after the specific blower efficency is applied along with additional head requirements associated to the blower unit, inter-connecting piping and inline valves.*

| | | | | |
|---|---|---|---|---|
| **Number of Operating Blowers =** | **3.0** | | | |
| **Airflow per Blower =** | **1,715** | **acfm** | **2,914** | **Am3/hr** |
| **Discharge Pressure* =** | **5.04** | psig | **34.750** | kPa |
| **Blower Brake HP =** | **49** | HP | **36.6** | kW |
| **Applied Blower Efficiency =** | **70%** | | | |

**Blower Performance Requirements**

**Note: Headloss associated to top side, field routed air supply piping, valves and blower fittings must be added to determine total system operating pressure and ICFM rate at blower.*

**Harold D. Thompson Regional Water Reclamation Facility**
**Aerobic Digesters No. 1,2,3 - Coarse Bubble Aeration & Mixing Systems**

## COARSE BUBBLE DIFFUSER SYSTEM
## Airflow Required for Complete Mixing based on Cubic Liquid Volume of Tank

| Recommended Design Values for Mixing | | |
|---|---|---|
| *Velocity Gradient G (sec-1)* | *Airflow per Volume Ratio cfm per 1000 cuft liquid* | *Dynamic Viscosity* lbf-s/ft^2 |
| 130-140 | 15 cfm/1000 cuft for Equalization Tank | 1.22E-05 |
| 130-140 | 20 cfm/1000 cuft for Aeration Tank to 2500 mg/l MLSS | 1.45E-05 |
| 130-140 | 25 cfm/1000 cuft for Aeration Tank to 4500 mg/l MLSS | 1.65E-05 |
| 130-140 | 28 cfm/1000 cuft for Aeration Tank to 6500 mg/l MLSS | 1.74E-05 |
| 130-140 | 30 cfm/1000 cuft for Aerobic Sludge to 1% solids | 1.95E-05 |
| **130-140** | **35 cfm/1000 cuft for Aerobic Sludge to 2% solids** | **2.75E-05** |
| 130-140 | 40 cfm/1000 cuft for Aerobic Sludge to 3% solids | 3.50E-05 |
| 130-140 | 45 cfm/1000 cuft for Aerobic Sludge to 4% solids | 4.25E-05 |

| | | |
|---|---|---|
| Specific Weight = | 62.4 | lb/ft^3 |
| Dynamic Viscosity = | 2.75E-05 | lbf-s/ft^2 |

*Water Level Surge*

| | | |
|---|---|---|
| Off Gas Rise Rate = | 2.00 | ft/sec |
| Volume of Air in Liquid = | 146.49 | cuft |
| Liquid Level Increase = | 0.62 | inches |
| MLSS Concentration = | 0 | mg/l |
| Solids Concentration = | 1.8 | % Solids |

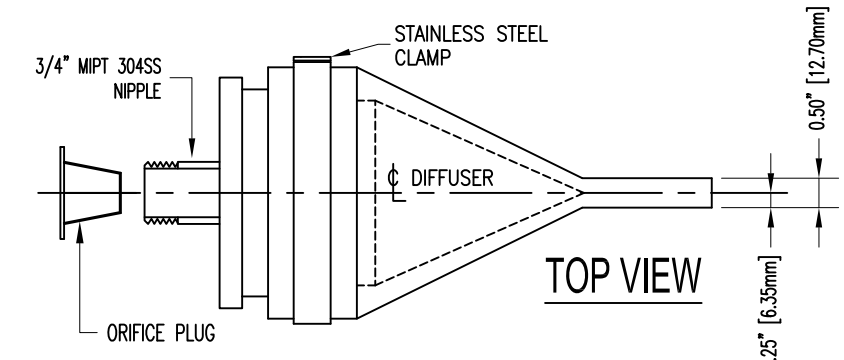
**Diffuser Model**
**TFA-3.00**

| Step 1 - Mixing based on Volume | | | Design Unit Air Flowrate | | Airflow Rate Required | | Air Flowrate per Diffuser | | Coarse Bubble Diffusers Required |
|---|---|---|---|---|---|---|---|---|---|
| Tank | Volume cu.ft. | Volume cu.m. | cfm/1000 cuft | m3/hr/m3 | cfm | m3/hr | cfm | m3/hr | |
| AD-01 | 29,894 | 846 | 57.37 | 3.442 | 1,715.00 | 2913.78 | 14.29 | 24.282 | 120.0 |
| AD-02 | 29,894 | 846 | 57.37 | 3.442 | 1,715.00 | 2913.78 | 14.29 | 24.282 | 120.0 |
| AD-03 | 29,894 | 846 | 57.37 | 3.442 | 1,715.00 | 2913.78 | 14.29 | 24.282 | 120.0 |
| | **89,680.50** cu.ft. | **2539.4** cu.m. | | | **5,145.00** cfm | **8,741.33** m3/hr | | | **360** units |

