

VCM GAS MONITORING SYSTEM

VCM TANK FARM AREA

ABERDEEN CHEMICAL PLANT

MARCH 8, 1985

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VCM GAS MONITORING SYSTEM

RAILCAR UNLOADING AREA

ABERDEEN CHEMICAL PLANT

I. Purpose of Design

The purpose of this design is to provide the VCM railcar unloading area with an additional gas monitoring system to detect serious VCM releases. Presently, there are six fixed point monitor locations that are tied into one of the plant's Honeywell GC's. These monitor locations are listed below:

1. Sphere (grade level).
2. Compressor shed (grade level).
3. Between railcar unloading stations number 1 and 6
(Top of railcar level).
4. Between railcar unloading stations number 2 and 7
(Top of railcar level).
5. Between railcar unloading stations number 3 and 8
(Top of railcar level).
6. Between railcar unloading stations number 4 and 9
(Top of railcar level).

These existing monitors do not provide immediate response and are not distributed throughout the entire VCM tank farm area. Also, since this area is not monitored by plant personnel the majority of the time and since it has the potential for a serious release, additional protection is needed.

In addition to the gas monitoring system, this design will provide a pressurization blower for the fire pump houses near the VCM tank farm. The purpose of this blower is to prevent VCM from entering the buildings in the event of a serious VCM leak.

This design will also provide for Item 84-6 of the Underwriter's Insurance Company recommendations. This item recommended installing vapor detectors for the sphere's VCM transfer pumps to the old and new module.

VCM GAS MONITORING SYSTEMVCM TANK FARM AREAABERDEEN CHEMICAL PLANTII. Process Description

This design will provide for the installation of ten VCM gas sensors, AT-101 through AT-110, in the VCM tank farm area (see P&I diagram for locations). These sensors will be tied into dual channel combustible gas monitors, AI-121 through 125. Each monitor will accept signals from two sensors and display the higher of the two readings. The monitors will indicate the percent of the lower explosive limit (LEL) of VCM gas in the air. The monitors will be tied into alarms in the vinyl control room. The first alarm will be set at 25% LEL and the second alarm will be set at 45% LEL.

Should any of the monitors indicate a low level (25% LEL) of VCM gas in the air, the panel operator will notify the yard operator of the situation. If the monitors indicate a high level (45% LEL) of VCM gas in the air, the panel operator will then notify the yard operator to shut down any transfer or unloading equipment that is being used. When this equipment is off, the panel operator will isolate the sphere by pushing the sphere control valve override switch. This switch will close the following valves:

- (1) The valve on the vapor line to/from the compressors.
- (2) The valve on the liquid line from the compressors.
- (3) The valve on the liquid line to the VCM transfer pumps.
- (4) The valve on the liquid recirculation line from the VCM transfer pumps.

The monitors will be equipped with relay connections to tie into the existing sphere isolation control valve override switch. However, the relay connection will not be tied into this switch until the REMOTE OPERATING VALVES project is installed. When this project is installed, additional equipment and valves will be shut off by the sphere isolation control valve override switch. This includes:

- (1) The valve on the liquid return line from the VCM vapor line knockout pot.
- (2) The five VCM compressors in the VCM tank farm.
- (3) The two VCM transfer pumps.

After installation of this project, the relay connections from the gas monitors will be tied into the sphere control valve override switch. Should the monitors indicate a high level (45% LEL) of VCM gas in the air, the sphere control valve override switch will automatically shut off all the valves and equipment mentioned above. When the isolation switch is used, it will override the motor controls and shut down the units should they be in service.

VCM GAS MONITORING SYSTEM

VCM TANK FARM AREA

ABERDEEN CHEMICAL PLANT

II. Process Description - Continued

In addition to the vapor monitors, a pressurization blower, F-150, will be installed for the fire pump houses. This blower will provide air to pressurize fire pump houses #1, #2, #3, and #4. Pressurizing the fire pump houses will prevent any VCM from entering the buildings in the event of a serious VCM leak.

