

ADDENDUM

APRIL 2, 2019

ATTENTION ALL REQUEST FOR BID (RFB) HOLDERS

RFB NO. 319006 - ADDENDUM NO. 1

PERIMETER GAS MITIGATION SYSTEM

DANE COUNTY LANDFILL SITE NO. 1 (VERONA)

BIDS DUE: TUESDAY, APRIL 9, 2019, 2:00 PM
DUE DATE AND TIME ARE NOT CHANGED BY THIS ADDENDUM.

This Addendum is issued to modify, explain or clarify the original Request for Bid (RFB) and is hereby made a part of the RFB. All bidders must acknowledge this Addendum on the Bid Form.

PLEASE MAKE THE FOLLOWING CHANGES:

1. BID FORM

Remove Bid Form; replace with new Bid Form, issued with this Addendum. The revised form is marked "Addendum No. 1". The new form has been revised as follows:

- a) Revise quantity for Item No. 3.1 – Gas well drilling and installation (borehole depth) from 274 VF to 261 VF.
- b) Revised quantity for Item No. 5.1 – Gas probe drilling and installation (borehole depth) from 126 VF to 124 VF.

2. INSTRUCTIONS TO BIDDERS (SECTION 19)

Owner will procure a blower from Twin City Fan & Blower (Model #: 16N4-TBNA) and provide a fabricated blower base.

Owner will procure an 48”H x 38”W outdoor control panel (installed by Contractor) and will have the following components already installed:

- a) Power Flex 525 Variable Frequency Drive
- b) Allen Bradley Compact Logix PLC rack
- c) Allen Bradley PanelView plus HMI

3. SECTION 01001 – BASIC REQUIREMENTS

Replace Part 1.3.B. with “Coordinate utility outages, shutdowns, and road closures with Owner. Provide at least 72-hour notice for road closures.”

4. SECTION 01010 – SUMMARY OF WORK

Replace Part 1.2.A.5. with “Install blower, control panel, flow meter, and pressure sensor (to be procured by Owner), and provide and install conduits, power and instrumentation wiring, wiring connections, bumper posts, and related appurtenances as required for a complete installation.”

5. SECTION 02665 – GAS MONITORING PROBES

Add “Drill using hollow stem augers.” to Part 3.02.A.

Add Line H to Part 3.02 to read: “Install and document in accordance with Wisconsin Administrative Code NR 507.11, including, but not limited to, collection of soil samples and conducting standard penetration tests.”

6. SECTION 02693 – GAS CONTROL WELLS

Add Part 1.04 titled “Quality Assurance” to read “A professional geologist or qualified technician who is directly supervised by a professional geologist must observe and direct the drilling and installation of all gas control wells.”

Add “Drill using hollow stem augers.” to Part 3.02.A.

Add Line I to Part 3.02. to read: “Install and document in accordance with Wisconsin Administrative Code NR 507.11, including, but not limited to, collection of soil samples and conducting standard penetration tests.”

7. PLAN SET – SHEET 3

Remove Sheet 3; replace with new Sheet 3, issued with this Addendum. The revised sheet is marked “Addendum No. 1”. The new sheet has been revised as follows:

- a) Updated Proposed Gas Control Well Information Table and Proposed Gas Monitoring Probe Information Table to reflect adjustments in location to Gas Control Wells and Gas Monitoring Probes.
- b) Added Proposed Piping Table.

8. PLAN SET – SHEET 4

Remove Sheet 4; replace with new Sheet 4, issued with this Addendum. The revised sheet is marked “Addendum No. 1”. The new sheet has been revised as follows:

- a) Mitigation system piping alignment and profile moved to toe of landfill berm slope. Gas Control Well, Gas Monitoring Probe, and silt fence locations modified to match piping alignment changes.
- b) Added existing underground electrical (abandoned) lines northeast of the Existing Blower Building.
- c) Added symbol for Existing Vertical Corrugated Metal Pipes (CMPs).
- d) Added gas header documentation points
- e) Added Note 9 “Trenching for gas header may encounter an existing abandoned gas mitigation control header pipe/trench. New gas header alignment may be adjusted to follow the existing pipe/trench path as approved by Owner/Engineer, provided a minimum pipe slope of 1% and minimum pipe cover of 4 feet is maintained.”

9. PLAN SET – SHEET 5

Remove Sheet 5; replace with new Sheet 5, issued with this Addendum. The revised sheet is marked “Addendum No. 1”. The new sheet has been revised as follows:

- a) Detail 1: Added “or elbow” to callout “6” dia. SDR-17 HDPE header pipe with 6” dia. SDR-11 Tee”.
- b) Detail 2: Revised invert to invert lengths for CD1 and CD2.

10. PLAN SET – SHEET 6

Remove Sheet 6; replace with new Sheet 6, issued with this Addendum. The revised sheet is marked “Addendum No. 1”. The new sheet has been revised as follows:

- a) Detail 4: Removed silencer from the blower outlet pipe.
- b) Detail 7: Added Note 1 “Run wiring from field instruments/equipment to control panel and terminate in control panel as directed by Controls Contractor”.

11. PLAN SET – SHEET 7

Remove Sheet 7; replace with new Sheet 7, issued with this Addendum. The revised sheet is marked “Addendum No. 1”. The new sheet has been revised as follows:

- a) Removed callout “Stub up conduit minimum 12” aboveground and install temporary cap (typ.)” and replaced with: “Run electrical wiring to Power Distribution Panels in Generator Building, install appropriately sized circuit breakers, and terminate wires. Run CAT 5e network cables from West Mitigation Blower Control Panel to SCADA PC Interface Panel and terminate at both ends as directed by Controls Contractor”.
- b) Added Note 4 “Trenching for gas header may encounter an existing abandoned gas mitigation control header pipe/trench. New gas header alignment may be adjusted to follow the existing pipe/trench path as approved by Owner/Engineer, provided a minimum pipe slope of 1% and minimum pipe cover of 4 feet is maintained.”

Other drawing changes:

- a) Updated to reflect changes made to Plan Sheet 4 of 8.
- b) Revised Section A-A’ to reflect actual blower.
- c) Updated blower outlet pipe to 4” diameter.
- d) Added callout to Section A-A’ “Level blower with metal shims and grout per blower manufacturer installation manual.”

12. ATTACHEMNT A - PRE-BID MEETING

Pre-bid meeting minutes and attendance list are provided in Attachment A.

13. ATTACHMENT B – SOIL BORING LOGS

Soil boring logs are provided in Attachment B (for informational purposes only). Bidders are responsible for determining actual field conditions.

14. ATTACHMENT C – BLOWER INFORMATION

Blower information is provided in Attachment C.

RESPONSE TO CONTRACTOR QUESTIONS:

QUESTION 1: Are the boreholes for the Gas Control Wells and Gas Monitoring Probes required to be drilled into the bedrock below auger refusal?

ANSWER 1: Drilling may be terminated once auger refusal is encountered.

QUESTION 2: Can we use 4-inch Schedule 80 PVC with flush-threaded joints for the Gas Control Wells instead of solvent-welded bell & spigot joints and lag-screws?

ANSWER 2: Flush-threaded joints are an acceptable alternate to solvent-welded bell & spigot joints with lag screws.

If any additional information about this Addendum is needed, please call Abdullah Younes at 608/516-6228, Younes@countyofdane.com.

Sincerely,

Abdullah Younes
Project Manager

Enclosures:

- Bid Form, Addendum No. 1 (Revised 4/1/19)
- Construction Plan Set, Sheets 3-7 (Revised 4/1/19)
- Attachment A – Pre-Bid Meeting
- Attachment B – Soil Boring Logs
- Attachment C – Blower Information

Name of Bidding Firm: _____

BID FORM

BID NO.: 319006
PROJECT: PERIMETER GAS MITIGATION SYSTEM
 DANE COUNTY LANDFILL SITE NO. 1

TO: DANE COUNTY DEPARTMENT OF WASTE & RENEWABLES
 1919 ALLIANT ENERGY CENTER WAY
 MADISON, WISCONSIN 53713

NOTE: WISCONSIN STATUTE 77.54 (9M) ALLOWS FOR NO SALES & USE TAX ON THE PURCHASE OF MATERIALS FOR COUNTY PUBLIC WORKS PROJECTS.

BASE BID - UNIT PRICING:

Dane County is inviting Bids for construction services for a standalone perimeter gas mitigation system consisting of 900 LF of header pipe, gas control wells, gas probes, and supplemental control instrumentation. The undersigned, having examined the site where the Work is to be executed and having become familiar with local conditions affecting the cost of the Work and having carefully examined the Drawings and Specifications, all other Construction Documents and Addenda thereto prepared by Dane County Department of Waste & Renewables hereby agrees to provide all labor, materials, equipment and services necessary for the complete and satisfactory execution of the entire Work, as specified in the Construction Documents, for the Base Bid unit pricing as follows:

Item No.	Description	Unit	Quantity	Unit Price	Total Price
1	Mobilization/Demobilization	LS	1		
2	Site preparation and erosion control installation	LS	1		
3	Gas Wells				
3.1	Gas well drilling and installation (borehole depth)	VF	261		
3.2	Wellheads (wellhead, flex hose, vault with cover and chain/lock)	EA	10		
4	Piping				
4.1	4" HDPE lateral piping, 6" HDPE header piping, condensate drains, valves	LS	1		
5	Gas Probes				
5.1	Gas probe drilling and installation (borehole depth)	VF	124		
5.2	Methane sensors (MSA Ultima X Series)	EA	5		
6	Blower				
6.1	Blower and control panel installation, wiring, sensors, bumper posts.	LS	1		
7	Other				
7.1	Site Restoration	LS	1		

Total: \$ _____
Numeric Price

_____ and _____ /100 Dollars
Written Price

ALTERNATE BID 1 - UNIT PRICING:

Unit price for separating, stockpiling, loading, hauling, and unloading waste materials that may be encountered during excavation, trenching, or drilling per Drawings and Specifications.

Cost for waste material handling = _____ /ton
Numeric Price (circle: Add or Deduct)

Written price (circle: Add or Deduct)

ALTERNATE BID 2 - UNIT PRICING:

Unit price for ripping, excavating, and offsite disposal of encountered competent bedrock to required depths and locations per Drawings and Specifications.

Cost for rock excavation = _____ /ton
Numeric Price (circle: Add or Deduct)

Written price (circle: Add or Deduct)

Receipt of the following addenda and inclusion of their provisions in this Bid is hereby acknowledged:

Addendum No(s). _____ through _____

Dated _____

Dane County Department of Waste & Renewables must have this project completed by June 28, 2019. Assuming this Work can be started by May 6, 2019, what dates can you commence and complete this job?

Commencement Date: _____ Completion Date: _____
(final, not substantial)

I hereby certify that all statements herein are made on behalf of:

(Name of Corporation, Partnership or Person submitting Bid)

Select one of the following:

1. A corporation organized and existing under the laws of the State of _____, or
2. A partnership consisting of _____, or
3. A person conducting business as _____;

Of the City, Village, or Town of _____ of the State of _____.

I have examined and carefully prepared this Bid from the associated Construction Documents and have checked the same in detail before submitting this Bid; that I have full authority to make such statements and submit this Bid in (its) (their) (my) behalf; and that the said statements are true and correct. In signing this Bid, we also certify that we have not, either directly or indirectly, entered into any agreement or participated in any collusion or otherwise taken any action in restraint of free competition; that no attempt has been made to induce any other person or firm to submit or not to submit a Bid; that this Bid has been independently arrived at without collusion with any other bidder, competitor, or potential competitor; that this Bid has not been knowingly disclosed prior to the Bids Due Date to another bidder or competitor; that the above statement is accurate under penalty of perjury.

The undersigned further agrees to honor the Base Bid and the Alternate Bid(s) for sixty (60) calendar days from date of Award of Contract.

SIGNATURE: _____
(Bid is invalid without signature)

Print Name: _____ Date: _____

Title: _____

Address: _____

Telephone No.: _____ Fax No.: _____

Email Address: _____

Contact Person: _____

THIS PAGE IS FOR BIDDERS' REFERENCE AND NEED NOT BE SUBMITTED WITH BID FORM.

BID CHECK LIST:

These items **must** be included with Bid:

Bid Form

Bid Bond

Fair Labor Practices Certification

BIDDERS SHOULD BE AWARE OF THE FOLLOWING:

DANE COUNTY VENDOR REGISTRATION PROGRAM

All bidders are strongly encouraged to be a registered vendor with Dane County. Registering allows vendors an opportunity to receive notifications for RFBs & RFPs issued by the County and provides the County with up-to-date company contact information. Complete a new form or renewal online at:

danepurchasing.com/Account/Login?

DANE COUNTY BEST VALUE CONTRACTING PRE-QUALIFICATION

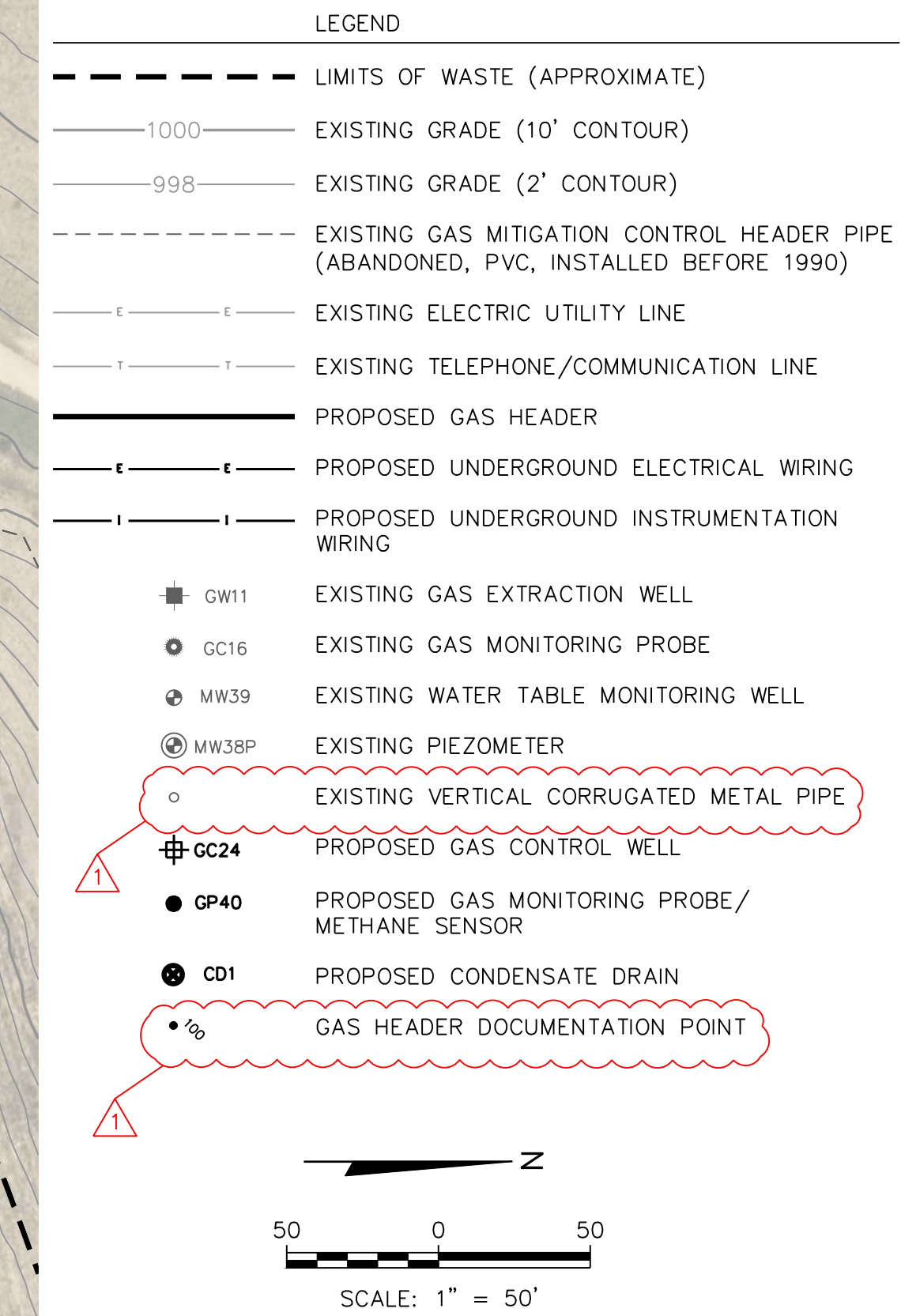
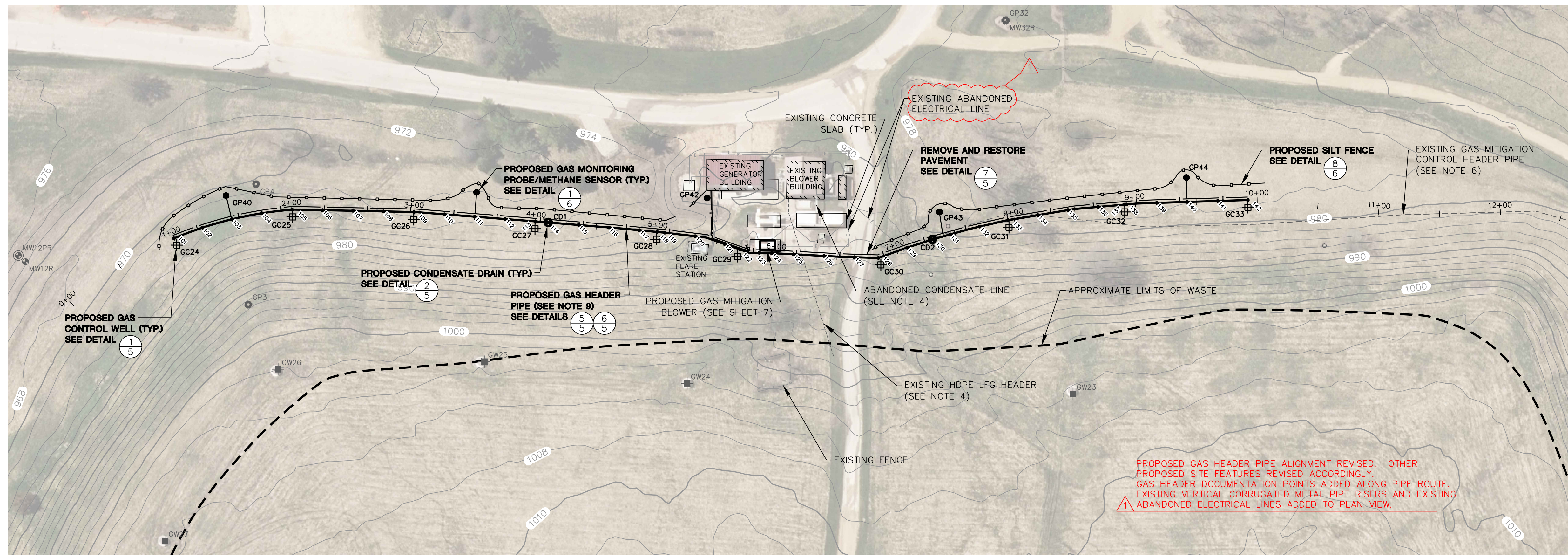
Contractors must be pre-qualified as a Best Value Contractor with Dane County Department of Waste & Renewables before the award of contract. Obtain a *Best Value Contracting Application* by calling 608/266-4018 or complete one online at:
countyofdane.com/pwht/BVC_Application.aspx

PROPOSED GAS CONTROL WELL INFORMATION TABLE (ALL DEPTHS IN FEET)									
WELL NO.	NORTH	EAST	EXISTING GROUND SURFACE ELEVATION (A)	DESIGN BOREHOLE BOTTOM ELEVATION (B)	DESIGN BOREHOLE DEPTH (C)	DESIGN TOP OF WELL (D)	DESIGN SOLID PIPE (INCLUDES STICK-UP)	TOP OF PERFORATED PIPE ELEVATION (E)	DESIGN PERFORATED WELL PIPE LENGTH (F)
GC24	454,446	786,913	973.25	951.16	22.09	976.25	11.50	964.75	12.59
GC25	454,541	786,890	973.92	951.16	22.76	976.92	11.50	965.42	13.26
GC26	454,640	786,892	972.56	951.16	21.40	975.56	11.50	964.06	11.90
GC27	454,739	786,899	973.78	951.16	22.62	976.78	11.50	965.28	13.12
GC28	454,839	786,908	977.53	951.16	26.37	980.53	11.50	969.03	16.87
GC29	454,905	786,922	982.23	951.16	31.07	985.23	11.50	973.73	21.57
GC30	455,023	786,929	985.71	951.16	34.55	988.71	11.50	977.21	25.05
GC31	455,128	786,898	978.75	951.16	27.59	981.75	11.50	970.25	18.09
GC32	455,223	786,885	977.28	951.16	26.12	980.28	11.50	968.78	16.62
GC33	455,324	786,882	978.05	951.16	26.89	981.05	11.50	969.55	17.39

PROPOSED GAS MONITORING PROBE INFORMATION TABLE (ALL DEPTHS IN FEET)										
PROBE NO.	NORTH	EAST	EXISTING GROUND SURFACE ELEVATION (A)	DESIGN BOREHOLE BOTTOM ELEVATION (B)	DESIGN BOREHOLE DEPTH (C)	DESIGN TOP OF PROBE (D)	DESIGN SOLID PIPE (INCLUDES STICK-UP)	DESIGN WELL PIPE STICK-UP ABOVE GROUND SURFACE	TOP OF PERFORATED PIPE ELEVATION (E)	DESIGN PERFORATED WELL PIPE LENGTH (F)
GP40	454,486	786,872	971.57	951.16	20.41	974.57	8.00	3.00	966.57	14.41
GP41	454,692	786,869	972.08	951.16	20.92	975.08	8.00	3.00	967.08	14.92
GP42	454,881	786,874	980.00	951.16	28.84	983.00	8.00	3.00	975.00	22.84
GP43	455,071	786,885	978.80	951.16	27.64	981.80	8.00	3.00	973.80	21.64
GP44	455,273	786,857	977.10	951.16	25.94	980.10	8.00	3.00	972.10	19.94

PROPOSED PIPING TABLE				
POINT NO.	DESIGN LOCATION		TOP OF PIPE ELEV. (FT)	COMMENTS
	NORTHING	EASTING		
101	454443.5	786907.1	968.82	6" ELBOW WITH 6"x4" REDUCER TO GC24
102	454466.9	786898.3	968.57	6" PIPE
103	454490.9	786891.4	968.32	6" PIPE
104	454515.4	786886.5	968.07	6" PIPE
105	454540.2	786883.5	967.82	6" TEE WITH 6"x4" REDUCER TO GC25
106	454565.2	786884.0	967.57	6" PIPE
107	454590.2	786884.5	967.32	6" PIPE
108	454615.2	786885.0	967.07	6" PIPE
109	454640.2	786885.5	966.82	6" TEE WITH 6"x4" REDUCER TO GC26
110	454665.1	786887.4	966.57	6" PIPE
111	454690.1	786889.3	966.32	6" PIPE
112	454715.0	786891.3	966.07	6" PIPE
113	454739.9	786893.2	965.82	6" TEE WITH 6"x4" REDUCER TO GC27
114A	454750.3	786894.0	965.71	6" PIPE, SOUTH SIDE OF CD1
114B	454750.3	786894.0	969.36	6" PIPE, NORTH SIDE OF CD1
115	454775.2	786896.1	970.27	6" PIPE
116	454800.1	786898.2	971.19	6" PIPE
117	454825.0	786900.4	972.10	6" PIPE
118	454839.5	786901.8	972.64	6" TEE WITH 6"x4" REDUCER TO GC28
119	454845.9	786902.4	972.95	6" PIPE, CHANGE IN PIPE SLOPE
120	454870.7	786905.4	974.52	6" PIPE
121	454894.8	786911.7	976.10	6" PIPE
122	454907.4	786916.2	976.94	6" TEE WITH 6"x4" REDUCER TO GC29
123	454923.4	786919.0	977.98	6" PIPE
124	454933.4	786919.2	978.61	6" SWEEP ELBOW
125	454951.3	786920.1	978.80	6" SWEEP ELBOW
126	454976.3	786921.5	978.38	6" PIPE
127	455001.3	786922.5	977.96	6" PIPE
128	455021.0	786923.1	977.63	6" TEE WITH 6"x4" REDUCER TO GC30
129	455044.5	786914.7	977.21	6" PIPE
130A	455065.2	786908.0	976.84	6" PIPE, SOUTH SIDE OF CD2
130B	455065.2	786908.0	971.02	6" PIPE, NORTH SIDE OF CD2
131	455079.8	786903.9	971.17	6" PIPE
132	455104.0	786897.5	971.42	6" PIPE
133	455127.1	786892.2	971.66	6" TEE WITH 6"x4" REDUCER TO GC31
134	455151.7	786888.1	971.91	6" PIPE
135	455176.4	786883.9	972.16	6" PIPE
136	455201.2	786881.3	972.41	6" PIPE
137	455222.4	786879.5	972.62	6" TEE WITH 6"x4" REDUCER TO GC32
138	455224.1	786879.3	972.64	6" PIPE
139	455249.1	786878.0	972.89	6" PIPE
140	455274.1	786877.2	973.14	6" PIPE
141	455299.1	786876.5	973.39	6" PIPE
142	455323.8	786875.7	973.64	6" ELBOW WITH 6"x4" REDUCER TO GC33

REVISION	TITLE	DATE
1	ISSUED FOR BID - ADDENDUM NO. 1	04/02/19
PROJECT NO.	ISSUED FOR BID - ADDENDUM NO. 1	04/02/19
DRAWN BY:	2521708719	RP/BSS
CHECKED BY:	12/18/18	MRH
APPROVED BY:	04/02/19	JMO, 03/11/19
DANE COUNTY WASTE AND RECYCLABLES 1919 ALLIANT ENERGY CENTER WAY MADISON, WISCONSIN 53713		
CLIENT	SCS ENGINEERS 2830 DARY DRIVE MADISON, WI 53718-0797 PHONE: (608) 224-2830	
ENGINEER	PERIMETER GAS MITIGATION SYSTEM VERONA, WISCONSIN	
SITE	DOCUMENTATION TABLES	
SHEET	3 of 8	



REVISION	TITLE	DATE	NO.