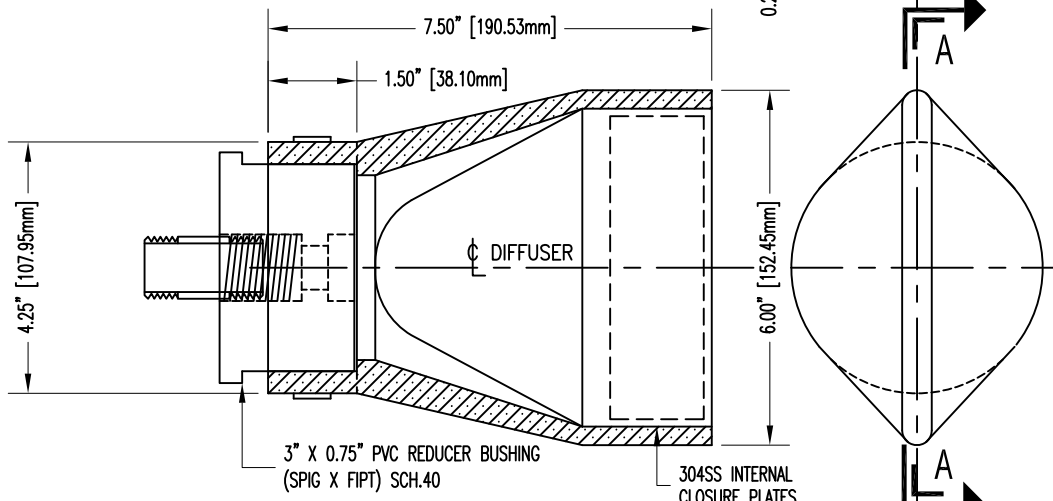
| Step 2 - Velocity Gradient at Airflow | | | | | Equivalent Power | | Mean-Squared Velocity Gradient |
|---|---|---|---|---|---|---|---|
| Tank | Volume cu.ft. | Volume cu.m. | Depth feet | Depth meters | ft-lb/sec | kW | G, sec-1 |
| AD-01 | 29,894 | 846 | 11 | 3 | 16,326 | 22.13 | 141 |
| AD-02 | 29,894 | 846 | 11 | 3 | 16,326 | 22.13 | 141 |
| AD-03 | 29,894 | 846 | 11 | 3 | 16,326 | 22.13 | 141 |

TFA-030-007-6DCP40

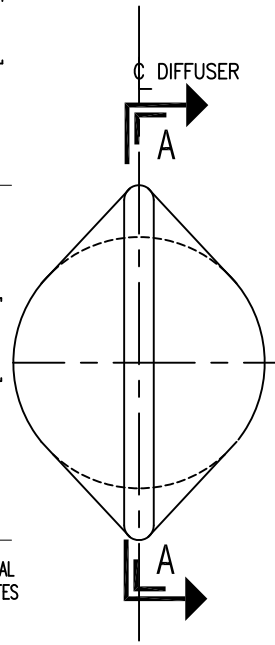
# COARSE BUBBLE AIR DIFFUSER




TOP VIEW




SECTION A-A




END VIEW

| | | |
|---|---|---|
| ~~TFA-030-007-6-CP40~~ | | PART NUMBER |
| 30 | CFM | MAXIMUM OPERATING AIRFLOW |
| 12.5 | IN. H20 | DIFFUSER HEADLOSS AT MAX AIRFLOW |
| 14.0 | IN. H20 | ORIFICE HEADLOSS AT MAX AIRFLOW |
| 26.5 | IN. H20 | TOTAL HEADLOSS AT MAX FLOW |
| STRAIGHT | | DIFFUSER BILL TYPE |
| MOLDED | | DIFFUSER CONSTRUCTION |
| 304SS | | INTERNAL CLOSURE PLATES |
| EPDM | | ELASTOMER MATERIAL |
| HOSE CLAMP | | CLAMP TYPE |
| 304SS | | CLAMP MATERIAL |
| 304SS | | DIFFUSER NPT CONNECTION MATERIAL |
| 0.75 | IN | DIFFUSER NPT CONNECTION DIAMETER |
| 304SS | | ORIFICE MATERIAL |
| NIPPLE | | ORIFICE TYPE |
| 0.750 | IN | ORIFICE DIAMETER |