The blower's controls will be tied into the 25% LEL alarm in the control room so that when this alarm goes off, the blower starts. The blower was sized to maintain a 0.25 inch of water pressure in the buildings while providing enough air to the diesel engines for combustion. This blower will be equipped with an extended inlet stack to provide VCM free air in the event of a serious release.

VCM GAS MONITORING SYSTEM

VCM TANK FARM AREA

ABERDEEN CHEMICAL PLANT

III. Equipment and Instrument Specifications

<u>Item No.</u>	<u>Description</u>
AI-121	VCM transfer pumps gas monitor
AI-122	South unloading stations gas mointor
AI-123	Middle unloading stations gas monitor
AI-124	North unloading stations gas monitor
AI-125	Compressor shed gas monitor
AT-101	Gas sensor north of VCM transfer pumps
AT-102	Gas sensor east of actuated valves
AT-103	Gas sensor south of unloading stations
AT-104	Gas sensor between #1 and #6 unloading stations
AT-105	Gas sensor between #2 and #7 unloading stations
AT-106	Gas sensor between #3 and #8 unloading stations
AT-107	Gas sensor between #4 and #9 unloading stations
AT-108	Gas sensor north of unloading stations
AT-109	Gas sensor north of compressor shed
AT-110	Gas sensor north of VCM sphere
F-150	Fire pump house pressurization blower
HS-130	Handswitch for F-150



Conoco Inc.
Engineering Center
Ponca City, Oklahoma
SPECIFICATION SHEET

SPECIFICATION SHEET

PROJECT NO. _____
DATE 12-21-84
DRAWN BY EGJ
CHECKED BY VLI

PLANT Aberdeen Chemical PROJECT VCM Gas Monitoring

ITEM NO
SERVICE

AI-121 through AI-125, Gas Monitors (2)

Quantity: 5

Manufacturer: General Monitors (1)

Model No.: 580

Service: To indicate VCM gas concentrations
in the tank farm and railcar unloading area.

Each unit will receive signals from two sensors
and display the higher of the two readings.

Temperature Range: 0°F to 150°F

Power Requirements: 105-130 VAC 50-60 Hz;
or 12-15 VDC, 12 watts.

Meter Span: 0-100% Lower Explosive Limit (LEL)

Three Alarm Circuits: High, Low, Malfunction.

Battery Backup: Circuit for battery backup to
be included.

Location: Indicators to be located west of
the ^{vinyl} control room in the emergency power generator
building.

Notes:

- (1) Or company approved equal.
- (2) All five monitors to be tied into existing alarms
located on the incinerator alarm annunciator
panel. These alarms will be used to indi-
cate 25% LEL and 45% LEL readings from the
gas monitors.

VAB.0001106390

SHEET _____ OF _____ REV _____



GENERAL MONITORS, INC.

3037 ENTERPRISE STREET
COSTA MESA, CALIFORNIA 92626
PHONE: (714) 540-4895 TWX 878-372

TO: Mr. Frank Jenson
Vista Polymers
Box 91
Aberdeen, MS

Date: 30 January 1985

GMI QUOTATION NO: 6150

Your Reference: Verbal request of 30 January 1985.

Please Reference GMI Quote No.
On All Correspondence.