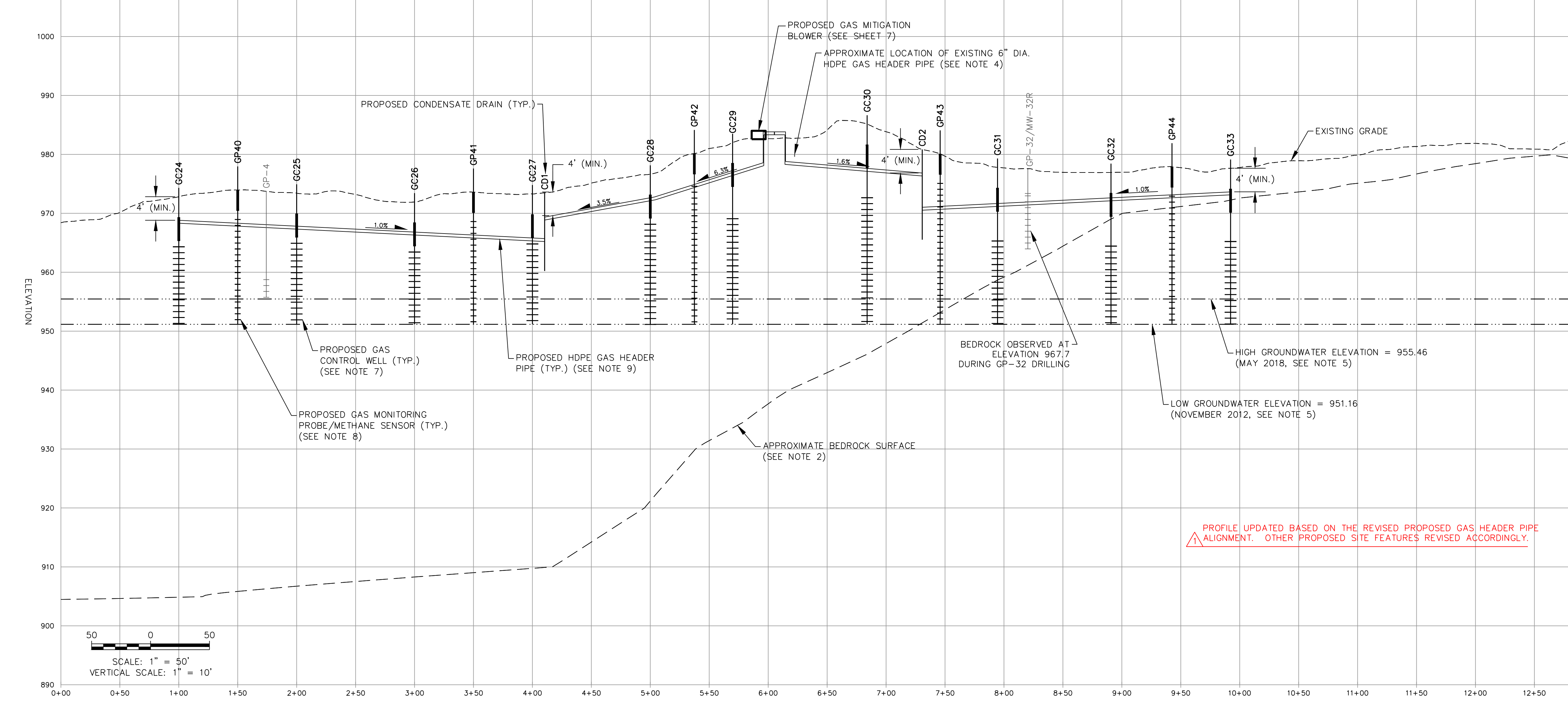
ISSUED FOR BID - ADDENDUM NO. 1	DATE	NO.

DANE COUNTY WASTE AND RENEWABLES 1919 ALLIANT ENERGY CENTER WAY MADISON, WISCONSIN 53713	DRAWN BY:	CHECKED BY:	APPROVED BY:

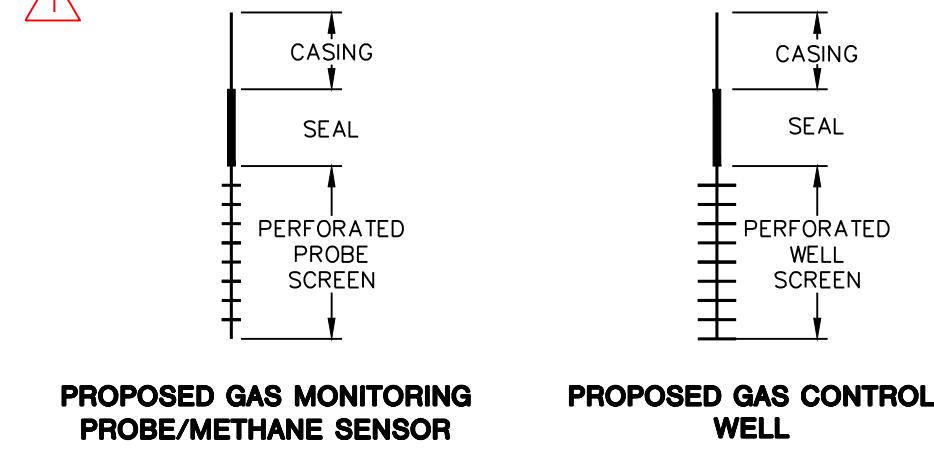
ISSUED FOR BID VERONA LANDFILL PERIMETER GAS MITIGATION SYSTEM VERONA, WISCONSIN	ENGINEER	NO.

ISSUED FOR BID VERONA LANDFILL PERIMETER GAS MITIGATION SYSTEM VERONA, WISCONSIN	SITE	NO.

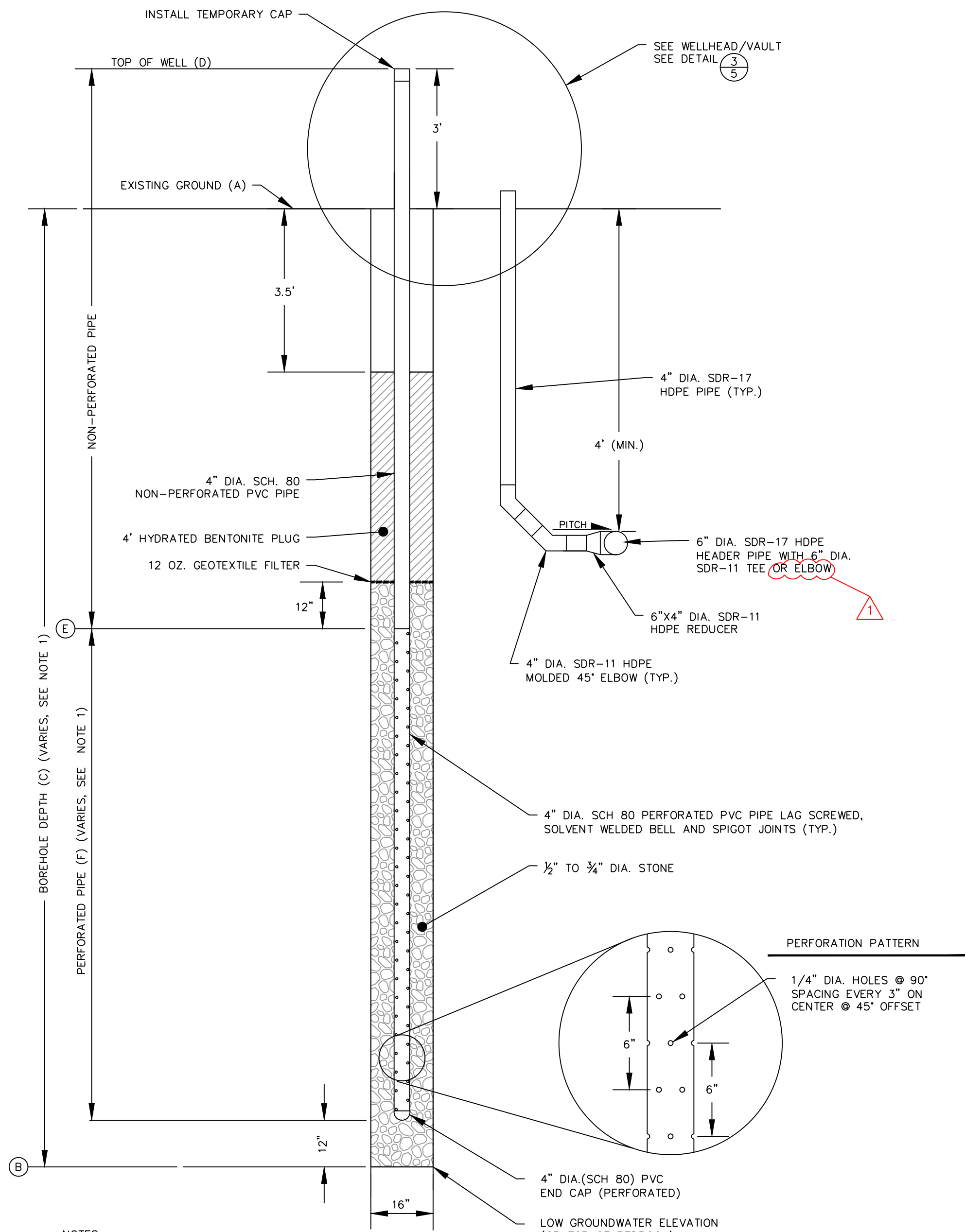
PERIMETER GAS MITIGATION SYSTEM LAYOUT	SHEET	NO.



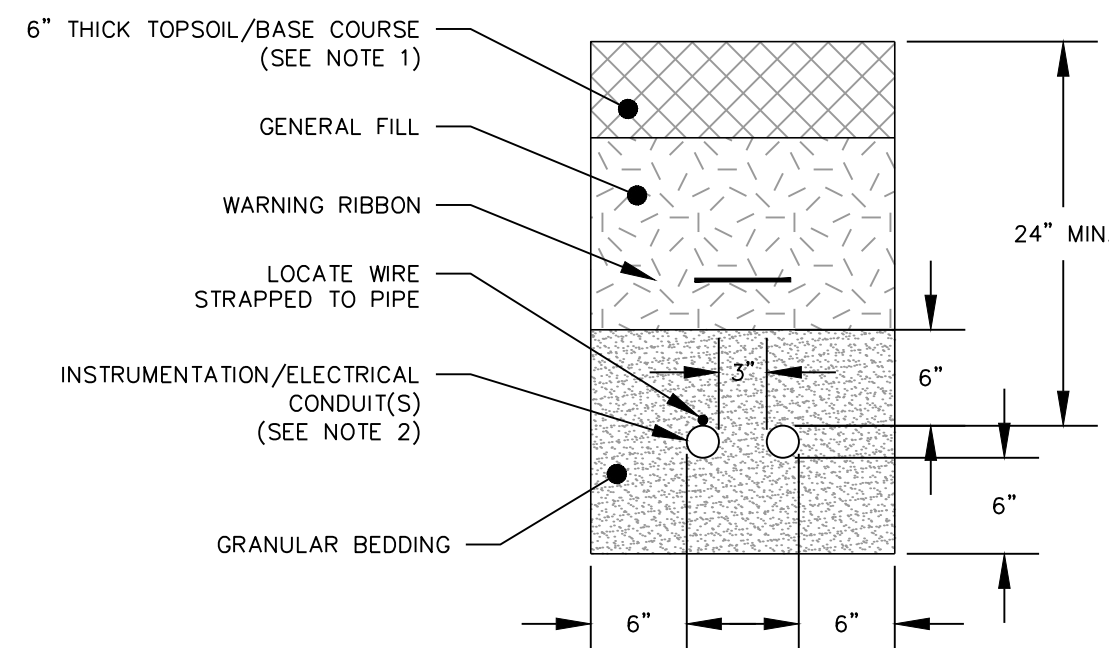
- NOTES:**
1. SEE SHEET 2 FOR ADDITIONAL BASE MAP NOTES AND LEGEND ITEMS.
 2. APPROXIMATE BEDROCK SURFACE DIGITIZED FROM DANE COUNTY WISCONSIN DEPARTMENT OF PUBLIC WORKS "SANITARY LANDFILL NO. 1 - BEDROCK SURFACE TOPOGRAPHIC MAP" DATED NOVEMBER, 1990.
 3. AERIAL PHOTOGRAPH (APRIL 2017) AND TOPOGRAPHY (2017) PROVIDED BY DANE COUNTY.
 4. EXISTING UTILITIES IN BLOWER AREA FROM DANE COUNTY NO.1 (VERONA) LANDFILL "SITE PLAN" SHEET 4 OF 6, DATED JANUARY 2017. EXISTING UTILITY LOCATIONS ARE APPROXIMATE AND WILL BE FIELD LOCATED BY OWNER PRIOR TO CONSTRUCTION.
 5. GROUNDWATER ELEVATIONS BASED ON MEASUREMENTS TAKEN AT MONITORING WELL MW-32R IN NOVEMBER 2012 AND MAY 2018 AND REPRESENT THE LOW AND HIGH OBSERVED GROUNDWATER ELEVATIONS FROM 2009 - 2018.
 6. EXISTING GAS MITIGATION CONTROL HEADER PIPE ALIGNMENT FROM "GAS MIGRATION SYSTEM LAYOUT" DATED NOVEMBER 1997 BY RMT.
 7. INSTALL GAS CONTROL WELLS TO LOW GROUNDWATER ELEVATION (AS SHOWN) OR TO AUGER REFUSAL (AS APPROVED BY ENGINEER).
 8. INSTALL GAS MONITORING PROBES TO THE LOW GROUNDWATER ELEVATION (AS SHOWN) OR TO AUGER REFUSAL (AS APPROVED BY ENGINEER).
 9. TRENCHING FOR GAS HEADER MAY ENCOUNTER AN EXISTING ABANDONED GAS MITIGATION CONTROL HEADER TRENCH/PIPE. NEW GAS HEADER PIPE ALIGNMENT MAY BE ADJUSTED TO FOLLOW THE EXISTING PIPE/TRENCH PATH AS APPROVED BY OWNER/ENGINEER. PROVIDED A MINIMUM PIPE SLOPE OF 1.0% AND MINIMUM PIPE COVER OF 4.0 FEET IS MAINTAINED.