S.O.#: QUOTE #:

| REV | BY | DATE | DESCRIPTION |
|---|---|---|---|
| | | | |
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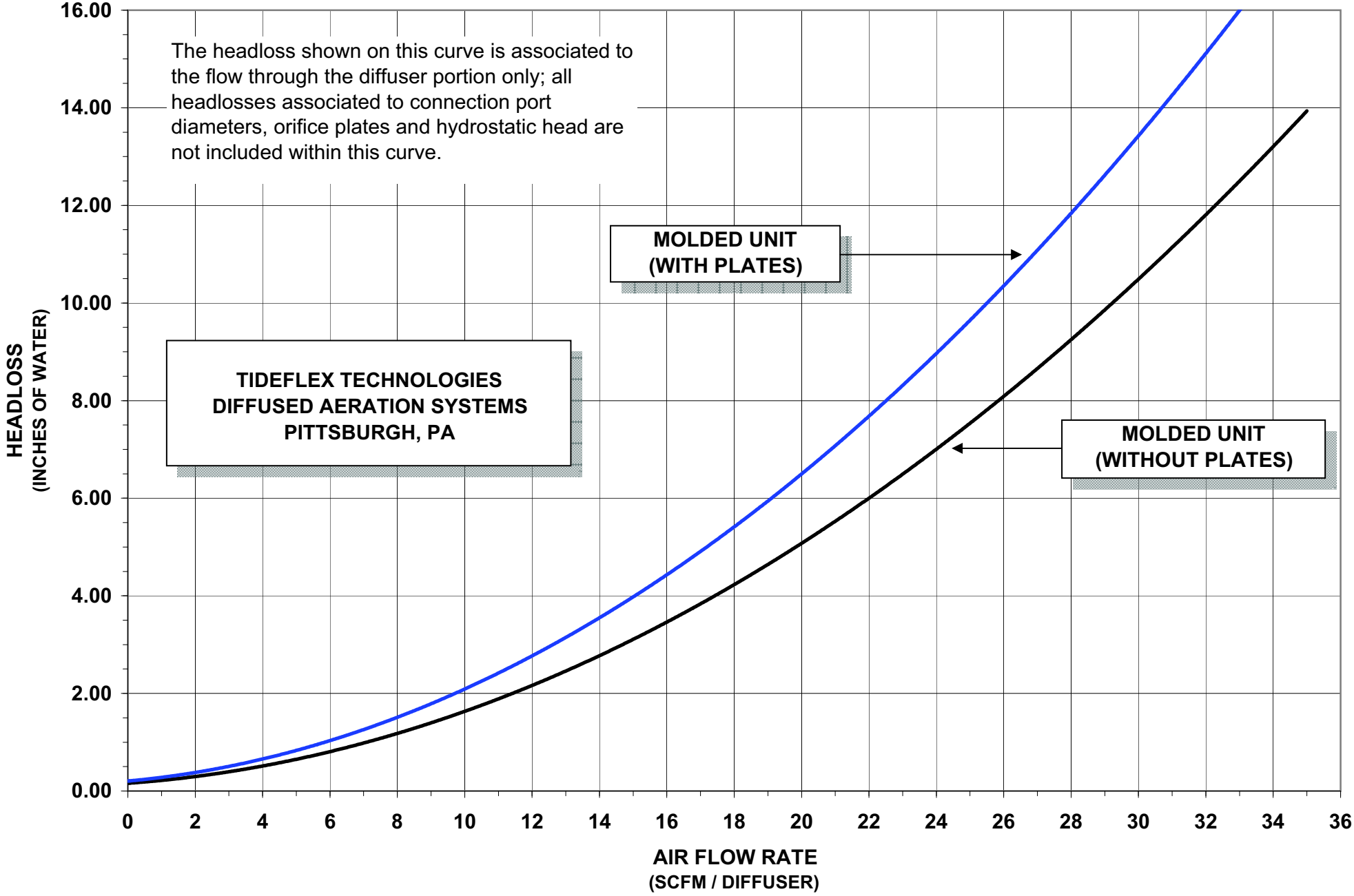
## COARSE BUBBLE DIFFUSER
## MODEL TFA-3.00 WITH CLOSURE PLATES

CONSULTANT:
APPLICATION:
SCALE: PLOT:
DWG. BY: DATE:
DWG. NO. A-105.04.024
SHEET 1 OF 1

# TIDEFLEX COARSE BUBBLE DIFFUSER

## HEADLOSS VS. AIR FLOW

**TFA-3.00"**
**US UNITS**



# TIDEFLEX COARSE BUBBLE DIFFUSER

SOTE VS. AIR FLOW

**TFA-3.0"**

**US UNITS**