ITEM	DESCRIPTION	QUANTITY	UNIT PRICE	EXT. PRICE
1.	Model 580 System to include one Dual Channel Monitor, 2 ea Sensor P/N 10001-1, 2 ea Sensor Housing P/N 10007 and 1 ea Instruction Manual. Standard Relay Configuration. *Common Alarm Relays	6 ea	\$1,764.00	\$10,584.00
1a.	Alternate System Model 610 System to include one Four Channel Monitor, 4 ea Sensor P/N 10001-1, 4 ea Sensor Housing P/N 10007 and 1 ea Instruction Manual. Standard Relay Configuration. *Common alarm relays for all Four Channels. Common alarm set point adjustment.	3 ea	\$2,973.00	\$ 8,919.00
	Note: For a discrete set of alarm relays (Malfunction Low and High) for each channel plus discrete alarm set point adjustment add \$470.00 to unit price of item #1A.			
1b.	Alternate System Model 4800 system to include one 16 Channel Monitor, 1 ea Extender Card for Channel Card and one for relay card and one Instruction Manual. Blank Panels included at N/C for inactive channels. Each active channel to include one each channel control card, Relay			
Quotation Firm For:				
F.O.B.				
Terms: Net 30 Days				
Delivery:		ARO	Warranty:	
Enclosures:				

Signature: _____ Sheet No. 1 Of 2 Sheets

Name/Title: _____

Local Representative: _____ Phone: _____ VAB:0001106591

Address: _____



GENERAL MONITORS

Description

General Monitors' Model 580 is a compact, highly-versatile system for continuously monitoring combustible gas concentrations in two locations. The system consists of two remote sensing assemblies and a solid-state controller.

For safety, reliability, and ease of calibration, sensor outputs are not summed. Each channel is completely independent and has its own constant current sensor drive circuit. Sensors are available to meet various service requirements for most gases.

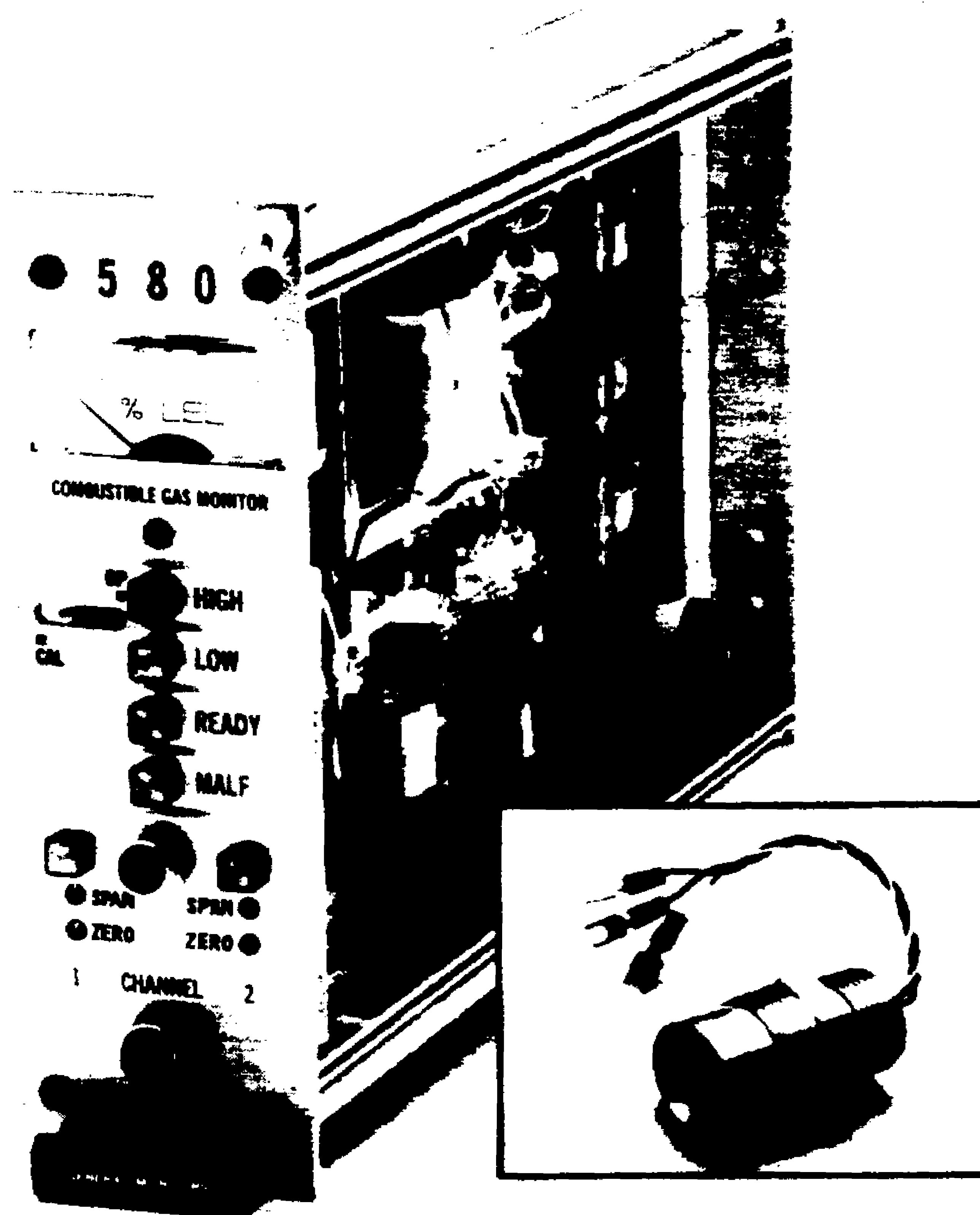
The Model 580 independently monitors two locations. The controller automatically displays the higher reading channel on an analog meter, scaled from 0-100% LEL (Lower Explosive Limit). Manual override switching permits readout of the low channel at any time. Low and high alarm set-points are common to both channels. Calibration of each channel is done independently, and an alarm override switch disables the alarms during the calibration mode. A 45 second time delay also disables the alarms on start-up.