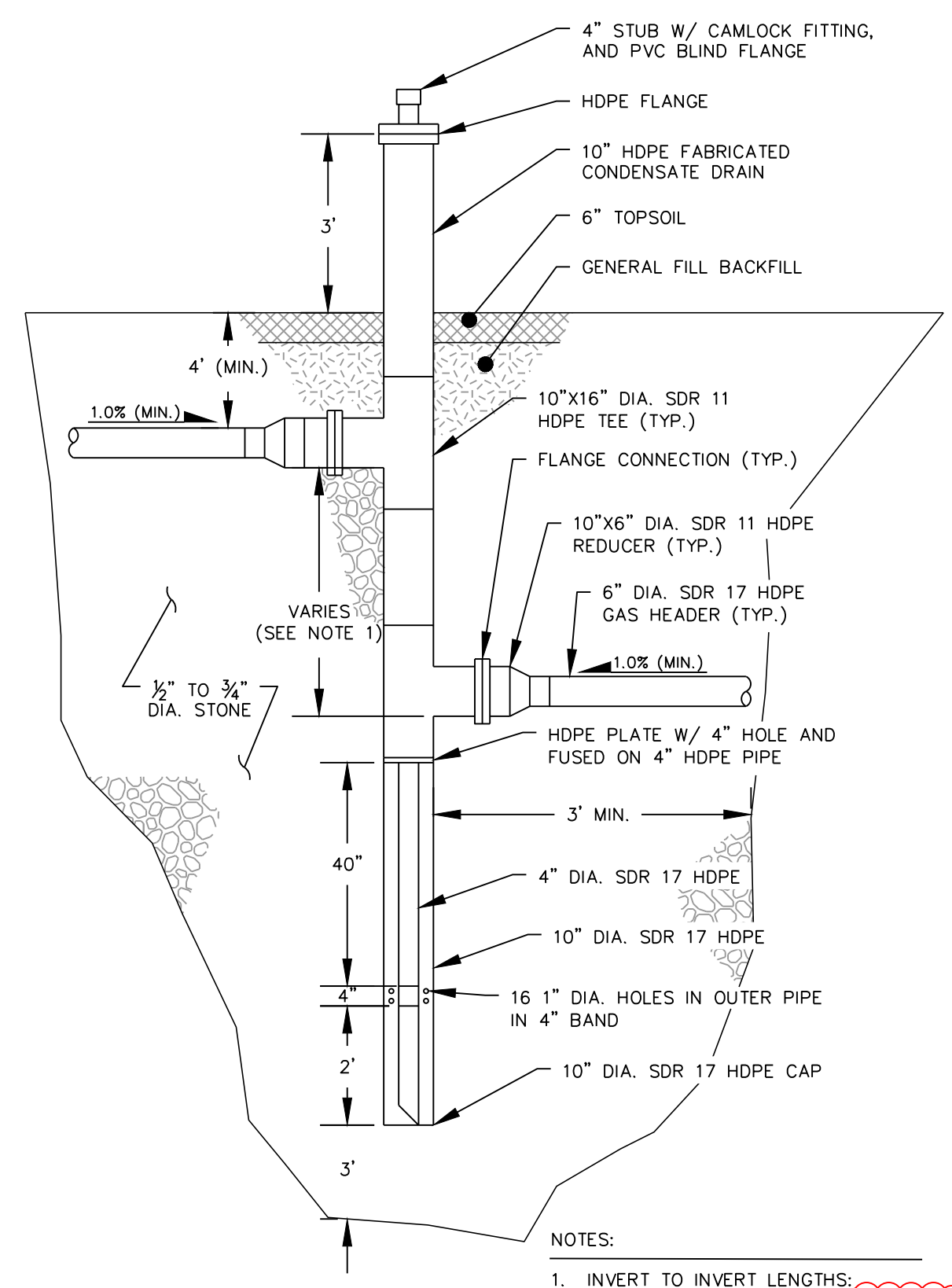
Addendum No. 1



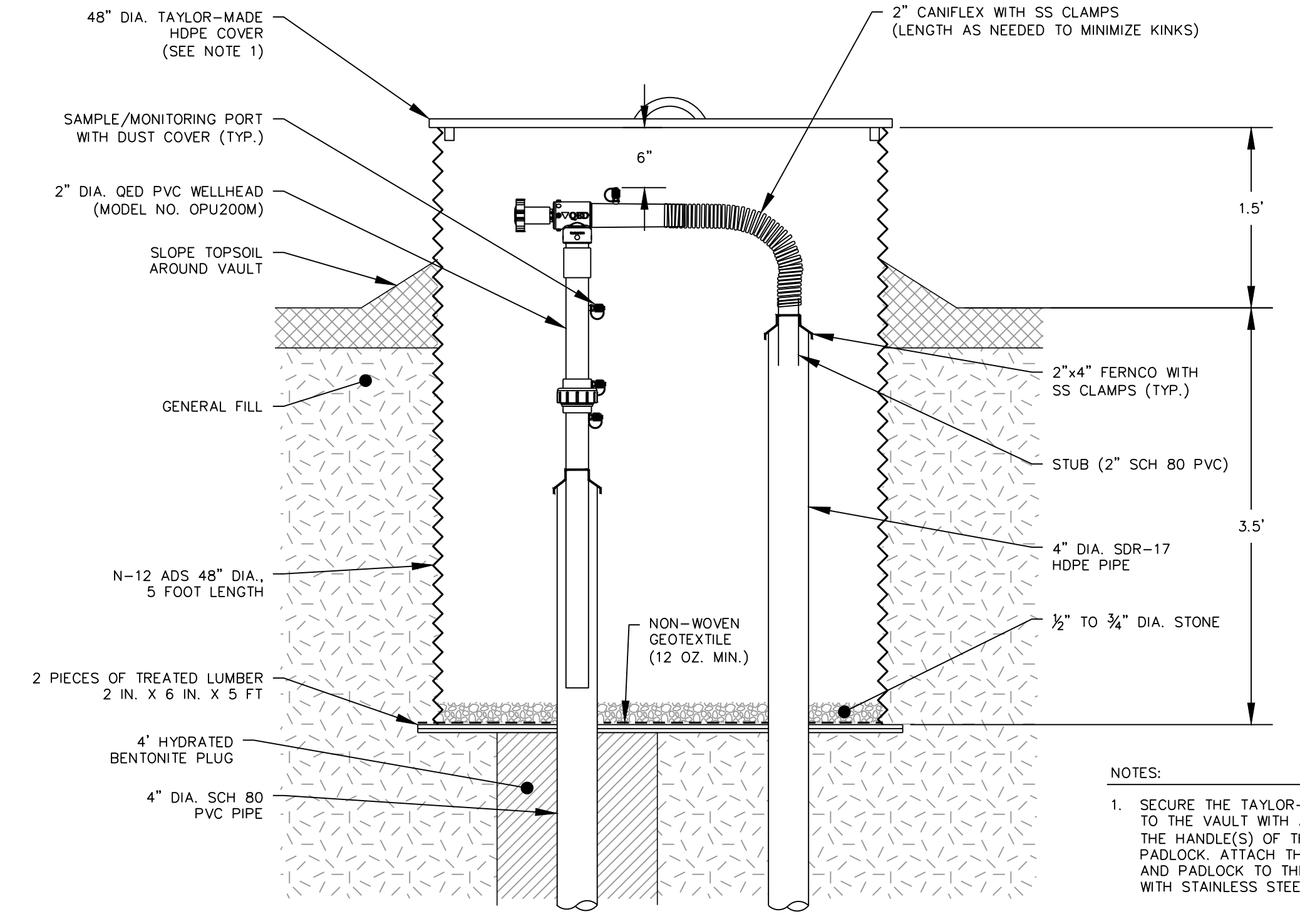
1 GAS CONTROL WELL
NOT TO SCALE



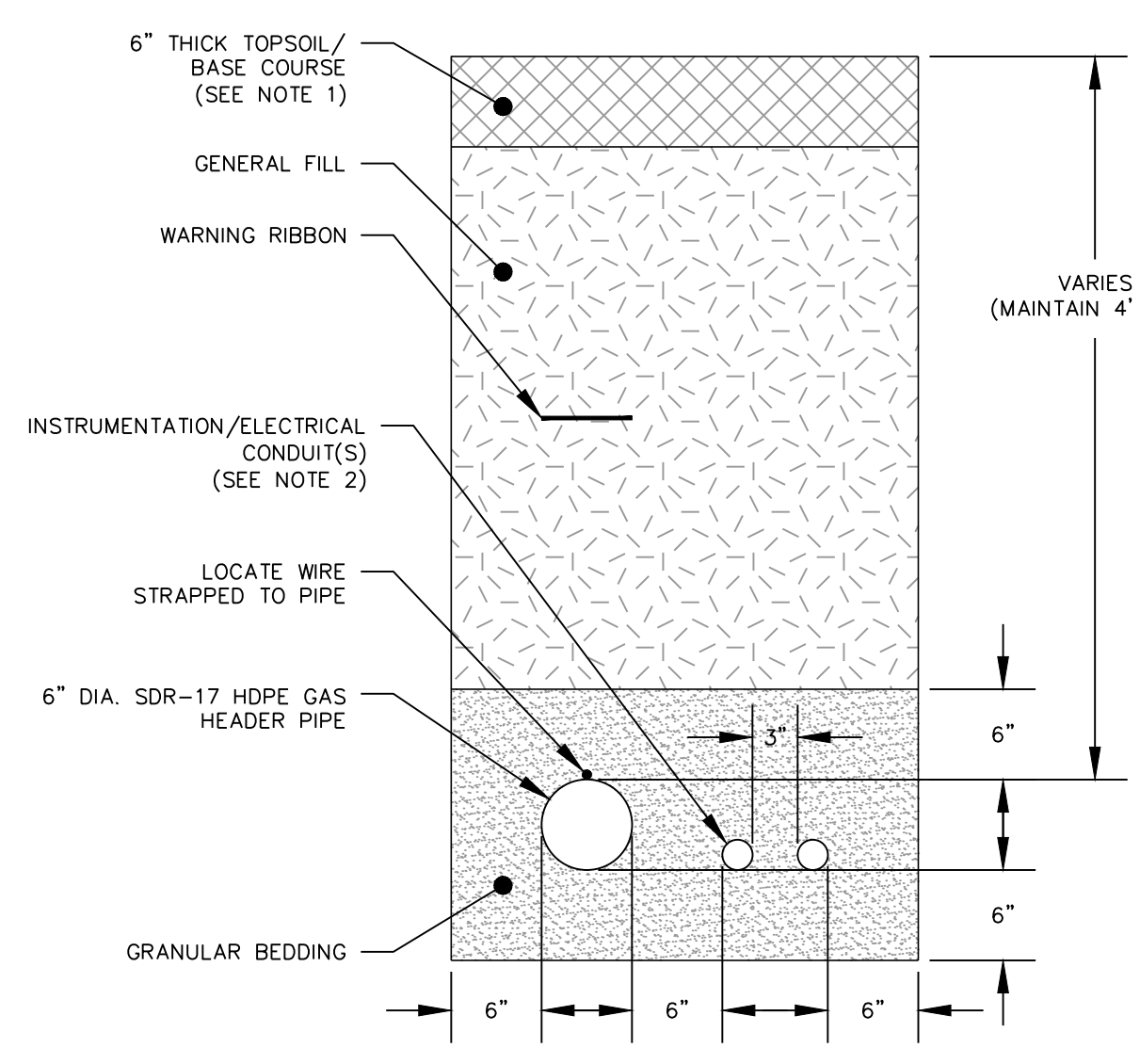
4 ELECTRICAL/INSTRUMENTATION TRENCH
NOT TO SCALE



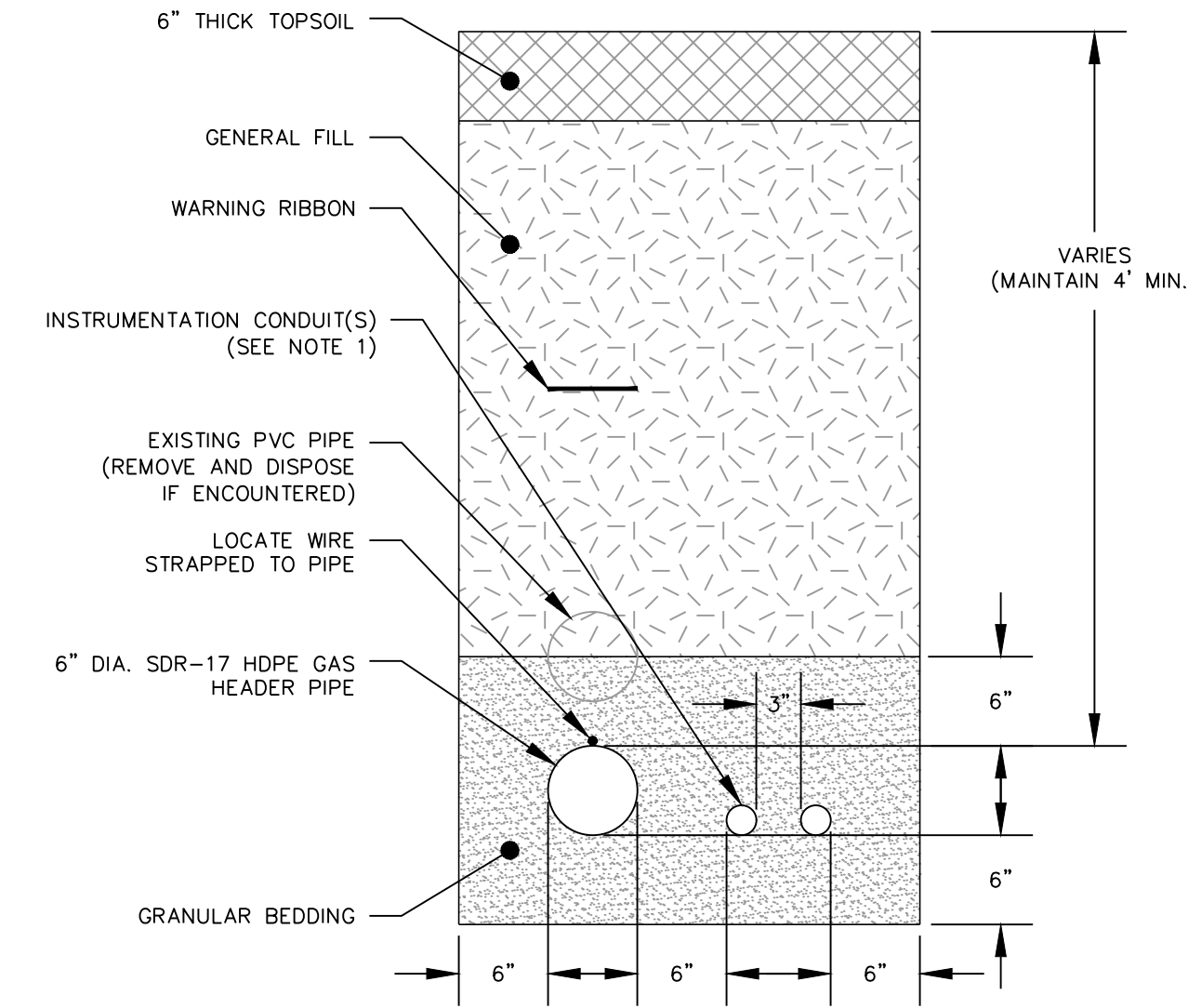
2 CONDENSATE DRAIN
NOT TO SCALE



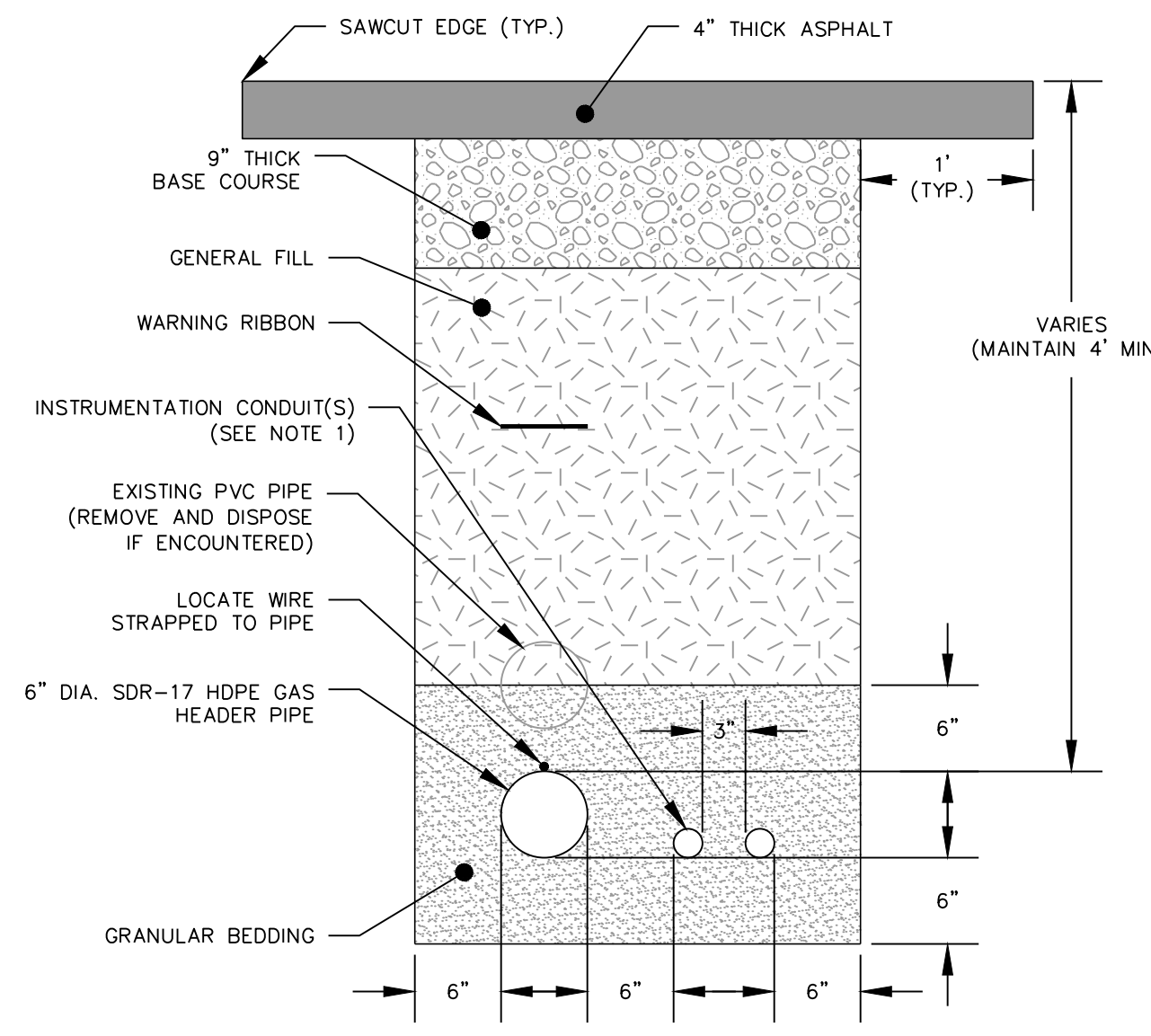
3 WELLHEAD / VAULT
NOT TO SCALE



5 GAS HEADER PIPE IN NEW TRENCH
NOT TO SCALE



6 GAS HEADER PIPE IN EXISTING PIPE TRENCH
NOT TO SCALE



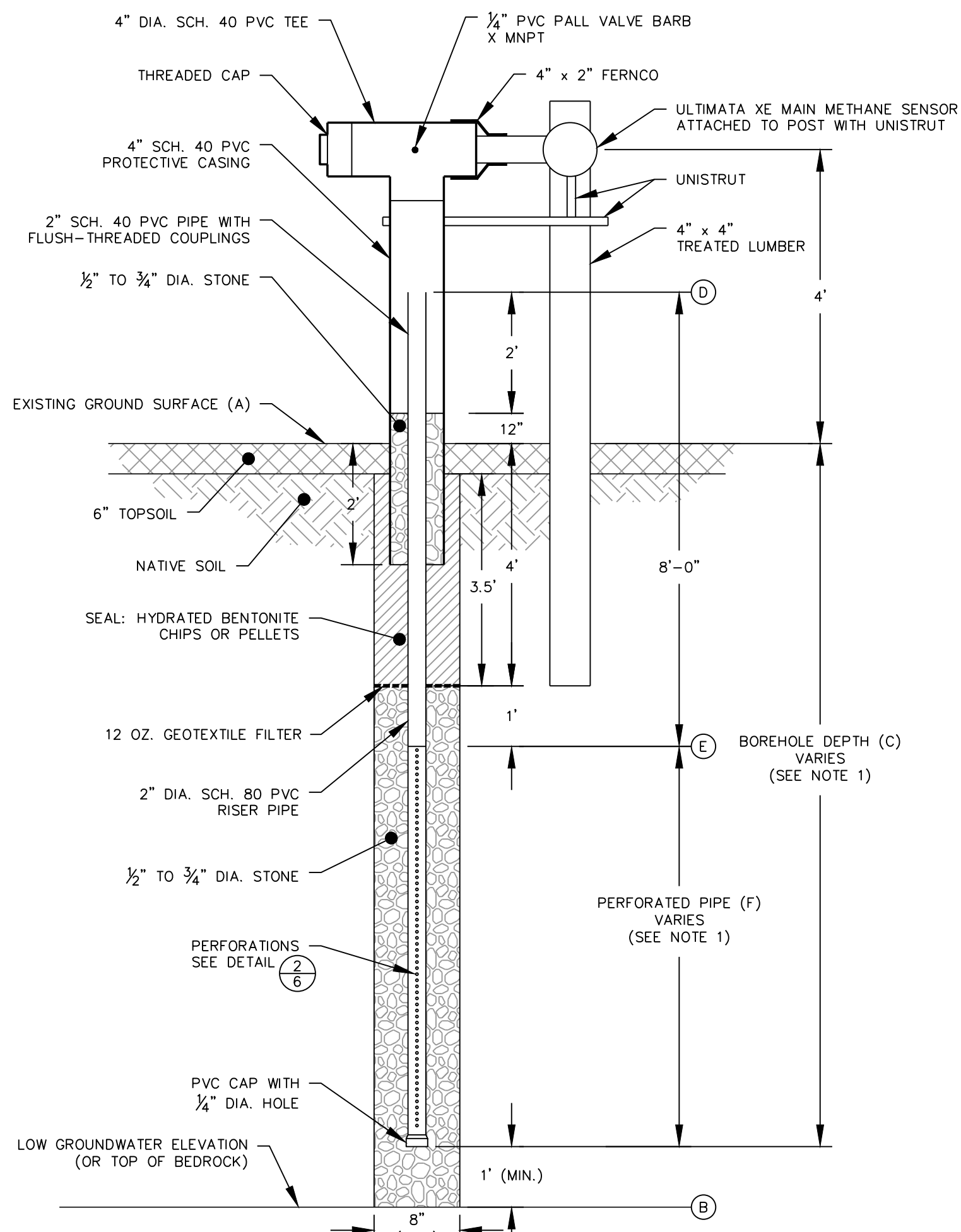
7 GAS HEADER TRENCH THROUGH ASPHALT DRIVE
NOT TO SCALE

NOTES:
1. SEE PROPOSED GAS CONTROL WELL INFORMATION TABLE ON SHEET 3 FOR DIMENSIONS AND ELEVATIONS.

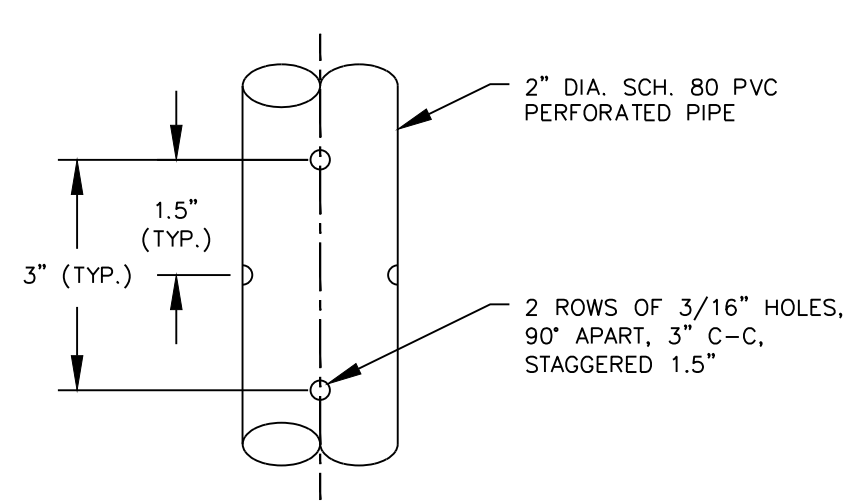
NOTES:
1. INVERT TO INVERT LENGTHS:
CONDENSATE DRAIN CD1 = 3.64 FEET
CONDENSATE DRAIN CD2 = 5.31 FEET

NOTES:
1. SECURE THE TAYLOR-MADE HDPE COVER TO THE VAULT WITH A CHAIN THROUGH THE HANDLE(S) OF THE COVER AND A PADLOCK. ATTACH THE END OF THE CHAIN AND PADLOCK TO THE SIDE OF THE VAULT WITH STAINLESS STEEL U-BOLTS.

REVISION	TITLE	ISSUED FOR BID - ADDENDUM NO. 1	DATE	04/02/19
PROJECT NO.	DRAWN BY:	2521787/19	RF/BSS	
CHECKED BY:	MRH			
APPROVED BY:	JMO	04/02/19	JMO	03/11/19
DANE COUNTY WASTE AND RECYCLABLES 1919 ALLIANT ENERGY CENTER WAY MADISON, WISCONSIN 53713				
CLIENT				
SCS ENGINEERS 2830 DARIY DRIVE MADISON, WI 53718-0797 PHONE: (608) 224-2830				
ENGINEER				
ISSUED FOR BID VERONA LANDFILL PERIMETER GAS MITIGATION SYSTEM VERONA, WISCONSIN				
SITE				
DETAILS				
SHEET				
5 of 8				

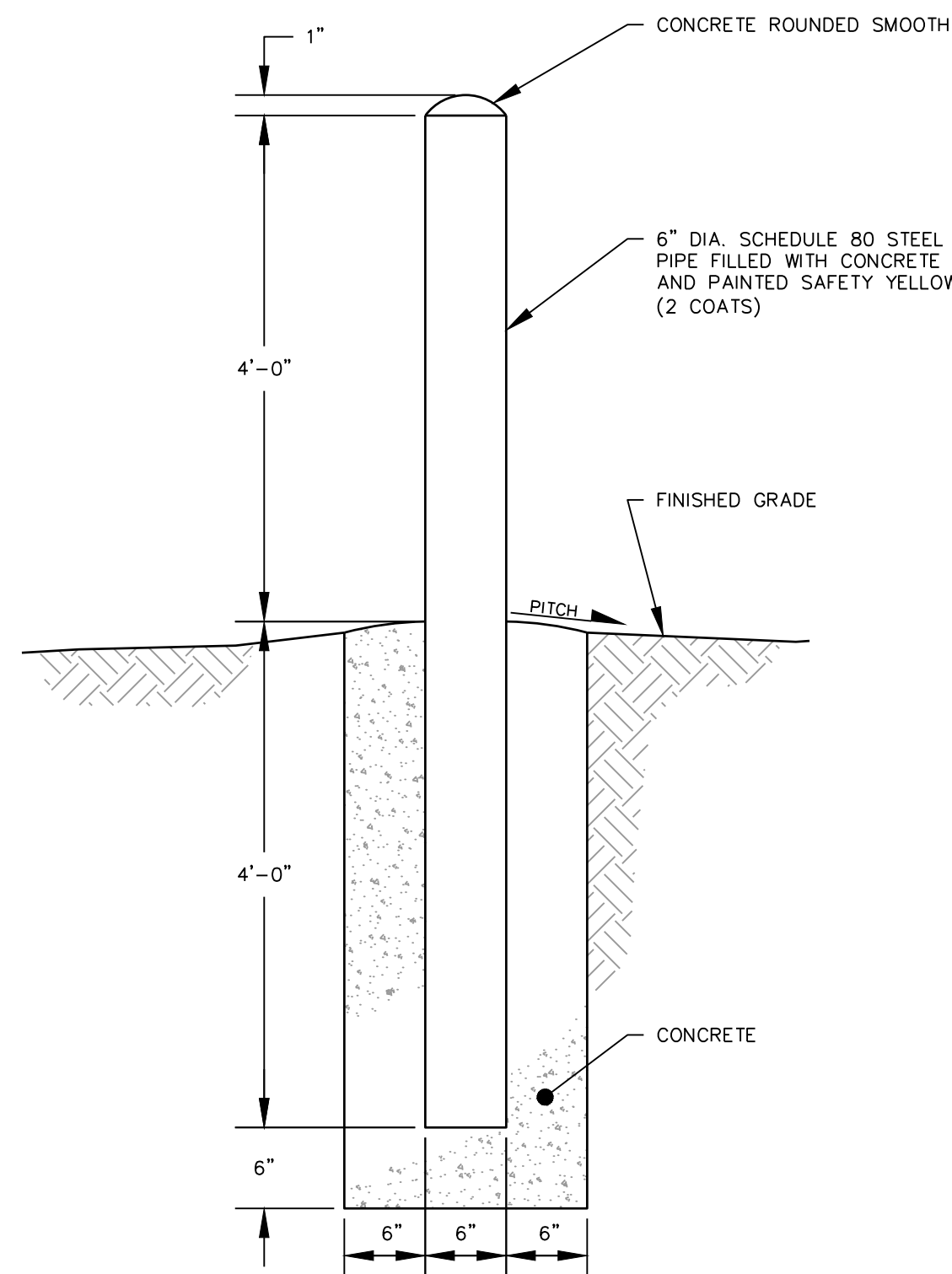


1
6
GAS MONITORING
PROBE/METHANE SENSOR
NOT TO SCALE

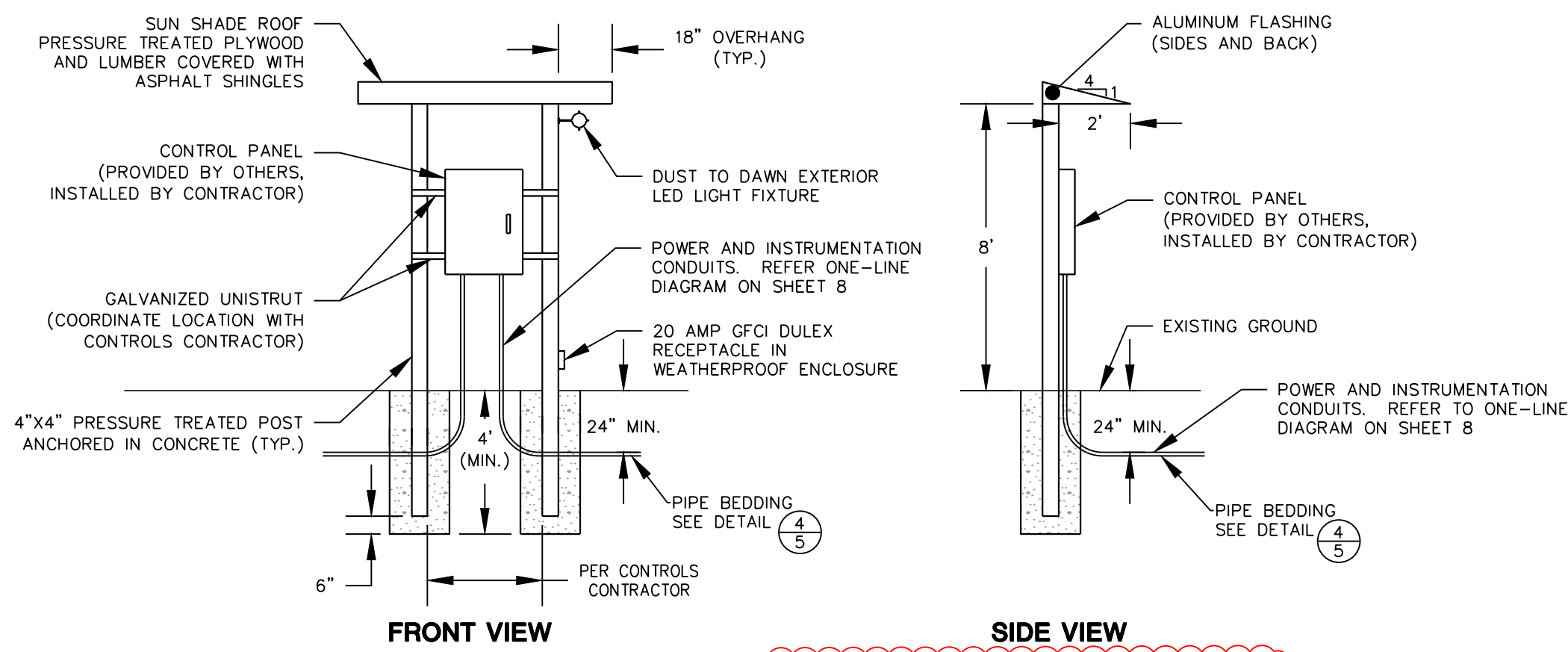


NOTES FOR PERFORATED PIPE:
1. CONTRACTOR TO USE FACTORY PERFORATED PIPING ONLY. FIELD PERFORATIONS WILL NOT BE ALLOWED.

2
6
TYPICAL GAS PROBE PERFORATED PIPE
NOT TO SCALE

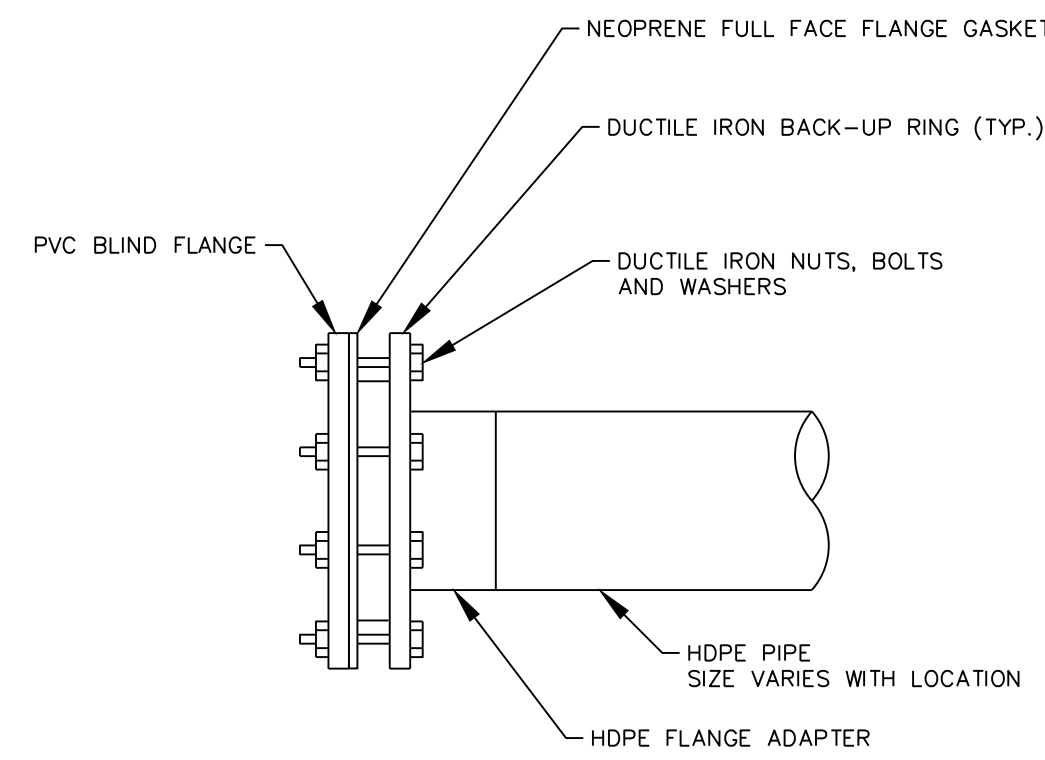


3
6
BUMPER POST
NOT TO SCALE

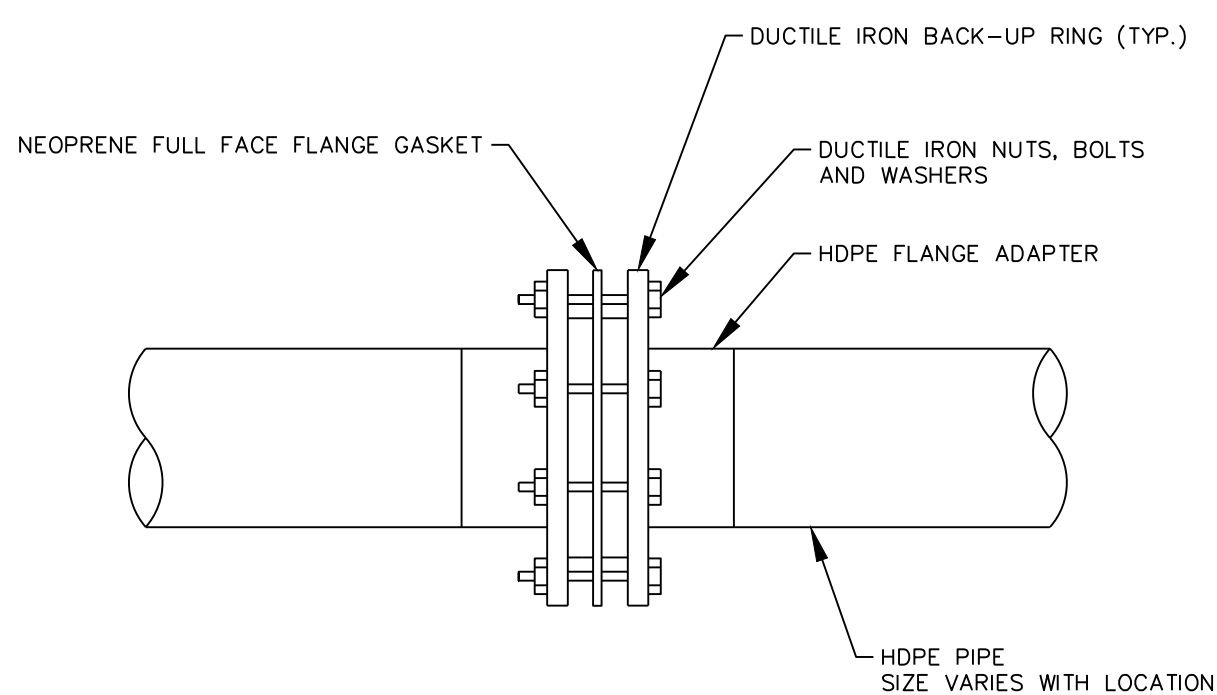


NOTES:
1. RUN WIRING FROM FIELD INSTRUMENTS/EQUIPMENT TO CONTROL PANEL AND TERMINATE IN CONTROL PANEL AS DIRECTED BY CONTROLS CONTRACTOR.

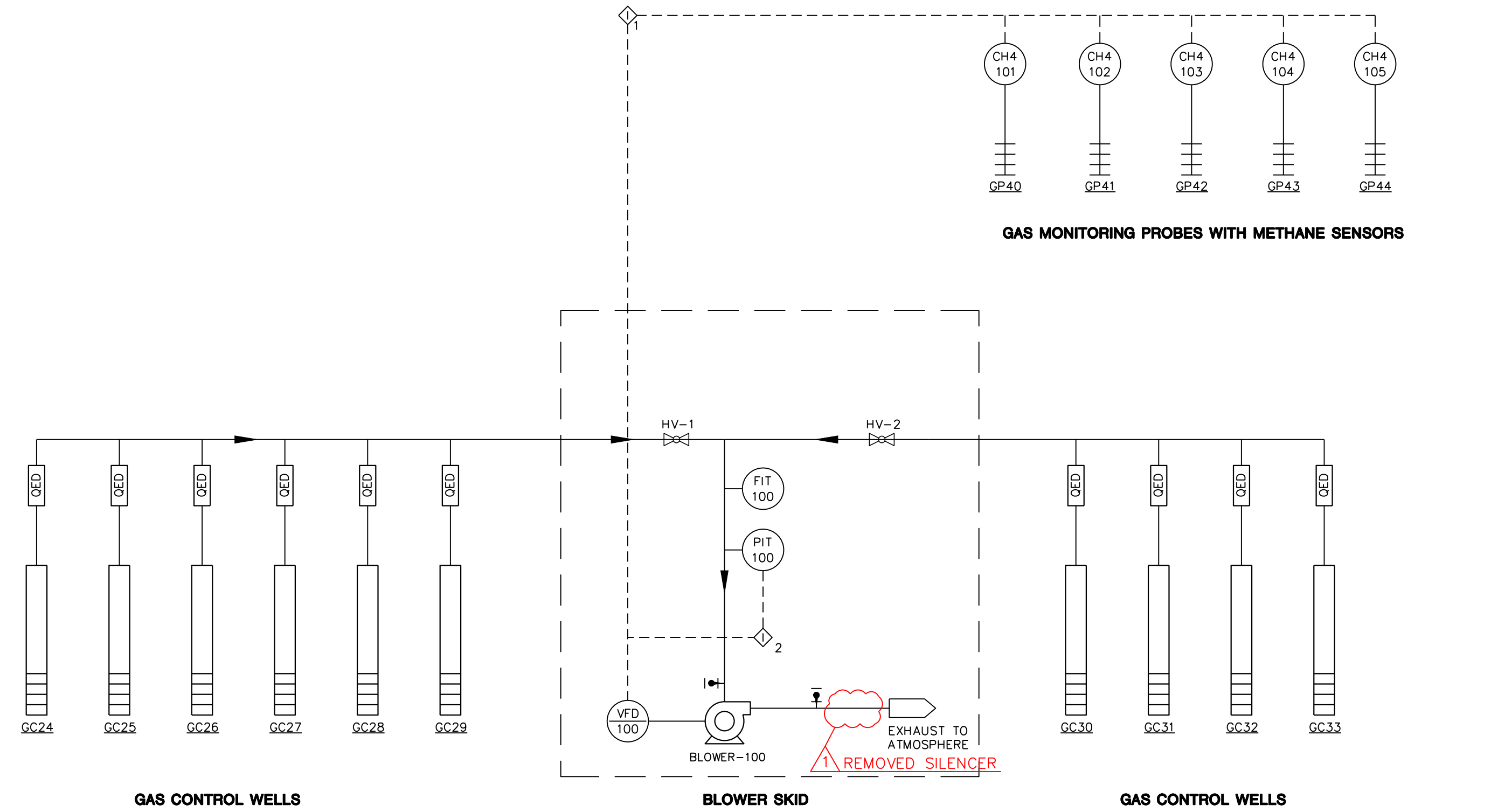
4
6
CONTROL PANEL
NOT TO SCALE



5
6
TYPICAL BLIND FLANGE CONNECTION
NOT TO SCALE



6
6
TYPICAL FLANGE CONNECTION
NOT TO SCALE



INSTRUMENT ABBREVIATIONS

- GC - GAS CONTROL WELL
- CH4 - METHANE SENSOR
- GP - GAS MONITORING PROBE
- FIT - PRESSURE INDICATING TRANSMITTER
- FIT - FLOW INDICATING TRANSMITTER
- HV - HEADER BUTTERFLY VALVE

LEGEND

- ELECTRIC SIGNAL LINE
- PROCESS LINE
- QED QED WELLHEAD
- ▽ SAMPLE PORT W/ BALL VALVE
- ◇ BUTTERFLY VALVE
- XXX LOCAL INSTRUMENT
- ### PANEL MOUNTED INSTRUMENT

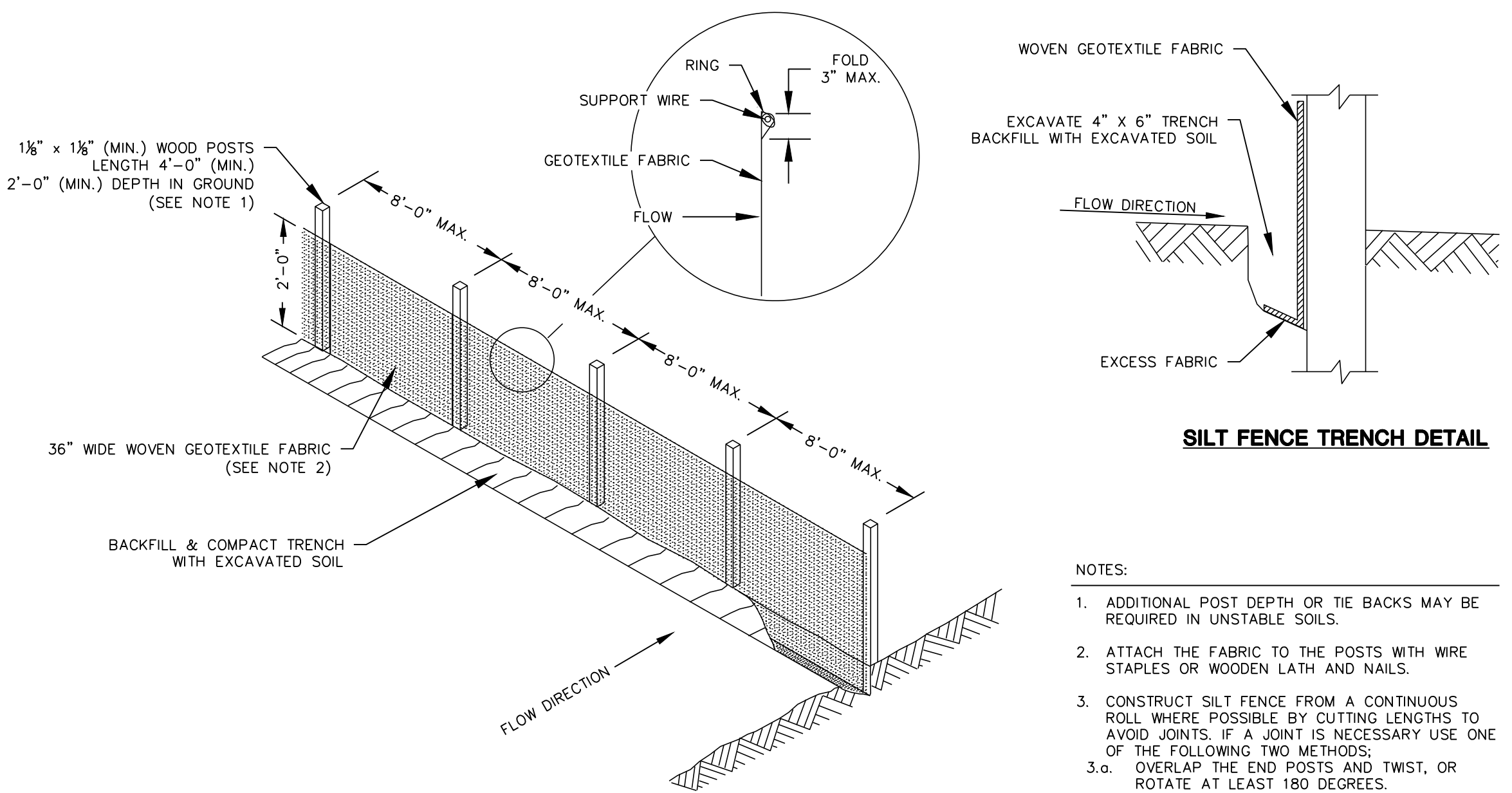
INTERCONNECTS

1. BLOWER ON WHEN METHANE SENSORS DETECTS METHANE ABOVE 30% LEL. BLOWER OFF 5 MINUTES AFTER METHANE SENSOR IS BELOW 10% LEL.
2. VARIABLE FREQUENCY DRIVE (VFD) TO OPERATE BLOWER AT A FIXED BLOWER INLET VACUUM OF APPROXIMATELY 6-INCHES OF WATER COLUMN (TO PROVIDE A VACUUM OF 4-INCHES OF WATER COLUMN AT THE MOST REMOTE GAS CONTROL WELL).

NOTES

1. CONTRACTOR TO INSTALL ALL EQUIPMENT INCLUDING THE FOLLOWING EQUIPMENT PROVIDED BY OTHERS:
 - PRESSURE INDICATING TRANSMITTER
 - FLOW INDICATING TRANSMITTER
 - BLOWER
 - VFD
 - BLOWER OUTLET SILENCER

4
6
PROCESS AND
INSTRUMENTATION DIAGRAM
NOT TO SCALE



NOTES:

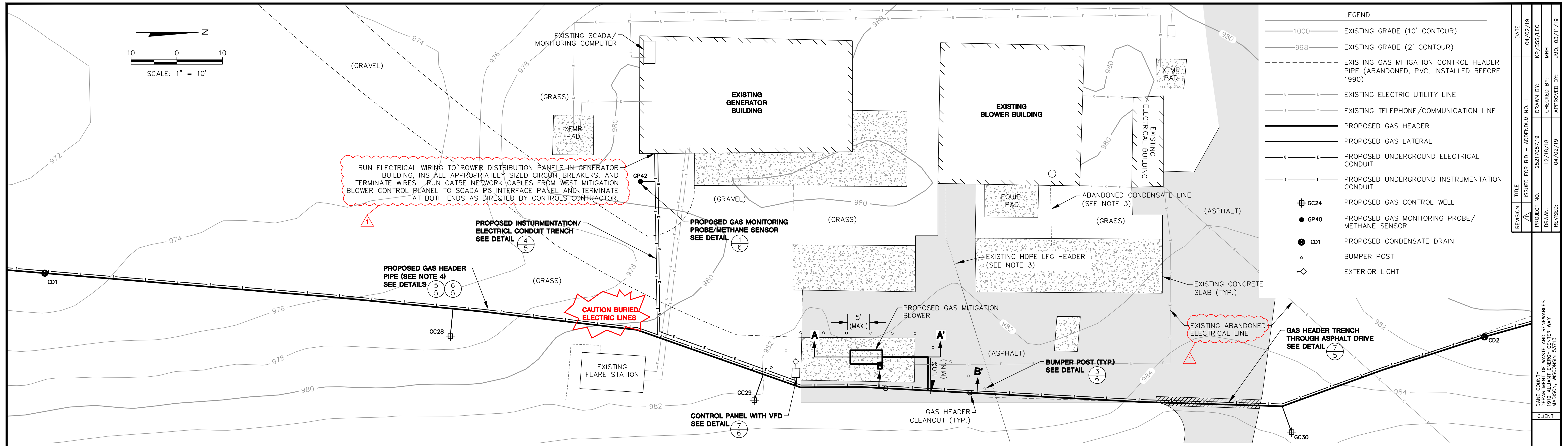
1. ADDITIONAL POST DEPTH OR TIE BACKS MAY BE REQUIRED IN UNSTABLE SOILS.
2. ATTACH THE FABRIC TO THE POSTS WITH WIRE STAPLES OR WOODEN LATH AND NAILS.
3. CONSTRUCT SILT FENCE FROM A CONTINUOUS ROLL WHERE POSSIBLE BY CUTTING LENGTHS TO AVOID JOINTS. IF A JOINT IS NECESSARY USE ONE OF THE FOLLOWING TWO METHODS:
 - 3.a. OVERLAP THE END POSTS AND TWIST, OR ROTATE AT LEAST 180 DEGREES.
 - 3.b. HOOK THE END OF EACH SILT FENCE LENGTH AND OVERLAP AT LEAST 2 FEET.