Customers may select from a wide variety of relay options, such as normally energized or de-energized high and low alarms, and latching or non-latching high and low alarms. The malfunction relay circuitry is normally energized and monitors both channels.

Features

- ☐ Peak Picking Circuitry
 - Automatically displays highest reading channel
- ☐ Compact Packaging
 - Dimensions: 2"W x 7"H x 11.5"D (51 mm W x 178 mm H x 292 mm D)
- ☐ Low Power Consumption
- ☐ Analog Meter Standard
- ☐ Independent 3 AMP/117 VAC DPDT High and Low Alarm Relays
 - 3 AMP/117 VAC SPDT Malfunction Alarm Relay
- ☐ Variety of Relay Options
 - Normally energized or de-energized high and low alarm
 - Latching or non-latching high and low alarm
 - Remote Reset
- ☐ Superior Reliability
 - Two week factory burn-in of system
 - Single PC board
 - Solid-state circuitry
 - Proven catalytic sensor
 - Malfunction alarm circuitry
 - Positive contact field terminals
 - Time delay
 - Constant current supply to sensor

Model 580 Combustible Gas Monitor



- ☐ Safe, Easy Calibration
 - Fully accessible calibration adjustments
 - Alarm relays automatically disabled while in calibration mode
- ☐ Low Cable Costs
 - 40 ohm loop resistance, e.g. 3000 ft. (910 meters) one way of #18 AWC cable
 - 7600 ft. (2320 meters) one way of #14 AWC cable
- ☐ User Protection
 - Two year warranty
 - CSA approved

Applications — Protection from hazardous combustible gases in:

- ☐ Fuel Loading Facilities
- ☐ Compressor Stations
- ☐ LNG Processing and Storage
- ☐ Oil Well Logging
- ☐ Sewage Plants
- ☐ Gas Turbine Enclosures
- ☐ Drilling and Production Platforms
- ☐ Solvent Vapors

Sensor Elements

General Monitors' sensors are designed for reliable performance and long life. Each sensor must undergo extensive burn-in and rigid quality control procedures before shipment.

The sensors consist of two catalytic bead elements in a balanced Wheatstone bridge circuit (See Principle of Operation). These low temperature catalytic bead sensing elements require minimal sensor excitation current, greatly increasing sensor life.