8
6
SILT FENCE
NOT TO SCALE

REVISION	TITLE	DATE
1	ISSUED FOR BID - ADDENDUM NO. 1	04/02/19
2	PROJECT NO.	2521708719
3	DRAWN BY:	KP/BSS
4	CHECKED BY:	MRH
5	DATE	04/02/19
6	APPROVED BY:	JMO, 03/11/19

ISSUED FOR BID	ENGINEER
VERONA LANDFILL	SCS ENGINEERS
PERIMETER GAS MITIGATION SYSTEM	2830 DARY DRIVE MADISON, WI 53718-0797
VERONA, WISCONSIN	PHONE: (608) 224-2830

SITE	DETAILS AND PAID
	6 OF 8



LEGEND

1000	EXISTING GRADE (10' CONTOUR)
998	EXISTING GRADE (2' CONTOUR)
- - - - -	EXISTING GAS MITIGATION CONTROL HEADER PIPE (ABANDONED, PVC, INSTALLED BEFORE 1990)
- - - - -	EXISTING ELECTRIC UTILITY LINE
- - - - -	EXISTING TELEPHONE/COMMUNICATION LINE
—	PROPOSED GAS HEADER
—	PROPOSED GAS LATERAL
—	PROPOSED UNDERGROUND ELECTRICAL CONDUIT
—	PROPOSED UNDERGROUND INSTRUMENTATION CONDUIT
⊕ GC24	PROPOSED GAS CONTROL WELL
● GP40	PROPOSED GAS MONITORING PROBE/METHANE SENSOR
⊙ CD1	PROPOSED CONDENSATE DRAIN
○	BUMPER POST
⊕	EXTERIOR LIGHT

REVISION	TITLE	DATE
1	ISSUED FOR BID - ADDENDUM NO. 1	04/02/19
2	PROJECT NO. 2521787/19	DRAWN BY: RP/BS/LEC
3	DRAWN: 12/18/18	CHECKED BY: MRH
4	04/02/19	APPROVED BY: JMO, 03/11/19

DANE COUNTY WASTE AND RECYCLES
1919 ALLIANT ENERGY CENTER WAY
MADISON, WISCONSIN 53713

CLIENT

NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP NOTES AND LEGEND ITEMS.

2. EXISTING BLOWER BUILDING AREA SITE FEATURES BASED ON 10/23/18 SITE VISIT AND 12/26/18 SURVEY BY SCS ENGINEERS.

3. EXISTING UTILITIES IN BLOWER AREA FROM DANE COUNTY NO.1 (VERONA) LANDFILL "SITE PLAN" SHEET 4 OF 6, DATED JANUARY 2017. EXISTING UTILITY LOCATIONS ARE APPROXIMATE AND WILL BE FIELD LOCATED BY OWNER PRIOR TO CONSTRUCTION.

4. TRENCHING FOR GAS HEADER MAY ENCOUNTER AN EXISTING ABANDONED GAS MITIGATION CONTROL HEADER TRENCH/PIPE. NEW GAS HEADER PIPE ALIGNMENT MAY BE ADJUSTED TO FOLLOW THE EXISTING PIPE/TRENCH PATH AS APPROVED BY OWNER/ENGINEER, PROVIDED A MINIMUM PIPE SLOPE OF 1.0% AND MINIMUM PIPE COVER OF 4.0 FEET IS MAINTAINED.

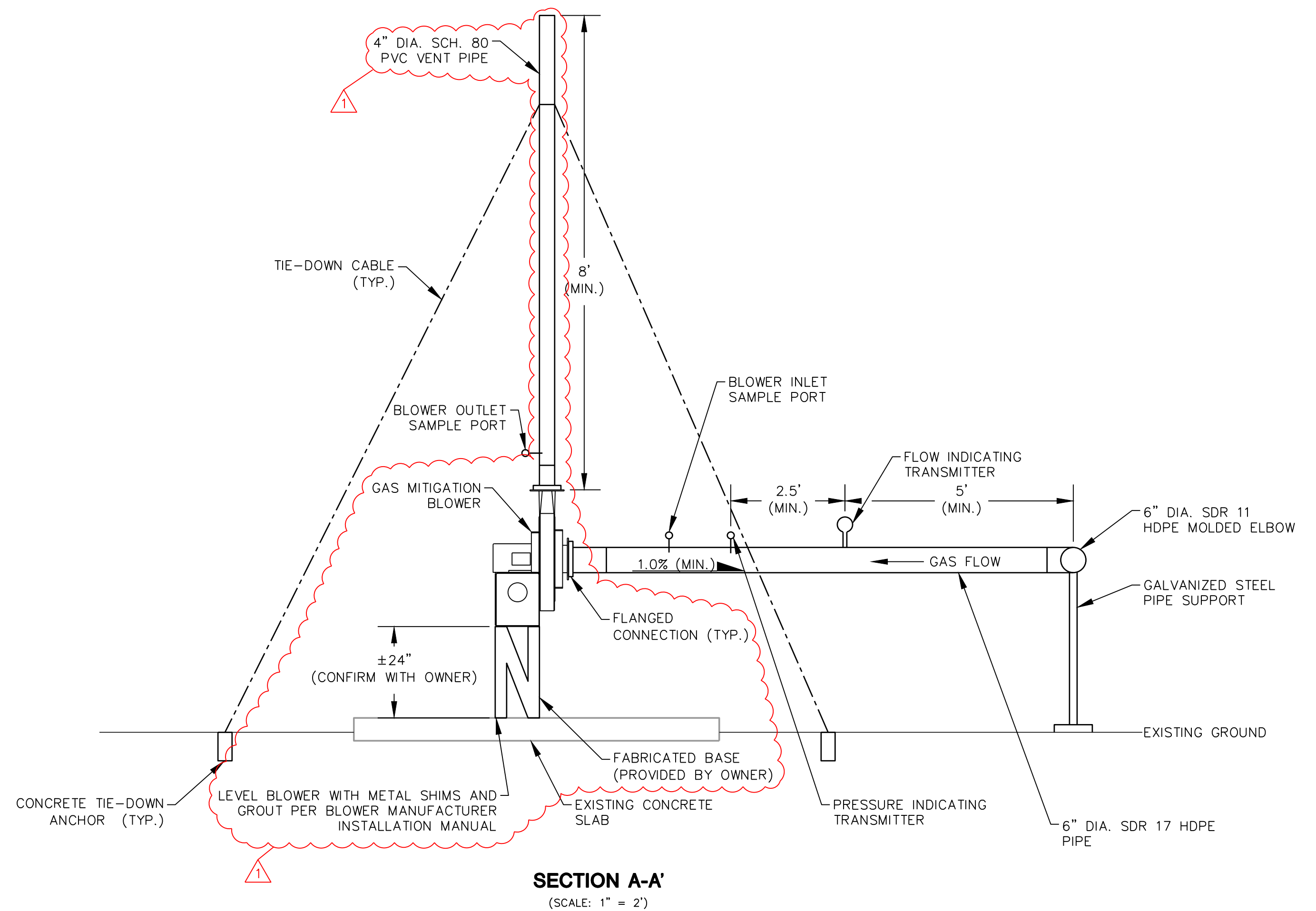
NOTES:

1. SEE SHEET 2 FOR ADDITIONAL BASE MAP NOTES AND LEGEND ITEMS.

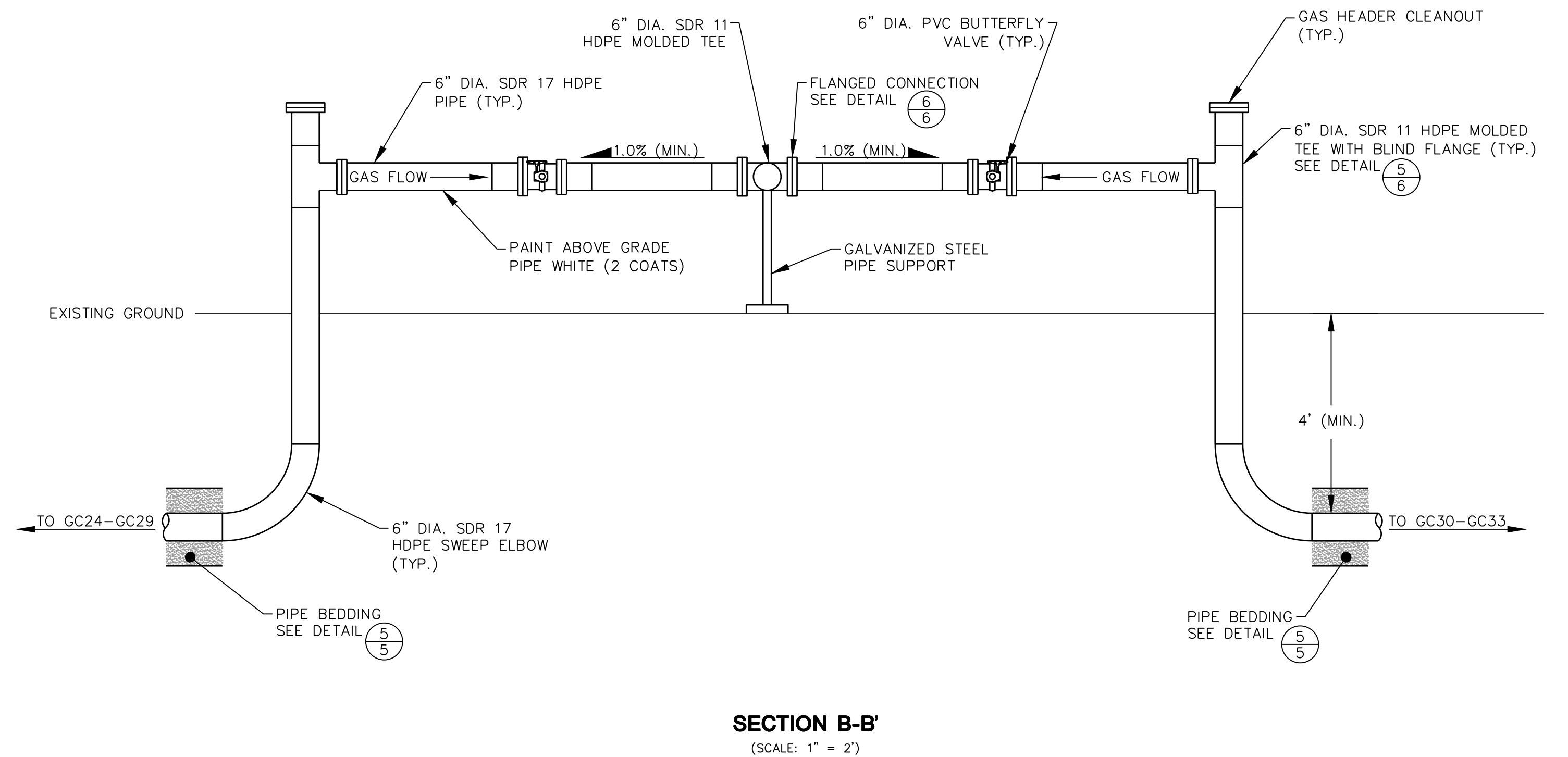
2. EXISTING BLOWER BUILDING AREA SITE FEATURES BASED ON 10/23/18 SITE VISIT AND 12/26/18 SURVEY BY SCS ENGINEERS.

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SECTION A-A'
(SCALE: 1" = 2')



SECTION B-B'
(SCALE: 1" = 2')

SCS ENGINEERS
2830 DARIY DRIVE MADISON, WI 53718-0797
PHONE: (608) 224-2830

ENGINEER

ISSUED FOR BID
VERONA LANDFILL
PERIMETER GAS MITIGATION SYSTEM
VERONA, WISCONSIN

SITE

BLOWER AREA PIPING

SHEET
7 of 8

Attachment A – Pre-Bid Meeting



DANE COUNTY DEPARTMENT OF WASTE AND RENEWABLES

County Executive
Joseph T. Parisi

1919 Alliant Energy Center Way ♦ Madison, Wisconsin 53713
Phone: (608) 266-4018 ♦ Fax: (608) 267-1533

Director
John Welch P.E.

PRE-BID MEETING MINUTES 4650 MAPLE GROVE ROAD, VERONA, WI WEDNESDAY, MARCH 27, 2019 @ 1:00 PM

- Introduction – sign in
 - See attendance sheet.
- Description of Work
 - Standalone perimeter gas mitigation system consisting of 900 LF of header pipe, gas control wells, gas probes, and supplemental control instrumentation.
- Work by Owner:
 - Outlined in Instructions to Bidders, Section 19 “Work by Owner”.
 - Blower varies from Instructions to Bidders, new blower will be:
 - Manufacturer: Twin City Fan & Blower
 - Model #: 16N4-TBNA (Turbo Pressure Blower, Aluminum Wheel)
 - Contractor will be required to pull and land wires for all equipment. Owner will verify all wires are landed correctly.
 - Contractor will be responsible for procuring and transporting all waste to Dane County Landfill Site No. 2 (Rodefeld). Landfill tipping fees will be waived.
 - Contractor may take excess soils to the compost site located at the east side of Dane County Landfill Site No. 1 (Verona). Minimal excess soils may be blended into existing grades adjacent to trenching.
 - Dane County will expose header pipe and conduit from flare to control room to verify location and depth prior to Contractor starting Work.
- Construction schedule
 - Notice to Proceed Issued: May 3, 2019
 - Commencement: May 6, 2019
 - Completion: June 28, 2019
- Bid Opening on Tuesday, April 9th, 2019 at 2:00 p.m. at Waste & Renewables Office, 1919 Alliant Energy Center Way, Madison WI 53713.
 - Absolutely no late bid are accepted and cannot be submitted electronically.
 - Make sure you have all items under “include with bid” included, bids will be rejected if they are not submitted with ALL items.
- Plans, Specifications, and Addenda available on the Dane County’s bid website (bids-pwht.countyofdane.com) for free download.
- Addenda
 - Timeline for questions – last day to submit is March 29, 2019.

- Timeline for addenda – last day to issue addenda is April 2, 2019.
- Dane County Protocol
 - General conditions of the contract, general requirements of the project.
 - ESB & AAP (**General Conditions, Section 43**)
 - BVC
 - Payments & retainage (**General Conditions, Section 25**)
 - **Dane County typically retains 5% of each payment application until 50% of the Work has been completed.**
- Include with bid:
 - Signed Bid Form – acknowledge all addenda
 - Fair Labor Practices Certification form
 - 5% Bid Bond
- Before award:
 - Submittals on proposed substitutions
 - Must be a *paid registered vendor* with Dane County
 - www.danepurchasing.com
 - 608/266-4131
- Submittals required once contract is awarded
 - Insurance with “Dane County” listed as additional insured
 - 100% Performance/Payment Bond are required
 - Signed NTP
 - Subcontractors list including fax, phone, and email
 - Product data, including any substitutions
 - Schedule of values and AIA Pay Request Form
- Or equal clause
 - Substitutions will be reviewed prior to Bid Opening if received 10 days before Bid Opening
 - Decisions on submittals made later than 10 days prior to Bid Opening may not be made prior to Bid Opening.
 - **Methane sensors shall be the specified make and model, no exceptions will be taken.**
- Must comply with City of Verona Noise Ordinance – Construction noise prohibited between 8 PM – 7 AM Monday-Friday and 8 PM - 8 AM on Saturday and Sunday.
- Electricity, parking, and storage are available on-site
- Project Security/Safety: public, traffic, methane, etc.
 - **All questions posed by the public or regulatory authority regarding the project shall be directed to Dane County.**
- Questions on procedure or requirements
- Site tour



DANE COUNTY DEPARTMENT OF WASTE AND RENEWABLES

County Executive
Joseph T. Parisi

1919 Alliant Energy Center Way ♦ Madison, Wisconsin 53713
Phone: (608) 266-4018 ♦ Fax: (608) 267-1533

Director
John Welch P.E.

PRE-BID ATTENDANCE SHEET
4650 MAPLE GROVE ROAD, VERONA, WI
WEDNESDAY, MARCH 27, 2019 @ 1:00 PM

NAME	COMPANY	PHONE	E-MAIL
Robert Leszczynski	Dakota Intertek	414.530.3905	Bob@dakotaic.com
Chris Steinke	Terra	608.219.4623	CSteinke@whyterra.com
Rob Karsten	Landfill Drilling & Piping	608.212.9828	RKarsten@landfilldps.com
Ava Lombardino	Landfill Drilling & Piping	608.709.2712	ALombardino@landfilldps.com
Duane Reichel	Soils & Engineering	608.274.7600 (o) 608.212.1847 (c)	Duane@soils.ws
Dave Lofthouse	Reconex Inc.	608.712.8113 (c) 608.253.4453 (o)	Reconex@frontier.com

Attachment B – Soil Boring Logs

Route To: Watershed/Wastewater Waste Management
 Remediation/Redevelopment Other

SES Project Number **506.37**

Facility/Project Name Verona Landfill, Verona		License/Permit/Monitoring Number		Boring Number GP 31	
Boring Drilled By: Name of crew chief (first, last) and Firm Kevin Z. Hargis Soils & Engineering Services, Inc.			Date Drilling Started October 24, 2008	Date Drilling Completed October 24, 2008	Drilling Method HSA
WI Unique Well No.	DNR Well ID No.	Common Well Name GP 31	Final Static Water Level	Surface Elevation 989.0 Feet	Borehole Diameter 7.6 in
Local Grid Origin <input type="checkbox"/> (estimated: <input checked="" type="checkbox"/>) or Boring Location <input type="checkbox"/>			Local Grid Location		
State Plane		Lat		<input type="checkbox"/> N <input type="checkbox"/> E <input type="checkbox"/> S <input type="checkbox"/> W	
1/4 of		1/4 of Sec.		T. N. R. E/W	
Facility ID	County Dane	County Code 13	Civil Town/City/ or Village City of Verona		

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	PID Readings	Soil Properties					RQD/ Comments
								Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			1	TOPSOIL Black, 3 inches thick	(CL)								
			2	LEAN CLAY Brown silty									
			3	DOLOMITE BEDROCK, WEATHERED Tan									
			4										
			5										
			6	Fractured with chert at 5'-6"									
			7										
			8	Very firm to hard at 8'-0"									
			9										
			10										
			11										
			12										
			13										
			14										
			15										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: *Kevin Z. Hargis* Firm: **Soils & Engineering Services, Inc.** Tel: 608-274-7600
1102 Stewart Street Madison, Wisconsin 53713-4648 Fax: 608-274-7511

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between \$10 and \$25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

Route To: Watershed/Wastewater
 Remediation/Redevelopment

Waste Management
Other _____

SES Project Number **506.37**

Facility/Project Name Verona Landfill, Verona		License/Permit/Monitoring Number		Boring Number GP 32	
Boring Drilled By: Name of crew chief (first, last) and Firm Kevin Z. Hargis Soils & Engineering Services, Inc.			Date Drilling Started October 24, 2008	Date Drilling Completed October 24, 2008	Drilling Method HSA
WI Unique Well No.	DNR Well ID No.	Common Well Name GP 32	Final Static Water Level 971.0 Feet	Surface Elevation 977.1 Feet	Borehole Diameter 7.6 in
Local Grid Origin <input type="checkbox"/> (estimated: <input checked="" type="checkbox"/>) or Boring Location <input type="checkbox"/>			Local Grid Location		
State Plane _____ ft. N, _____ ft. E. S/C/N		Lat _____		<input type="checkbox"/> N <input type="checkbox"/> E	
_____ 1/4 of _____ 1/4 of Sec. _____, T. _____ N, R. _____ E/W		Long _____		<input type="checkbox"/> Feet <input type="checkbox"/> S _____ Feet <input type="checkbox"/> W	
Facility ID	County Dane	County Code 13	Civil Town/City/ or Village City of Verona		

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID Readings	Soil Properties						RQD/ Comments		
									Pocket Penetrometer	Moisture Content	Liquid Limit	Plasticity Index	P 200				
Total Depth = 14'-6"																	
1	1.18	14	7 9 11	TOPSOIL Black, 3 inches thick SILTY FINE TO COARSE SAND WITH GRAVEL AND OCCASIONAL COBBLES Reddish-Brown													
2	1.18	6	7 7 7		(SM)												
3	1.18	7	8 14 17														
4	1.5	4	20/4" 60/4"	DOLOMITE BEDROCK, WEATHERED													

▼6'-1" at completion

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature *Kevin Z. Hargis* Firm **Soils & Engineering Services, Inc.** Tel: 608-274-7600
1102 Stewart Street Madison, Wisconsin 53713-4648 Fax: 608-274-7511

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between \$10 and \$25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

Attachment C – Blower Information



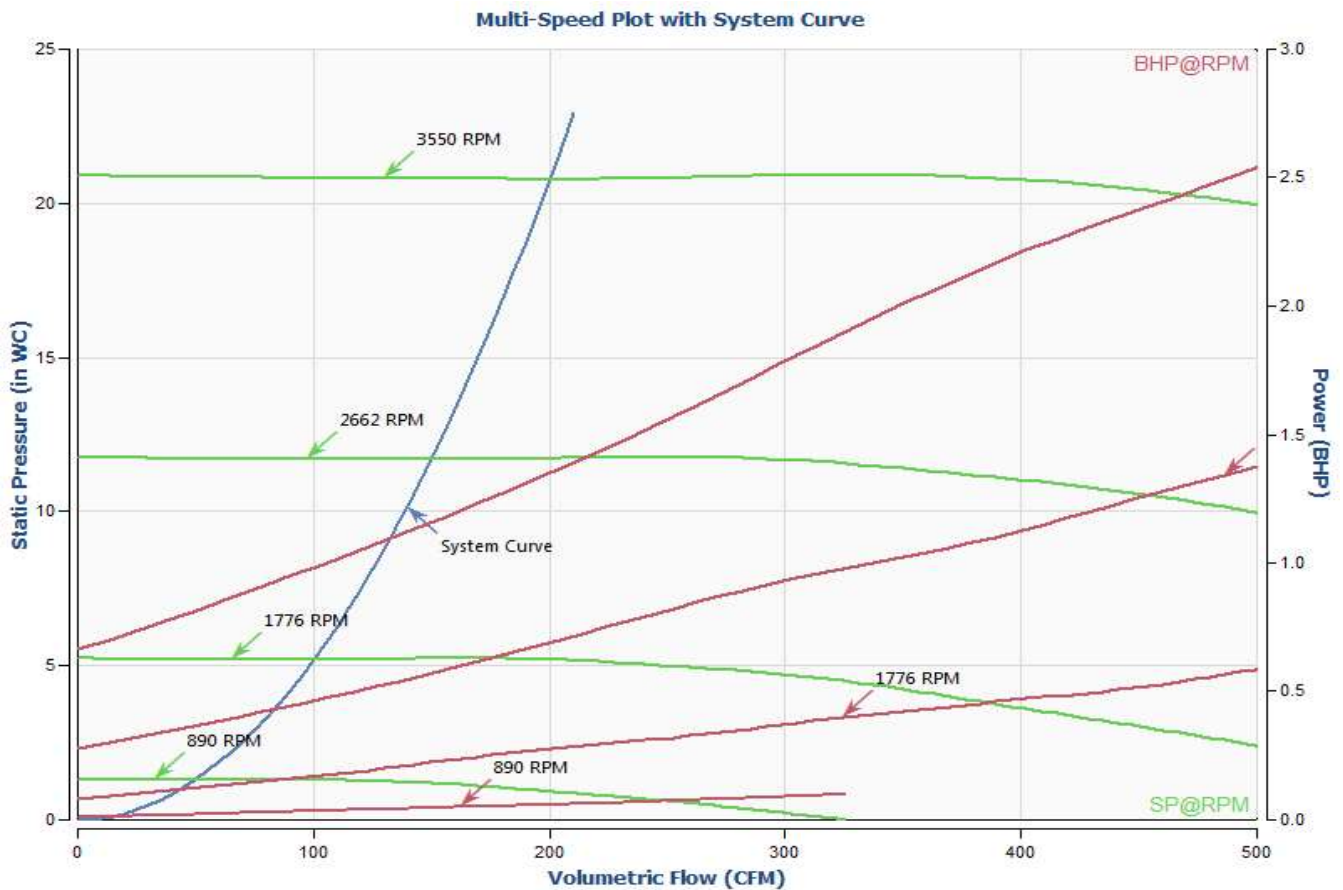
Customer: SCS Engineers
 Job ID: SCS0311191-A
 Date: March 15, 2019

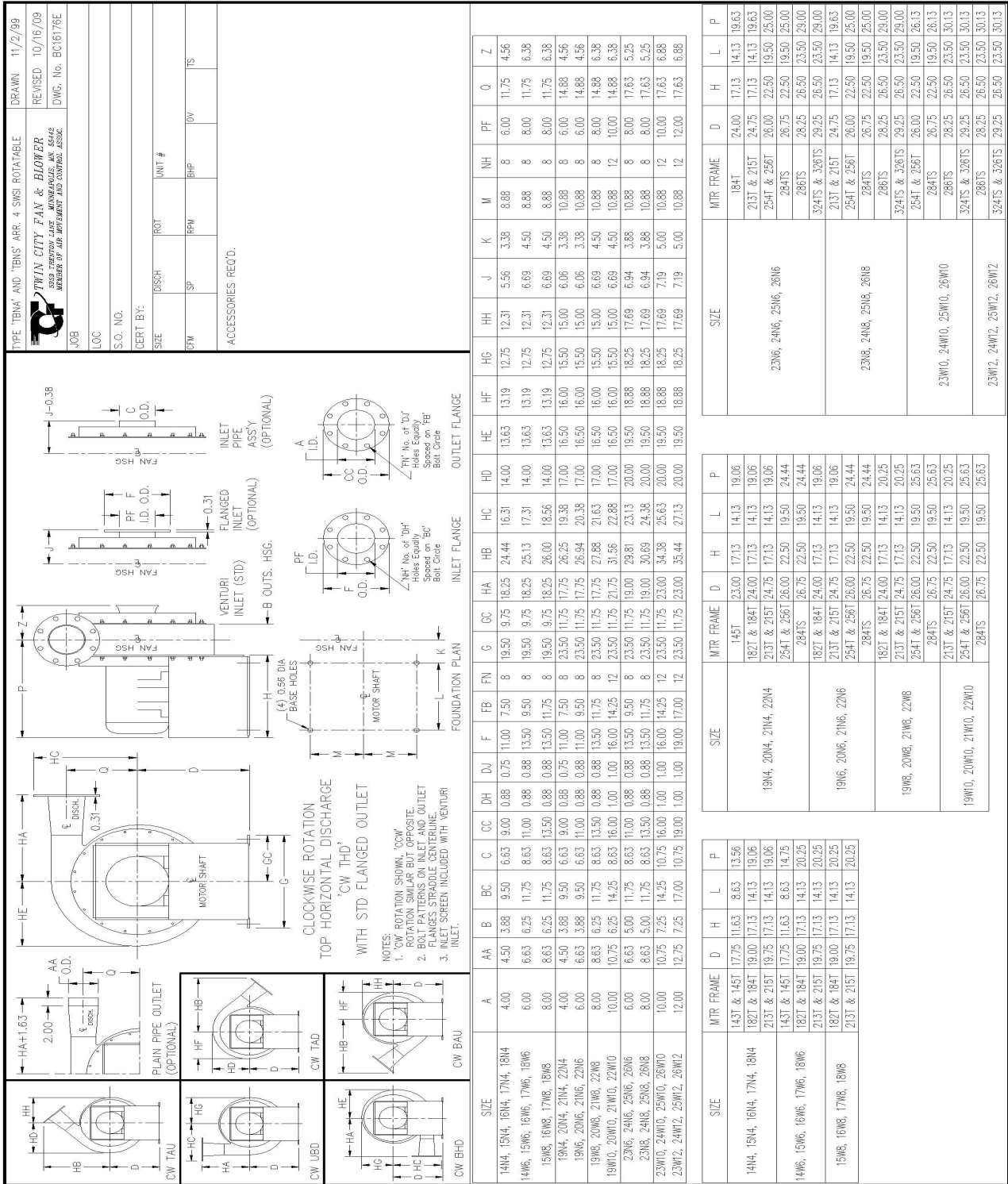
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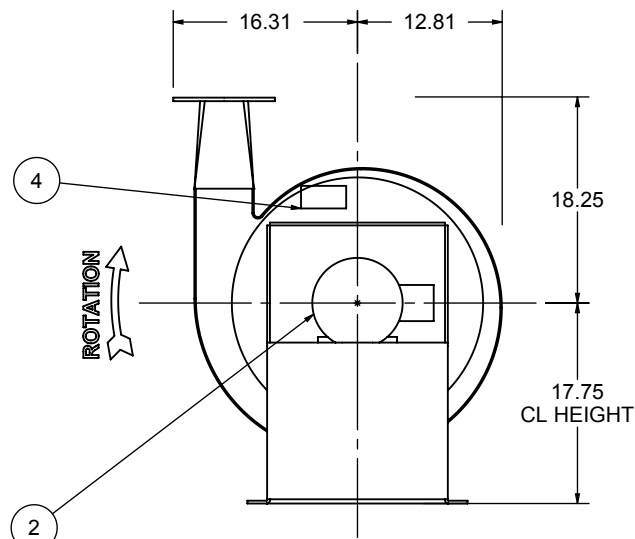
Fan information

Size/Model	16N4/TBNA	Class	HP	Outlet Vel (FPM)	2291
Volumetric Flow (CFM)	200	Speed (RPM)	3550	Density (lb/ft ³)	0.0741
SP (in WC)	20.78	Max Speed . .	4,000 RPM @ 50 °F		
		Power (BHP)	1.35		

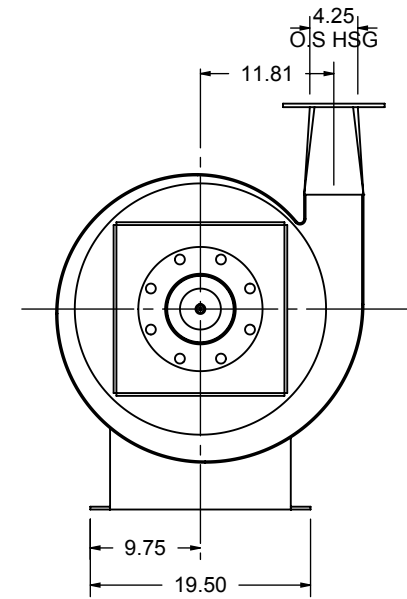
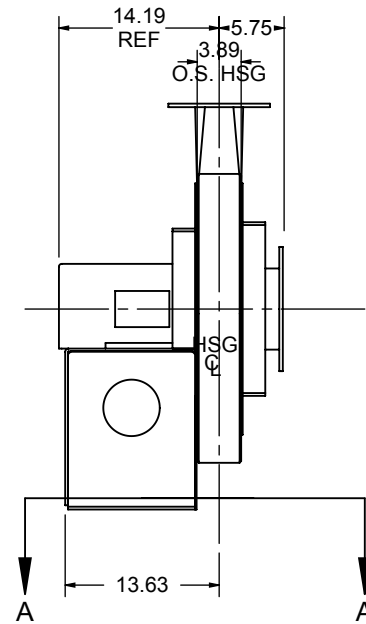
Adjusted for Apply Compressibility, Op temp: 50°F, Design temp: 50°F, Inlet Pres: -20 WC



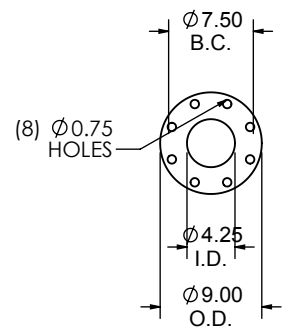
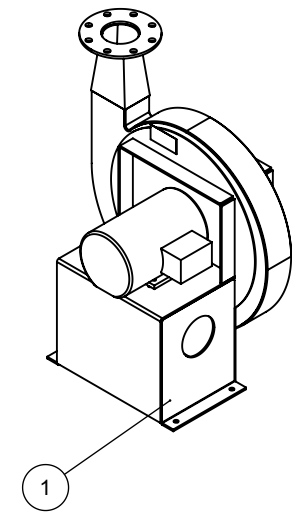




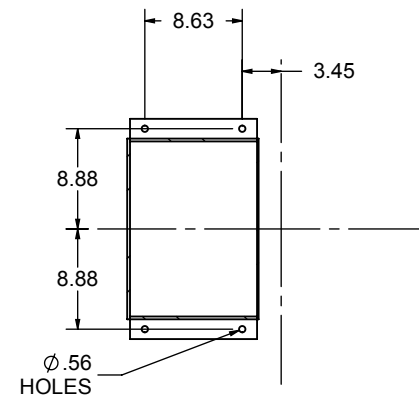
DRIVE SIDE VIEW



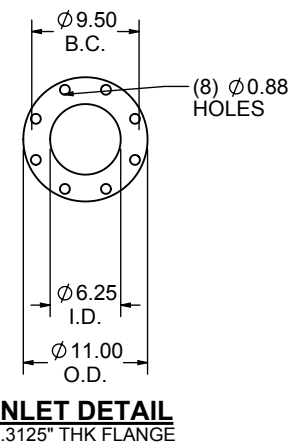
INLET SIDE VIEW



OUTLET FLANGE DETAIL



FOUNDATION PLAN - TOP VIEW SECTION A-A



INLET DETAIL
0.3125" THK FLANGE

- ACCESSORIES:
- A. VIBRATION ISOLATORS - RIS RAILS
 - B. FLANGE - OUTLET, PUNCHED
 - C. FLANGE - INLET, PUNCHED
 - D. DAMPER - OUTLET VOLUME CONTROL - BUILT IN
 - E. NAMEPLATE - STAINLESS STEEL
 - F. DRAIN W/ PLUG
 - G. SHAFT CLOSURE PLATE
 - H. OUTLET SILENCER - 4" DIAMETER

* REFER TO [HTTP://WWW.TCF.COM/RESOURCES/INSTALLATION-MAINTENANCE-MANUALS](http://www.tcf.com/resources/installation-maintenance-manuals) FOR INSTALLATION AND MAINTENANCE DOCUMENTS.

* THE DESIGN SHOWN ON THIS DRAWING IS THE EXCLUSIVE PROPERTY OF TWIN CITY FAN COMPANIES, LTD. IT IS NOT TO BE USED FOR ANY PURPOSE OR ITS CONTENTS DISCLOSED WITHOUT OUR WRITTEN CONSENT.

ITEM	DESCRIPTION	QTY	NOTES
4	ROTATION LABEL	1	
3	WHEEL	1	
2	MOTOR	1	2 HP, 3600 RPM, 3/60/230/460V, TEFC, 145T, FURN. & MTD BY TCF
1	FAN WLDMT/ASSY	1	

JOB AND LOCATION	
CUSTOMER NAME	SCS ENGINEERS
JOB NAME	SCS0311191
JOB ID	SCS0311191
S.O. NUMBER	GA259105
TAG UNIT	SCS03-1

PERFORMANCE "A"	
TEMP.	50°F
ELEVATION	0 FT
DENSITY	0.074
C.F.M.	200
S.P.	20
R.P.M.	3483
B.H.P.	1.29
T.S.	15045
O.V.	2291
SCALE	1:17

REV	REV BY	REV DATE	APP BY	APP DATE	DESCRIPTION
-	-	-	-	-	-

Fans & Blowers
Twin City

5959 Trenton Lane N | Minneapolis, MN 55442
ISO-9001:Registered

TITLE		ROW	ITEM	SHEET	REV.
SIZE 16N4, TYPE TBNA, CL HP, CW, UBD					
ARR-4, ROT					
DRAWING NO. GA259105		000	00	1 OF 1	
GA259105					



DATE
Sept. 8, 2005
CAT. #: EPO022

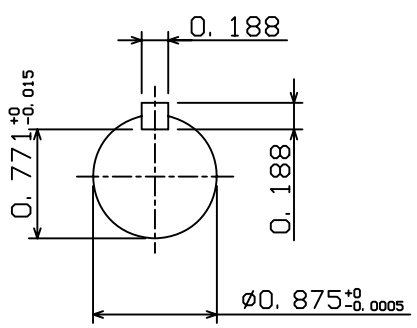
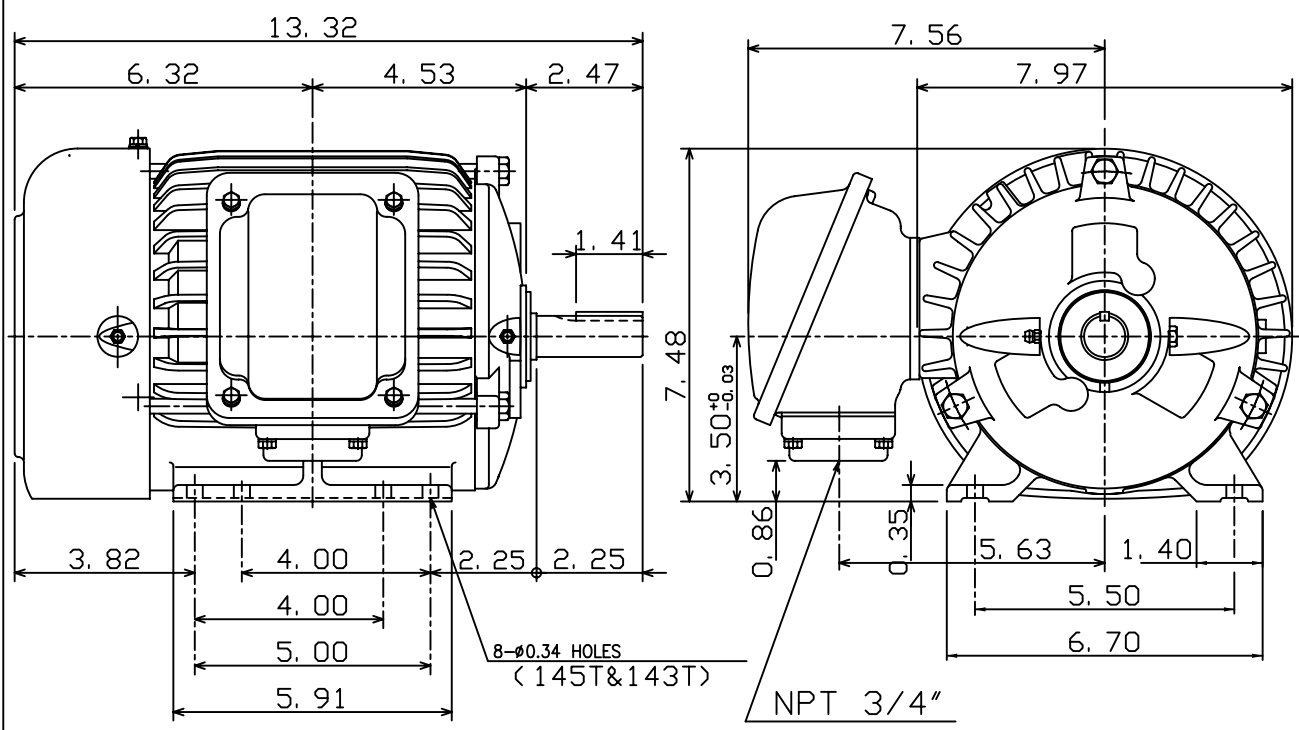
OUTLINE DIMENSIONS
3-PHASE INDUCTION MOTOR

MOTOR TYPE:
AEHH8N
FRAME NO. 145T

Pole	HP	kW	Hz	VOLT	Syn. Speed r/min(rpm)
2	2	1.5	60	230/460	3600

Ins	Rating	Dimension in	Approx Weight	Bearings
F	CONT.	inches	59 lbs.	DE: 6205ZZ NDE: 6205ZZ

Totally Enclosed Fan-Cooled Type. Squirrel-Cage Rotor.



◇		
---	--	--

DWN.	C. S. LO	12-22-04
CHKD.	C. S. LO	12-27-04
APPD.	M. C. TSAI	12-27-04



DWG NO.
31057H352080

TECO Westinghouse

ISSUED 8/15/2014	PERFORMANCE DATA 3-PHASE INDUCTION MOTOR	ENCLOSURE TEFC
TYPE AEHH8N		CATALOG# EP0022

NAMEPLATE INFORMATION

OUTPUT		POLE	FRAME SIZE	VOLTAGE	HZ	RATED AMBIENT	INS. CLASS	NEMA DESIGN	TIME RATING	SERVICE FACTOR
HP	KW									
2	1.5	2	145T	230/460	60	40°C	F	B	CONT.	1.15

VARIABLE FREQUENCY DRIVE SERVICE

VARIABLE TORQUE				OHMS/PHASE EQUIVALENT WYE CIRCUIT (AT RATED OPERATING TEMPERATURE 25°C)				
HZ	HP	RPM	TORQUE (lb-ft)	R1	R2	X1	X2	X _m
3~60	0.0003~2	180~3600	0.009~3.031	3.6032	4.4722	6.1885	8.3917	260.73

CONSTANT TORQUE				CONSTANT HORSEPOWER			
HZ	HP	RPM	TORQUE (lb-ft)	HZ	HP	RPM	TORQUE (lb-ft)
6~60	.2~2	360~3600	3.031	60~120	2	3600~7200	3.031~1.516

TYPICAL PERFORMANCE

FULL LOAD RPM	EFFICIENCY				POWER FACTOR			SOUND PRESSURE LEVEL @ 3 FT Db(A)
	FULL LOAD		3/4 LOAD %	1/2 LOAD %	FULL LOAD %	3/4 LOAD %	1/2 LOAD %	
	MIN.%	NOM.%						
3465	84	86.5	86.5	85.5	86	80.5	70	61

CURRENTS									NEMA KVA CODE LETTER	SAFE STALL TIME IN SECONDS	
NO LOAD			FULL LOAD			LOCKED ROTOR				COLD	HOT
AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT	AT 208 VOLT	AT 230 VOLT	AT 460 VOLT			
1.74	2.00	1	5.56	5.03	2.52	45.2	50.0	25	L	17	12

TORQUE				INERTIA			ACCEL TIME (DOL)		ALLOWABLE STARTS PER HOUR	
FULL LOAD (lb-ft)	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	ROTOR WR ² (lb-ft ²)	NEMA LOAD WK ² (lb-ft ²)	MAX ALLOWABLE WK ² (lb-ft ²)	NEMA LOAD WK ² Sec	MAX ALLOWABLE WK ² Sec	COLD	HOT
3.03	350	315	390	0.064	2.4	6.5	2.79	7.42	2	1

APPROVED:	M. PRATER	DRAWING NO.	31057EP0022	REVISION:	1
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DATE:
June 17, 2005

CONNECTION DIAGRAM

CATALOG NO.:
EP0022



SCHEMATIC - 2Y/Y CONNECTION

ACROSS THE LINE CONNECTION



**LINE
230 VOLT CONNECTION**



**LINE
460 VOLT CONNECTION**



INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR THREE PHASE INDUCTION MOTORS

Frames 143T - 449TZ



5100 North IH 35 Round Rock, Texas 78681

RECEIVING

1. Check nameplate data.
2. Check whether any damage has occurred during transportation.
3. After removal of shaft clamp, turn shaft by hand to check that it turns freely.
4. If motor is to be reshipped (alone or installed to another piece of equipment) the shaft must again be clamped to prevent axial movement.

Note: Remove the bearing clamp before turning the shaft on 284T-449TZ frame motors.

WARNING

THE FOLLOWING SAFETY PRECAUTIONS MUST BE OBSERVED:

1. Electric rotating machinery and high voltage can cause serious or fatal injury if improperly installed, operated or maintained. Responsible personnel should be familiarized with NEMA MG-1; Safety Standards for Construction and Guide Selection. Installation and Use of Electric Motors and Generators; National Electric Code and all local safety requirements.
2. When servicing, all power sources to the motor and to the accessory devices should be de-energized and disconnected and all rotating parts should be at standstill.
3. Lifting means, when supplied, are intended for lifting the motor only. When two lifting devices are supplied with the motor a dual chain must be used.
4. Suitable protection must be used when working near machinery with high noise levels.
5. Safeguard or protective devices must not be by-passed or rendered inoperative.
6. The frame of this machine must be grounded in accordance with the National Electric Code and applicable local codes.
7. A suitable enclosure should be provided to prevent access to the motor by other than authorized personnel. Extra caution should be observed around motors that are automatically or have automatic re-setting relays as they may restart unexpectedly.
8. Shaft key must be fully captive or removed before motor is started.
9. Provide proper safeguards for personnel against possible failure of motor-mounted brake, particularly on applications involving overhauling loads.
10. Explosion proof motors are constructed to comply with the label service procedure manual, repair of these motors must be made by TECO-Westinghouse Motor Company or U/L listed service center in order to maintain U/L listing.

LOCATION

1. Drip-proof motors are intended for use where atmosphere is relatively clean, dry, well ventilated and non-corrosive.
2. Totally enclosed motors may be installed where dirt, moisture, or dust are present and in outdoor locations.
3. Explosion-proof motors are built for use in hazardous locations as indicated by Underwriters' label on the motor.
4. Chemical duty enclosed motors are designed for installation in high corrosion or excessive moisture locations.

Note: in all cases, no surrounding structure should obstruct normal flow or ventilating air through or over the motor.