Principle of Operation

A catalytically treated ceramic active bead and a passivated ceramic reference bead form two legs of a Wheatstone bridge circuit. Combustible gases diffuse through a flame arrestor and oxidize on the catalytically treated active bead, causing an increase in its temperature and electrical resistance. This results in an unbalancing of the Wheatstone bridge circuit. The reference bead, inert to combustible gases, compensates for ambient temperature, humidity and pressure changes. The difference in resistance of the active and reference beads is converted into a sensor signal which is amplified in the controller, sent to the indicator and alarm circuits, and displayed on an analog meter. The meter is scaled in percent of the Lower Explosive Limit (% LEL). In the Model 580 the two sensor inputs are continuously compared, the higher signal being displayed on the meter.

Two adjustable electronic alarm circuits may be field-set for any alarm level up to 100% LEL. The low alarm signal indicates potentially hazardous gas accumulations at low concentrations, allowing time for corrective action. The high alarm signal indicates immediate danger. A flashing malfunction LED will indicate low input power, sensor removal or damage, "CAL" mode, severed cable or current failure. Two LED channel indicators are provided to indicate the higher channel.

A variety of alarm relay options provides contacts for high, low and malfunction alarms to be wired to auxiliary lamps, horns, fans or shut-down equipment.



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Engineering Center
Ponca City, Oklahoma
SPECIFICATION SHEET

SPECIFICATION SHEET

PROJECT NO. _____

DATE _____

DATE 12-20-84 _____

DESIGNED BY FGJ _____

CHECKED BY VLT _____

PLANT Aberdeen Chemical PROJECT VCM Gas Monitoring

ITEM NO
SERVICE

AT-101 through AT-110, Gas Sensors

Quantity: 10

Type: Diffusion, low temperature catalytic bead

Manufacturer: General Monitors (1)

Model No: 10001-1

Service: To sense VCM concentrations in the VCM tankfarm and railcar unloading area. These sensors will send a signal to respective General Monitors indicating units. Refer to P&I or process description for Tie-in details.

Location: Sensors to be located between 2 and 3 feet above ground level at each of the designated locations on the P&I diagram

Notes:

(1) Or company approved equal

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Ponca City, Oklahoma
SPECIFICATION SHEET

SPECIFICATION SHEET

PROJECT NO. _____
DATE 1-25-85 (REV) NO. _____
DATE BY EGJ (REV) NO. _____
DATE BY VLJ (REV) NO. _____

PLANT Aberdeen Chemical PROJECT VCM Gas Monitoring

ITEM NO
SERVICE

F-150 Blower (see note 2)

Service: Fire Pump House pressurization

Location: Fire Pump House Area (Fire pump houses #1, #2, #3, #4) grade level.

Material: Air

Density: .076 lb/ft³

Rate: 3500 SCFM @ 0.50" H₂O

Minimum Pressure Required in Buildings: .15" H₂O

Temp.: 10°F min.

100°F max.

Mat'l of Const.: C.S.

Manufacturer: The New York Blower Co. (1)

Model No.: 155 KB-1

Description: 1 1/2 hp, 1750 RPM

Combustion Air Required For Each Detroit Diesel Engine:
620 SCFM

Notes:

(1) or Company approved equal

(2) Blower handswitch, HS-130, to be tied into the 25% LEL control panel alarm for any of the gas monitors.

(3) Provide screen for inlet of blower.

(4) Provide local Hand/OFF/Auto Switch for blower (see spec. sheet for HS-130).