MOUNTING

1. Mount motor securely on a firm, flat base. All ball bearing normal thrust motors up to and including 256T frame size may be side-wall or ceiling mounted; all others check nearest TECO-Westinghouse office for mounting recommendations.
2. Align motor accurately, using a flexible coupling if possible. For drive recommendations, consult with drive or equipment manufacturer, or TECO-Westinghouse.
3. Mounting bolts must be carefully tightened to prevent changes in alignment and possible damage to the equipment. The recommended tightening torque's for medium carbon steel bolts, identified by three radial lines at 120 degrees on the head, are:

Bolt Size	Recommended Torque (Ft-lb.)	
	Minimum	Maximum
2/8	25	37
1/2	60	90
5/8	120	180
3/4	210	320

4. V-belts Sheave Pitch Diameters should not be less than those shown in Table 1 (NEMA recommended values)
5. Tighten belts only enough to prevent slippage. Belt speed should not exceed 5000 ft. per min.

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number					V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	Horsepower at				Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
	Synchronous Speed, RPM							
3600	1800	1200	900					
143T	1.5	1	.75	.5	2.2	4.25	2.2	2.25
145T	2-3	1.5-2	1	.75	2.4	4.25	2.4	2.25
182T	3	3	1.5	1	2.4	5.25	2.4	2.75
182T	5	...	...	...	2.6	5.25	2.4	2.75
184T	...	...	2	1.5	2.4	5.25	2.4	2.75
184T	5	...	...	...	2.6	5.25	2.4	2.75
184T	7.5	5	...	...	3.0	5.25	3.0	2.75
213T	7.5-10	7.5	3	2	3.0	6.5	3.0	3.375
215T	10	...	5	3	3.0	6.5	3.0	3.375
215T	15	10	...	...	3.8	6.5	3.8	3.375
254T	15	...	7.5	5	3.8	7.75	3.8	4
254T	20	15	...	...	4.4	7.75	4.4	4
256T	20-25	...	10	7.5	4.4	7.75	4.4	4
256T	...	20	...	...	4.6	7.75	4.4	4
284T	...	...	15	10	4.6	9	4.4	4.625
284T	...	25	...	...	5.0	9	4.4	4.625
286T	...	30	20	15	5.4	9	5.2	4.625

TABLE 1. V-Belt Sheave Pitch Diameters (MG1-14.42)

Frame Number					V-Belt Sheave			
					Conventional A, B, C, D AND E		Narrow 3V, 5V, AND 8V	
	Horsepower at				Minimum Pitch Diameter Inches	*Maximum Width Inches	Minimum Outside Diameter Inches	**Maximum Width Inches
	Synchronous Speed, RPM							
3600	1800	1200	900					
324T	...	40	25	20	6.0	10.25	6.0	5.25
326T	...	50	30	25	6.8	10.25	6.8	5.25
364T	40	30	6.8	11.5	6.8	5
364T	...	60	...	...	7.4	11.5	7.4	5.785
365T	50	40	8.2	11.5	8.2	5.785
365T	...	75	...	...	9.0	11.5	8.6	5.785
404T	60	...	9.0	14.25	8.0	7.25
404T	50	9.0	14.25	8.4	7.25
404T	...	100	...	...	10.0	14.25	8.6	7.25
405T	75	60	10.0	14.25	10.0	7.25
405T	...	100	...	...	10.0	14.25	8.6	7.25
405T	...	125	...	...	11.5	14.25	10.5	7.25
444T	100	...	11.0	16.75	10.0	8.5
444T	75	10.5	16.75	9.5	8.5
444T	...	125	...	...	11.0	16.75	9.5	8.5
444T	...	150	...	...	...	16.75	10.5	8.5
445T	125	...	12.5	16.75	12.0	8.5
445T	100	12.5	16.75	12.0	8.5
445T	...	150	...	...	...	16.75	10.5	8.5

*Max. Sheave width = $2(N-W) - .25$

**Max Sheave width = $N-W$

***Sheave ratios greater than 5:1 and center-to-center distance less than the diameter of the large sheave should be referred to TECO-Westinghouse.

POWER SUPPLY & CONNECTIONS

1. Wiring of motor and control, overload protection and grounding should be in accordance with National Electrical Code and all local safety requirements.
2. Nameplate voltage and frequency should agree with power supply. Motor will operate satisfactorily on line voltage within $\pm 10\%$ of nameplate voltage; or frequency with $\pm 5\%$ and with a combined variation not to exceed $\pm 10\%$. 230-volt motors can be used on 208-volt network systems, but with slightly modified performance characteristics as shown on the nameplate.
3. Dual voltage and single voltage motors can be connected for the desired voltage by following connection diagram shown on the nameplate or inside of the conduit box.
4. All Explosion Proof motors have Temperature Limiting Devices in the motor enclosure to prevent excessive external surface temperature of the motor in accordance with U/L standards. Terminals of thermal protectors (P1 & P2) should be connected to the motor control equipment, according to the connection diagram inside of the conduit box.
5. Standard connection diagram for three phase, not thermally protected, dual rotation motors are shown in diagrams A through E. **(Note: To change rotation, Interchange any two line leads)**

A. 3 Lead, Single Voltage



B. 6 Lead, Dual Voltage & Voltage Ratio 1 to 3

B-1 Across the Line Start & Run



B-2 Wye Start & Delta Run (Low Voltage only)



C. 9 Leads; Dual Voltage & Voltage Ratio 1 to 2, Wye Connected

C-1 Across the Line Start & Run



C-2 Part Winding Start (Low Voltage only)



D. 9 Leads; Dual Voltage & Voltage Ration 1 to 2, Delta Connected

D-1 Across the Line Start & Run



D-2 Part Winding Start (Low Voltage only)



E. 12 Leads, Dual Voltage

E-1 Across the Line Start & Run



E-2-1 Wye Start & Delta Run (Low Voltage only)



E-2-2 Wye Start & Delta Run (High Voltage only)



E-3 Part Winding Start (Low Voltage only)



*Important: For Part Winding Start, M2 contactor should be closed within two (2) seconds after M1 contactor is closed.
Only 4 pole and above (e.g., 6P, 8P...) motors are satisfactory for Part Winding Start at low voltage.

START UP

1. Disconnect load and start motor. Check direction of rotation. If rotation must be changed, ALLOW THE MOTOR TO STOP COMPLETELY. Interchange any two leads of a three-phase motor.
2. Connect load. The motor should start quickly and run smoothly. If no, shut power off at once. Recheck the assembly including all connections before restarting.
3. If excessive vibration is noted, check for loose mounting bolts too flexible motor support structure or transmitted vibration from adjacent machinery. Periodic vibration checks should be made; foundations often settle.
4. Operate under load for short period of time and check operating current against nameplate.

TESTING

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megometer. Depending on the length and conditions of storage it may be necessary to regrease or change rusted bearings.

If the resistance is lower than one megohm the windings should be dried in one of the following two ways:

1. Bake in oven at temperatures not exceeding 194°F until insulation resistance becomes constant.
2. With rotor locked, apply low voltage and gradually increase the current through windings until temperature measured with a thermometer reaches 194°F. Do not exceed this temperature.

MAINTENANCE

INSPECTION

Inspect motor at regular intervals. Keep motor clean and ventilation openings clear.

LUBRICATION

1. Frame 143T-256T: Double shielded and pre-lubricated ball-bearing motors without grease fittings and don't need re-lubrication, except on MAX-E1[®] and MAX-E2[®] products which have re-greasable features.
2. Frames 280TS, 320-449TZ(TS): Motors having grease fittings and grease discharge devices at brackets. Motors are shipped with grease for initial running. It is necessary to re-lubricate anti-friction bearing motors periodically, depending on size and type of service. See Table 2 to provide maximum bearing life. Excessive or too frequent lubrication may damage the motor.

TABLE 2

Horsepower	Standard Conditions	Severe Conditions	Extreme Conditions
1 Thru 30 Hp, 1800 rpm and below	7 years	3 years	180 days
40 Thru 75 Hp, 1800 rpm and below	210 days	70 days	30 days
100 Thru 150 Hp, 1800 rpm and below	90 days	30 days	15 days
1 Thru 20 Hp, 3600 rpm	5 years	2 years	90 days
25 Thru 75 Hp, 3600 rpm	180 days	60 days	30 days
100 Thru 150 Hp, 3600 rpm	90 days	30 days	15 days

Note:

- A. Standard conditions: 8 hours operation per day, normal or light loading, clear and 40°C ambient conditions.
 - B. Severe conditions: 24-hour operation per day or light shock loading, vibration or in dirty or dusty conditions.
 - C. Extreme conditions: With heavy shock loading or vibration or dusty conditions.
 - D. For double shielded bearings, above data (lubrication frequency) means that the bearing must be replaced.
3. Be sure fittings are clean and free from dirt. Using a low-pressure grease gun, pump in the recommended grease until new grease appears at grease discharge hole.
 4. Use the POLYUREA grease unless special grease is specified on the nameplate.
 5. If re-lubrication is to be performed with the motor running, stay clear of rotating parts. After re-greasing, allow the motor to run for ten to thirty minutes.

RENEWAL PARTS

1. Use only genuine TECO-Westinghouse renewal parts or as recommended by TECO-Westinghouse Motor Company.
2. When you order renewal parts please specify complete information to TECO-Westinghouse office/agent such as type, frame no., poles, horsepower, voltage, series no., quantity, etc.

**FOR FURTHER INFORMATION PLEASE CONTACT
TECO-WESTINGHOUSE MOTOR COMPANY**

Round Rock, TX

800-873-8326



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Introduction

The purpose of this manual is to provide instructions that complement good general practices when installing or operating fans manufactured by Twin City Fan & Blower. It is the responsibility of the purchaser to provide qualified personnel experienced in the installation, operation, and maintenance of air moving equipment.

Instructions given in the body of this manual are general in nature and apply to a variety of models manufactured by Twin City Fan & Blower. Most units can be installed and maintained with the instructions given.

Special applications may require additional information. These instructions are supplied in the form of attached appendices. Use the instructions in the appendix if the directions in this manual differ from instructions in the appendix.

As always, follow good safety practices when installing, maintaining and operating your air moving equipment. A variety of safety devices is available. It is the user's responsibility to determine adequate safety measures and to obtain the required safety equipment.

Shipping and Receiving

All Twin City Fan & Blower products are carefully constructed and inspected before shipment to insure the highest standards of quality and performance.

Compare all components with the bill of lading or packing list to verify that the proper unit was received.

Check each unit for any damage that may have occurred in transit. Any damage should be reported immediately to the carrier and the necessary damage report filed.

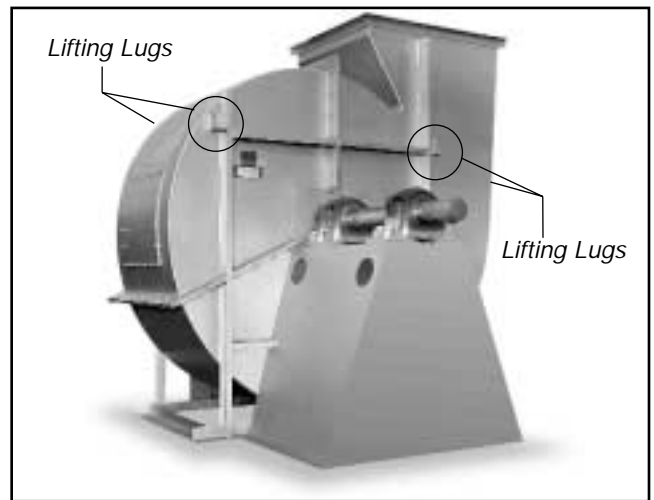
Handling

Handling of all air moving equipment should be conducted by trained personnel and be consistent with safe handling practices. Verify the lift capacity and operating condition of handling equipment. Maintain handling equipment to avoid serious personal injury.

Units shipped completely assembled may be lifted with slings and spreader bars. Use well-padded chains, cables or nylon straps. On most units, lifting lugs are provided for attaching chains (see Figure 1). Lift the fan in a fashion that protects the fan and fan coating from damage. Never lift a fan by the inlet or discharge flange, shafting or drives, wheel or impeller, motor or motor base, or in any other manner that may bend or distort parts.

Partial or disassembled units require special handling. All parts should be handled in a fashion which protects the coatings and parts from damage. Components should be handled such that forces are not concentrated and bending or distortion cannot occur.

Figure 1. Lifting Lug Locations

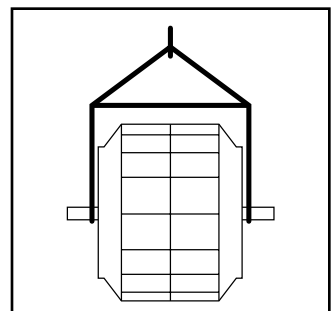


Housings should be lifted using straps and spreaders. Do not distort housing or side plates when lifting.

Bearing pedestals should be lifted using straps or padded chains. Under no circumstances should an attached or separated bearing pedestal be lifted by the shaft, bearings, drives, motor or wheel.

The shaft and wheel assembly may be lifted using a hoist and a spreader with a sling around the shaft at points nearest the wheel (see Figure 2). Take care not to scratch the shaft where the wheel or bearings will be mounted. Never lift or support the assembly by the wheel. Always support the assembly by the shaft when lifting or storing. Do not sup-

Figure 2. Moving Shaft and Wheel with Spreader Bar



port the shaft or the wheel on housing sides. Use only the key provided with the shaft and wheel.

Wheels shipped separately can be lifted by slings running through the blades and around the hub. Never lift the wheel by blades or flanges. Always transport wheels by lifting. Do not roll the wheel as this can damage coatings and change the balance of the wheel.

Bent shafting is a source of vibration and bearing failure, so handle the shaft with care. Any scratches on the shaft may be removed with fine emery cloth or a stone.

Short Term Storage

If fan installation is to be delayed, store the unit in a protected area. Protect the fan and motor bearings from moisture and vibration (or shock loading).

Long Term Storage

Prior to Storage — Fan bearings (and motor bearings per the motor manufacturer's specifications) are to be greased at the beginning of extended storage. On belt driven units the belt tension should be reduced to less than half the specified value for the fan's design to prevent a sag/set from forming in the shafts and belts. If the unit was supplied with a motor the motor windings should be meggered at this time and recorded for comparison prior to placing in service. If the fan housing was supplied with a drain connection, this plug should be removed to prevent moisture from accumulating in this portion of the unit during storage.

Storage — Fans should be stored indoors whenever possible where control over temperature, shock and dust is reasonably maintained. If the unit is to be stored outside in the elements, it should be covered with a water resistant material. The bearings should be shielded individually from water and dirt; however, do not tightly seal them to avoid trapping condensation. Stored equipment should be housed on a clean, dry floor or blocked up off the ground to prevent units from sitting in any water or on the ground. If shock or vibration will be present during storage the unit may need to be placed on some type of vibration dampening material to aid in preventing brinelling of the bearing surfaces.

Periodic Check — On a monthly interval the equipment should be checked to ensure that it has remained in an acceptable stored condition. The fan (and motor if supplied) should be rotated several times while adding enough grease to replenish the bearing surfaces with fresh grease or to maintain a full bearing cavity. Grease used must be compatible with that already supplied in the motor and fan bearings. The fan impeller should be left at approximately 180 degrees from that of the previous month to prevent the shaft and impeller from taking a set in one position. Storage records should be maintained which indicate the above requirements have been followed. Consult the motor manufacturer for proper storage, space heater connection and lubrication if the unit was supplied with one.

Startup — When the unit is removed from storage all the bearing grease should be purged and replenished with fresh grease per lubrication decal. The motor should be meggered to verify that the resistance is still at a satisfactory level compared to the value recorded prior to storage.

Foundations and Supporting Structures

Floor mounted fans should be installed on a flat, level, rigid concrete foundation with a mass at least three times that of the assembly supported. The plan area should be no more than twice that required by the equipment. Foundations with larger areas should have correspondingly larger mass. Anchor bolts should be "L" or "T" shaped with sufficient length for nuts, washers, shims, and threads for draw-down.

Each bolt should be placed in a sleeve or pipe with a diameter larger than the bolt to allow for adjustment.

Fans mounted to or within a structure should be placed as close as possible to a rigid member such as a wall or column. The structure must be designed for rotating equipment; static design for strength is not sufficient to insure proper operation. Supports for suspended fans must be cross-braced to prevent side sway. Structural resonance should be at least 20% from fan operating speed. Vibration isolators should be used where applicable.

Any ducting should have independent support; do not use the fan to support ducting. Isolating the fan from ductwork with flex connections eliminates transmission of vibration. Fans handling hot gases require expansion joints at both the inlet and discharge to prevent excessive loads caused by thermal growth.

Fan Installation, Factory Assembled Units

Follow proper handling instructions given earlier.

1. Move the fan to the final mounting position.
2. Remove skid, crates, and packing materials carefully.
3. If supplied, place vibration pads or isolation base on mounting bolts. Line up holes in fan base with bolts.
4. Place fan on mounting structure. Carefully level unit using shims as required at all mounting hole locations. Bolt down the unit.
5. Any grout may now be used. Bolt the fan in position before applying grout. Do not depend upon grout to support rotating equipment.
6. Continue with Operations Checklist.

Additional instructions may be given for some fan models, components and accessories in the appendix.

Fan Installation – Disassembled Units

A unit is considered "disassembled" if any component required for proper operation is shipped or supplied separately or in pieces. Reference earlier instructions concerning proper handling of fan components.

Instructions for Mounting and Assembly of Unit:

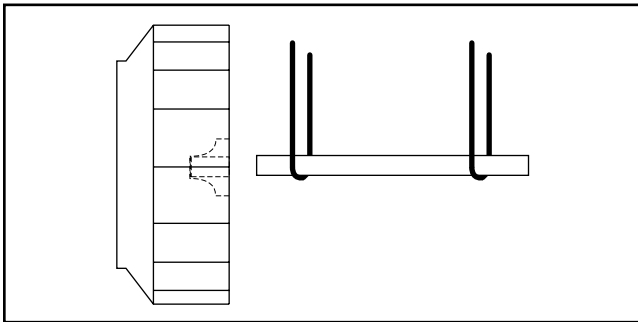
1. Move lower housing/framework to mounting location.
2. If vibration pads or bases are used, place on bolts first. Place lower housing assembly onto bolts.
3. Level and shim if required. Bolt into place.
4. If separated pedestal or bearing pedestal:
 - a. Bring bearing pedestal to desired location.
 - b. Place any vibration base or pads into place. Set bearing pedestal on bolts.
 - c. Never distort bearing pedestal by forcing it to align with a non-level surface. Shim beneath the pedestals as required.
 - d. Check bearing centerline height. Change centerline height to match centerline height of housing. High temperature units may require the housing centerline to be lower when cold so that it will be centered when hot.
 - e. Measure from housing to bearing pedestal to bring bearing pedestal into square with housing (a large square may also suffice).
 - f. Bolt into position.
5. Shaft and wheel assembly preparation:
 - a. Clean protective coating off shaft with solvent. Do

not touch clean areas of shaft with hands. Perspiration can cause rust or pitting over time.

- b. Remove keys from shaft.
 - c. Clean inside of wheel bore with solvent. Make sure set screws will not interfere when inserting shaft into wheel bore.
6. Arrangement 1, 9 or 10: Drive Component Assembly (See Figure 3):
- a. Insert shaft into wheel from back side of wheel.
 - b. When shaft is flush with wheel hub, put key into key-way and tighten wheel set screws.
 - c. Insert shaft through opening in drive side. (If split housed unit, lower into position.)
 - d. Install bearings onto shaft. Do not tighten bearing set screws at this time. The bearing housing should be perpendicular and the bearing base parallel to the axis of the shaft to prevent loads caused by misalignment.
 - e. Mount assembly, bolt bearings to drive stand. Shaft must be parallel with side of bearing pedestal. After aligning and bolting bearings to pedestal, tighten bearing set screws. Continue with step 8.

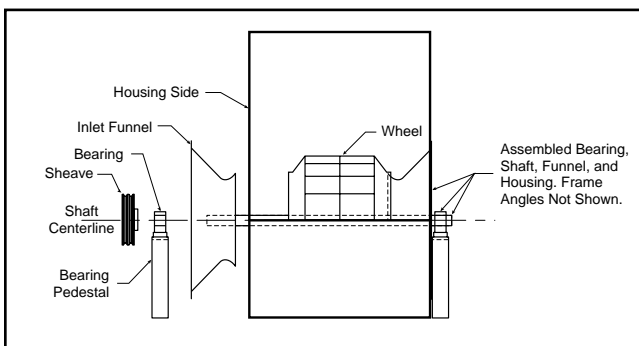
7. Arrangement 3 (Split-housed) units (See Figure 4):

Figure 3. Drive Component Assembly



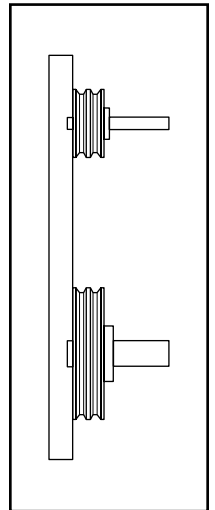
- a. Parts on DWDI units are assembled in the following order as viewed from opposite drive side: Bearing bar assembly and opposite bearing, funnel, (housing side), wheel, (housing side), funnel, drive side bearing bar assembly, drive bearing and sheaves. Mount bearing bar assembly to housing. Center wheel in funnels.
- b. Parts on SWSI are assembled in the following order as viewed from opposite drive side: Bearing bar assembly and opposite bearing, funnel, (housing side), wheel, (housing side), drive side bearing bar assembly, drive bearing and sheaves. Mount bearing bar assembly to housing. (See Figure 6 for wheel-funnel overlap.)
- c. Assemble parts in above order on shaft.

Figure 4. Split-housed Drive Component Assembly



- d. Move assembly into position. Lightly bolt bearings into place.
 - e. Shaft should be parallel with discharge of housing. Move bearings to accommodate.
 - f. Level shaft; shim bearings if required. Tighten bearing set screws.
8. Install motor on base. Carefully align shafts for drive installation.
9. Mount drives as follows:
- a. Slip (do not pound) proper sheave onto corresponding shaft as close as possible to bearing. CAUTION: PLACING FAN SHEAVE ON MOTOR CAN OVERSPEED WHEEL AND CAUSE STRUCTURAL FAILURE.
 - b. Align sheaves with a straightedge extended along perimeters of both sheaves, just making contact in two places on outside the perimeters of both sheaves (see Figure 5).
 - c. Tighten down sheave bolts.
 - d. Install a matched set of belts. Slide the motor to obtain slack and tighten belts. Using a pry will damage belts.
 - e. Tighten belts to proper belt tension. Ideal tension is just enough tension so that belts do not slip under peak load. Recheck sheave alignment.
 - f. After initial installation of belts, recheck belt tension again after a few days to adjust belt tension. (New belts require a break-in period of operation.)