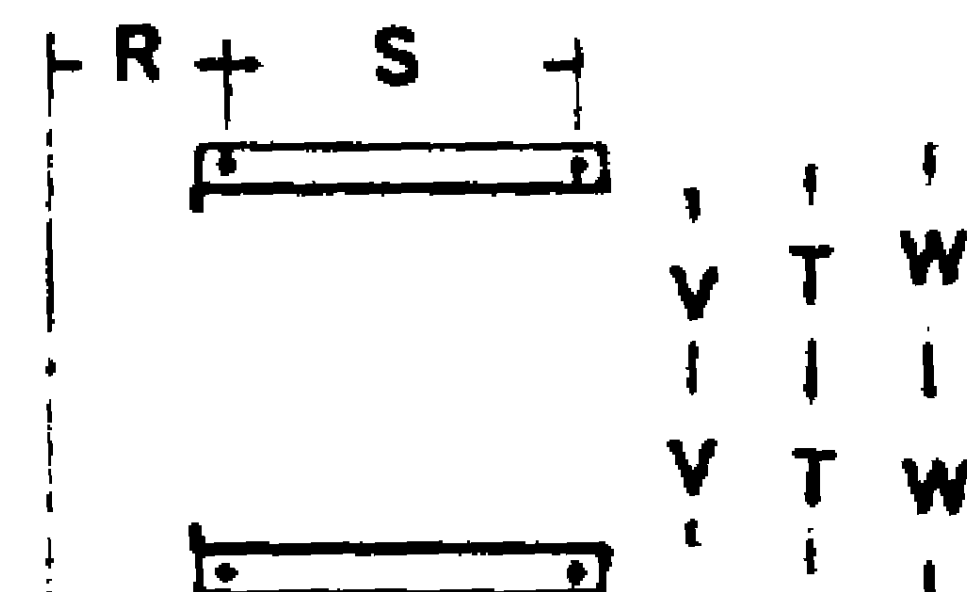
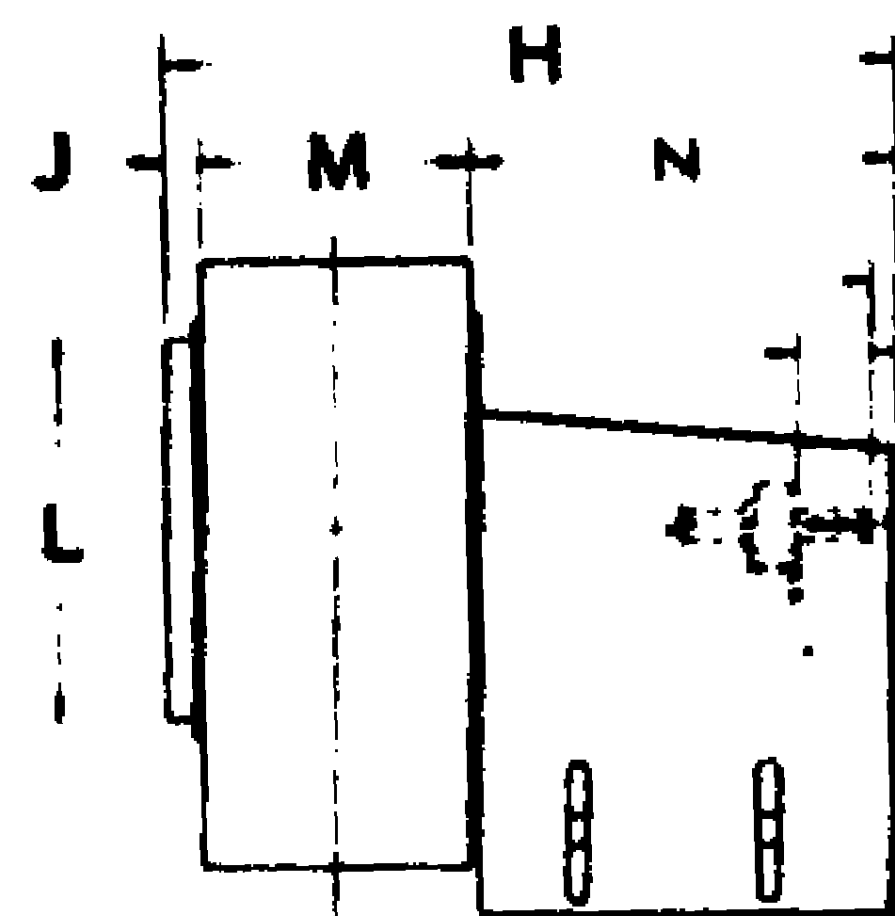
(5) Provide belt guards for blower.