Figure 5. Sheave Alignment



10. Install any safety devices or accessories supplied. (Accessories commonly used are inlet vanes, shaft seals and shaft coolers, plugs, dampers, and inlet or discharge screens. Refer to appropriate documents in appendix.)
11. Grout may now be applied. Grout is used to distribute loads and should not be used as the sole support of any rotating equipment.
12. When connecting the fan to the system, it is recommended that the inlet and discharge be isolated from the system with flex connections (where practical) to block transmitted vibration. All duct connections to the fan should be independently supported. Do not use fan to support duct.

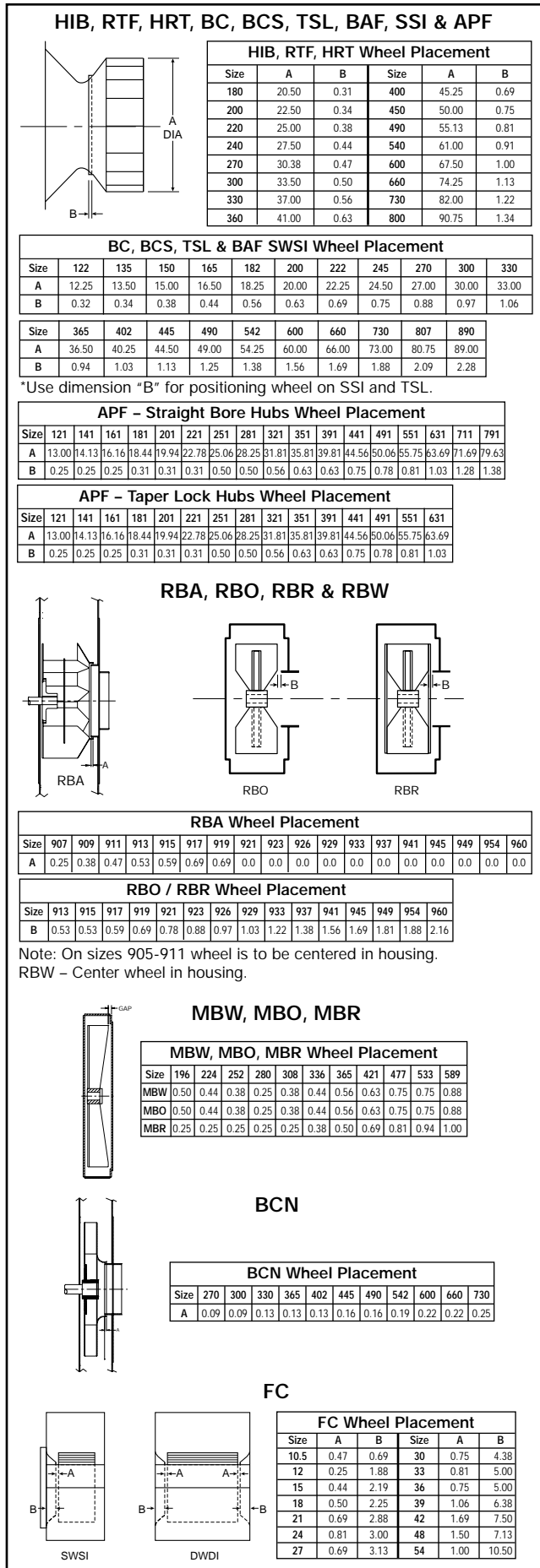
Fan Operation - Safety

For general safety practices for air moving equipment, see AMCA Bulletin 410.

Twin City Fan & Blower has many safety accessories available. These safety devices include (but are not limited to) belt guards, shaft guards, inlet and discharge screens. The use, abuse, or non-use of safety devices is the responsibility of the purchaser.

Facility-related safety conditions include fan accessibility and location. How easily can non-service personnel access the unit? Is the fan in a hazardous duty environment? Was the unit ordered for this duty? Other concerns must also be addressed. All fans should be powered through switches which are easily accessible to service personnel from the

Figure 6. Wheel-Funnel Overlap



fan. Every switch should have the ability to be "locked-off" by the service person and the key to be retained by this person to prevent accidental power of the fan while service is in process.

Operation Checklist

Verify that proper safety precautions have been followed:

- Electrical power must be locked off.

Check fan mechanism components:

- System connections are properly made and tightened.
- Bearings are properly lubricated.
- Wheel, drives and fan surfaces are clean and free of debris.
- Rotate the impeller by hand to verify it has not shifted in transit.
- Check wheel/funnel overlap. See Figure 6.
- Drives on correct shafts (not reversed).
- Check position of guards to prevent rubbing.

Check fan electrical components:

- Motor is wired for proper supply voltage.
- Motor was properly sized for power and rotational inertia of rotating assembly.
- Motor is properly grounded.
- All leads are properly insulated.

Trial "bump":

- Turn on power just long enough to start assembly rotating.
- Check rotation for agreement with rotation arrow. Does the assembly make any unusual noise? (See Figure 7)
- Check drive alignment and tension. Does this meet with drive manufacturer's recommendations?
- Correct any problems which may have been found. (Follow safety guidelines - shut power off). Perform checklist again until unit is operating properly.
- Run unit up to speed.

Verify fastener tightness. These may have loosened during shipment or installation.

- Set screws attaching wheel hub to shaft.
- Set screws in drive sheaves or coupling.
- Nuts on inlet funnel.
- Nuts and bolts holding motor.
- Nuts holding housing frame to base and base to ground.
- Nuts on accessories including shaft seal, access doors and pie-splits.
- Bolts in taper-lock bushings.
- Grease line connections.

After one week of operation, check all nuts, bolts and set screws and tighten if necessary.

Maintenance of Fans

This section contains general maintenance instructions for your Twin City Fan & Blower unit. For specific information about maintenance of components, particularly for special application fans, see the attached documents.

General Motor Maintenance

The three basic rules of motor maintenance are:

1. Keep the motor clean.
2. Keep the motor dry.
3. Keep the motor properly lubricated.

Keeping motors and windings clean is important because dirt and dust serve as thermal insulators. Heat normally dissipated by the motor is trapped causing overheating and/or premature failure. Blow dust and dirt out of windings and off the motor periodically. Use low pressure (50 psig) airstream so that winding damage does not occur. Keep the area surrounding the motor open so the air can circulate through the motor cooling fan. Follow normal maintenance.

nance schedule given below.

Motors should be kept dry to avoid electrical short circuits. Motors kept in storage for long periods of time can have moisture condense on the windings. Be certain the motor is dry before using.

Some smaller motors are lubricated for life. Motor bearing lubrication, if required, must follow a rigorous schedule. Motors less than 10 hp running about eight hours a day in a clean environment should be lubricated once every five years; motors 15 to 50 hp, every 3 years; and motors 50 to 150 hp, yearly. For motors in a dusty or dirty environment or running 24 hours a day, divide the service interval by 2. If the environment is very dirty or high temperatures exist, divide the service interval by 4. Lubrication requirements are normally attached to the motor. Do not overlubricate.

Drive Maintenance

V-belt drives need periodic inspection and occasional belt replacement. When inspecting drives, look for dirt buildup, burrs or obstructions which can cause premature belt or drive replacement. If burrs are found, use fine emery cloth or a stone to remove the burr. Be careful that dust does not enter the bearings.

Check the sheaves for wear. Excessive slippage of belts on sheaves can cause wear and vibration. Replace worn sheaves with new ones. Carefully align sheaves to avoid premature sheave failure.

Observe belts for wear. If fraying or other wear is observed to be mostly on one side of the belts, the drives may be misaligned. Reinstall the drives according to instructions given for Fan Installation of Disassembled Units, part 9. Never use belt dressing on any belts.

When replacing belts, replace the entire set. After initial replacement and tensioning, recheck belt tension after a few days to adjust belt tension again. (New belts require a break in period of operation.)

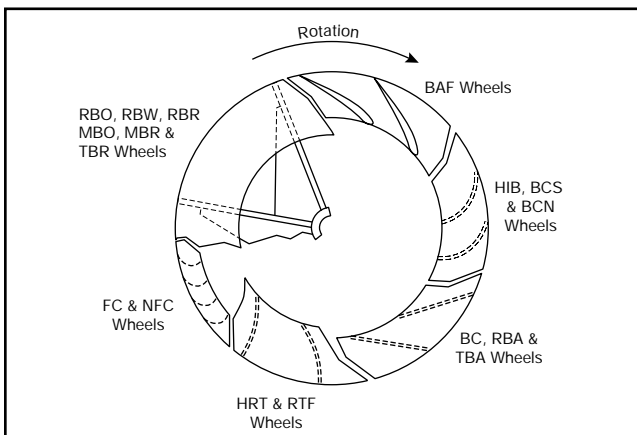
Bearing Maintenance

For instructions covering special lubrication intervals, bearing assembly or disassembly, or installation details, see attached documents. Any bearing which is disassembled should be kept separate from other bearing parts as components may not be interchangeable. Maintain cleanliness of components and bearings to prevent bearing contamination.

Bearing failure can occur from many causes. See Troubleshooting section for details.

Note: All speeds shown do not apply to all shaft sizes in that group. Consult the factory if in doubt of maximum speed for a particular bearing.

Figure 7. Proper Wheel Rotation



Lubrication

Proper lubrication of bearings helps assure maximum bearing life. All fans are equipped with decals indicating relubrication intervals for normal operating conditions. However, every installation is different and the frequency of lubrication should be established accordingly.

Figure 8. Safety & Lubrication Instructions for Fans with Ball Bearings

WARNING

1. This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
2. Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)* Ball Bearing Pillow Blocks									
Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA									
1/2" thru 1 1/16"	6	6	5	3	3	2	2	2	1
1 1/16" thru 2 7/16"	6	5	4	2	2	1	1	1	1
2 1/16" thru 2 5/16"	5	4	3	2	1	1	1		
3 7/16" thru 3 5/16"	4	3	2	1	1	1			

*Suggested initial greasing interval: Reubricate while running, if safety permits, until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required.

1. Lubricate with a high quality NLGI No. 2 or No. 3 multipurpose ball bearing grease having rust inhibitors and antioxidant additives. Some greases having these properties are:
 Shell - Alvania No. 2 Mobil - Mobilith AW2/Mobilith SHC100
 Gulf - Gulfcrown No. 2 American - Rykon Premium 2
2. Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Figure 9. Safety & Lubrication Instructions for Fans with Unit Roller Bearings

WARNING

1. This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
2. Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)* Spherical Roller Bearing - Solid Pillow Blocks									
Speed (RPM)	500	1000	1500	2000	2500	3000	3500	4000	4500
Shaft DIA									
1 3/16" thru 1 7/16"	6	4	4	2	1	1	1	1	1/2
1 1/16" thru 2 3/16"	4	2	1 1/2	1	1/2	1/2	1/2	1/2	1/2
2 7/16" thru 3 7/16"	3	1 1/2	1	1/2	1/2	1/4	1/4		
3 5/16" thru 4 1/16"	2 1/2	1	1/2	1/4					

*Suggested initial greasing interval: Relubricate while running, if safety permits, until some purging occurs at seals. Adjust lubrication frequency depending on condition of purged grease. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required.

1. Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some greases having these properties are:
 Shell - Alvania No. 2 Mobil - Mobilith AW2/Mobilith SHC100
 Texaco - Premium RB2 American - Rykon Premium 2
2. Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Experience has shown that airborne moisture and heavy dust will dramatically reduce the life of the bearing lubricant. If any of these adverse conditions exist, it is recommended that bearings be regreased after several days of operation. Lubrication intervals can then be adjusted based on the condition of the purged grease.

Figure 8 illustrates the decal for ball bearings, Figure 9 the decal for solid pillow block spherical roller bearings, and Figure 10 shows the decal for split pillow block spherical roller bearings. Observation of the condition of the grease expelled from the bearings at the time of relubrication is the best guide as to whether regreasing intervals and the amount of grease added should be altered. This observation is particularly important when bearings operate continuously over 160°F.

Greases are made with different bases. There are synthetic base greases, lithium base, sodium base, etc. Avoid mixing greases with different bases. They could be incompatible and result in rapid deterioration or breakdown of the grease.

All bearings are filled with grease before leaving the factory. When the fans are started, the bearings may discharge excess grease through the seals for a short period of time. Do not replace the initial discharge because leakage will cease when the excess grease has worked out. Sometimes the bearing has a tendency to run hotter during this period and one should not get alarmed unless it lasts over 48 hours or gets above 220°F. When relubricating, use a sufficient amount of grease to purge the seals. Rotate bearings during relubrication where good safety practice permits.

For bearings with oil lubrication, sight gauges are installed so that a proper level can be reviewed and maintained. Sight gauges should be read with bearings not rotating.

Wheel and Shaft Maintenance

Periodically inspect the shaft and wheel for dirt buildup, corrosion, and signs of excess stress or fatigue. Clean the components and, when appropriate, apply new coatings. (Any addition of coatings or weld can create an imbalance.) Check the balance of the assembly.

Structural Maintenance

All structural components or devices used to support or attach the fan to a structure should be checked at regular intervals. Vibration isolators, bolts, foundations, etc., are subject to failure from corrosion, erosion, and other causes. Improper mounting can lead to poor operation characteristics or fan fatigue and failure.

Check metallic components for corrosion, cracks, or other signs of stress. Concrete should be checked to insure the structural integrity of the foundation.

Troubleshooting Guidelines

Use current safety practices when investigating fan or system performance problems. General safe practices and performance troubleshooting guidelines can be found in AMCA Publications 410 and 202, respectively. Fan application and field measurement procedures can be found in AMCA Publications 201 and 203.

Troubleshooting Performance Problems

The lists below indicate possible areas to check when air or sound values do not match expectations. Most fan problems can be pinpointed to one of these common causes.

Air Capacity Problems:

1. Resistance of system not at design rating. If resistance is lower than expected, both airflow and horsepower may

Figure 10. Safety & Lubrication Instructions for Fans with Split Roller Bearings

WARNING

1. This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be sure remote power switches are locked off. See AMCA Publication 410 for recommended safety practices.
2. Before starting: Check all setscrews for tightness, and rotate wheel by hand to make sure it has not moved in transit.

Relubrication Schedule (Months)* Spherical Roller Bearing - Split Pillow Blocks										Grease to be added at each interval
Speed (RPM)	500	750	1000	1500	2000	2500	3000	3500	4000	
Shaft DIA										
1 ¹ / ₆ " thru 1 ¹ / ₂ "	6	4 ¹ / ₂	4	4	3 ¹ / ₂	2 ¹ / ₂	2 ¹ / ₂	1	1	0.50 oz.
2 ³ / ₁₆ " thru 2 ¹ / ₄ "	5	4 ¹ / ₂	4	2 ¹ / ₂	2 ¹ / ₂	1 ¹ / ₂	1 ¹ / ₂	1/4	1/4	0.75 oz.
2 ¹ / ₂ " thru 3 ¹ / ₁₆ "	4 ¹ / ₂	4	3 ¹ / ₂	2 ¹ / ₂	1 ¹ / ₂	1	1/2			2.00 oz.
4 ¹ / ₁₆ " thru 4 ¹ / ₂ "	4	4	2 ¹ / ₂	1	1/2					4.00 oz.
5 ¹ / ₁₆ " thru 5 ¹ / ₂ "	4	2 ¹ / ₂	1 ¹ / ₂	1						7.00 oz.

*Suggested initial greasing interval: Remove bearing cap and observe condition of used grease after lubricating. Adjust lubrication frequency as needed. Hours of operation, temperature, and surrounding conditions will affect the relubrication frequency required. Clean and repack bearings annually. Remove old grease, pack bearing full and fill housing reservoirs on both sides of bearing to bottom of shaft.

1. Lubricate with a multipurpose roller bearing NLGI No. 2 having rust inhibitors and antioxidant additives, and a minimum oil viscosity of 500 SSU at 100°F. Some greases having these properties are:

Shell - Alvania No. 2
Mobil - Mobilith AW2/Mobilith SHC100

Texaco - Premium RB2
American - Rykon Premium 2
2. Lubricate bearings prior to extended shutdown or storage and rotate shaft monthly to aid corrosion protection.

Static Oil Lubrication

1. Use only highest quality mineral oil with a minimum viscosity of 100 SSU at the oil's operating temperature. The oil's operating temperature is approximately 10° greater than the bearing's housing. SAE values having this viscosity at the following operating temperature are:

150° - SAE 20
160° - SAE 30
180° - SAE 40
2. Static oil level should be at the center of the lowermost roller (Do not overfill).
3. Complete lubrication change should be made annually.

be up. If resistance is higher than anticipated, air volume will be down.

2. Fan speed is not at design speed.
3. Air density not at design values. Also check air performance measurement techniques/procedures.
4. Devices for air modulation are closed or plugged. Also check filters.
5. Wheel mounted improperly or is rotating in reverse.
6. Parts of system or fan have been damaged or need cleaning.

Noise Problems:

1. Air performance is incorrect and fan is not at design point of operation. Fan forced to operate in an unstable flow region.
2. Bearing failure. Check bearings (lubrication).
3. Supply voltage high or inconsistent supply frequency. Adjustable frequency controllers can generate motor noise.
4. Objects which are installed in a high velocity airstream can generate noise. This includes flow sensors, turning vanes, etc.

5. Poor fan inlet conditions.
6. Acoustics or sound measurement procedure incorrect.

Vibration Problems:

1. Misalignment of drive components.
2. Poor foundations or mounting structure (resonances).
3. Foreign material attached to rotating components.
4. Damaged rotating components (bearings, shaft, fan, wheel, sheaves).
5. Broken, loose or missing set screws.
6. Loose bolts.
7. Vibration transmitted by another source.
8. Water accumulating in airfoil blades.
9. Fan is operating in stall or unstable flow region.

Motor Problems:

1. Incorrect wiring.
2. Speed of fan too high.
3. Parts improperly installed - binding.
4. Bearings improperly lubricated.
5. WR^2 capability of motor too low for application.
6. Protection devices may be improperly sized.

Drive Problems:

1. Belts improperly tensioned.
2. Drive alignment is poor.

Bearing Problems:

Generally speaking, Twin City Fan & Blower uses three types of bearings:

1. Ball bearing with set screw lock
2. Spherical roller bearings with set screw lock
3. Spherical roller bearings with adapter lock/taper lock feature to attach them to the shaft

Ball Bearing — These are self-aligning bearings and should present no alignment problems with one exception: i.e., on Sealmaster bearings there is a pin beneath the grease fitting which prevents the bearing's outer race from rotating. Should this pin jam, the bearing loses its alignment feature.

Common failure causes are (1) set screws loosening and the shaft turning within the bearing, and (2) crowned bearing supports. Loosen one bolt and measure the clearance between the pillow block and the support. Add shim to compensate.

Spherical Roller Bearings With Set Screw Lock — The self-aligning characteristic of these bearings is inherent in the spherical roller design. The closer that these bearings are to perfect alignment, the cooler they will operate.

Common failure causes are the same as with ball bearings, mainly set screws loosening and crowned bearing supports.

Spherical Roller Bearings With Adapter Lock — Again, the self-aligning feature is inherent in the spherical design. Good alignment results in a cooler operating bearing. The faster the bearing operates the more critical this becomes.

A common cause of failure is improper installation practice. Removing too much clearance from the bearing can result in preloading the bearing, resulting in premature failure; and removing not enough can result in the shaft rotating within the bearing. Properly tightened, this method of attaching a bearing to a shaft is second only to a press fit. Crowned bearing supports can also preload these bearings and should be checked by loosening one side of the bearing and checking for clearance.

Lubrication — The major cause of bearing failure is contamination of grease, insufficient grease, or incompatibility of grease. If a fan is to be stored for any length of time at the job site, the bearings immediately should be filled with grease while rotating the shaft and then the bearings should be regreased and rotated monthly. This will prevent moisture, which condenses within the bearing, from corroding the raceways. Most greases used on fan pillow blocks are lithium base. Use the greases shown on the bearing decal. Do not mix the bases without completely purging the initial grease.

Initially, follow the lubrication instruction on the side of the fan. The frequency of lubrication should be adjusted depending on the condition of the old grease being purged. This is the responsibility of the user. If the grease is dirty, the lubrication frequency should be more often.

- a. Noise — If a bearing is increasing in noise intensity and/or vibration, it will probably result in failure.
- b. Temperature — If a bearing temperature begins to gradually rise, it will generally result in failure. A bearing can operate up to 200 degrees and operate satisfactorily if the temperature remains constant and the bearing receives adequate lubrication. Remember that a roller bearing under the same load and speed will be somewhat more noisy and run warmer than a ball bearing. This is normal.

Rough handling and/or dropping a fan can result in brinelling the bearing. This appears as a clicking noise at first, then gradually worsens until failure.

When replacing a bearing, always align the bearings first, then bolt the pillow blocks to their support, rotate the shaft, fasten the bearings to it. If the bearing is fastened to the shaft first, tightening the pillow block bolts may bind the shaft and preload the bearings.

Limitation of Warranties and Claims

Seller warrants to the original purchaser that the goods sold hereunder shall be free from defects in workmanship and material under normal use and service (except in those cases where the materials are supplied by the buyer) for a period of one year from the date of original installation or eighteen (18) months from the date of shipment, whichever occurs first. The liability of seller under this warranty is limited to replacing, repairing, or issuing credit (at cost, F.O.B. factory and at seller's discretion) for any part or parts which are returned by buyer during such period provided that:

- a. seller is notified in writing within ten (10) days following discovery of such defects by buyer, or within ten (10) days after such defects should reasonably have been discovered, whichever is less;
- b. the defective unit is returned to seller, transportation charges prepaid by buyer.
- c. payment in full has been received by seller or said products; and
- d. seller's examination of such unit shall disclose to its satisfaction that such defects have not been caused by misuse, neglect, improper installation, repair, alteration, act of God, or accident.

Seller cannot guarantee sound pressure levels or dBA.

No warranty made hereunder shall extend to any seller product whose serial number is altered, effaced or removed. Seller makes no warranty, express or implied, with respect to motors, switches, controls, or other components of seller's product, where such components are warranted separately by their respective manufacturers. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall seller be liable to buyer for indirect, incidental collateral, or consequential damages of any kind. (BUYER'S FAILURE TO PAY THE FULL AMOUNT DUE WITHIN SIXTY (60) DAYS OF DATE OF INVOICE SHALL OPERATE TO RELEASE SELLER FROM ANY AND ALL LIABILITY OR OBLIGATION ARISING PURSUANT TO ANY WARRANTY, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, MADE IN CONNECTION WITH ANY CONTRACT FORMED HEREUNDER. BUYER AGREES THAT SUCH FAILURE TO PAY SHALL CONSTITUTE A VOLUNTARY WAIVER OF ANY AND ALL SUCH WARRANTIES ARISING PURSUANT TO SUCH CONTACT.)



Twin City Fan & Blower

A Twin City Fan Company

5959 Trenton Lane · Minneapolis, MN 55442-3238
Phone (763) 551-7600 · Fax (763) 551-7601 · www.tcf.com