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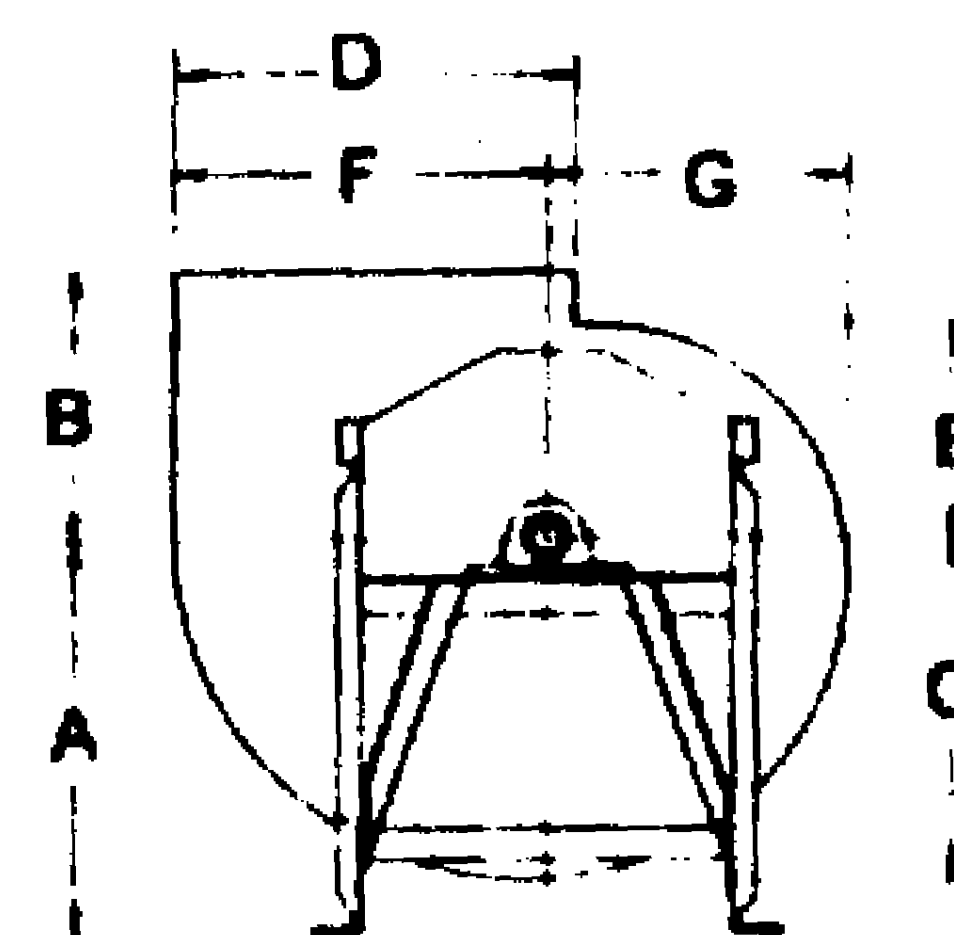
DATE 1 OF 1 REV

SIZES 125 and 155—BELT DRIVEN

MAXIMUM TEMPERATURE: 200°F.



Inlet and outlet dimensions are outside.
Dimensions not to be used
for construction unless certified.



DIMENSIONS [INCHES]

Size	Wheel dia.	Outlet area sq. ft.	A	B	C	D	E	F	G	H	J	K	L	M	N
125	12 1/4	.86	17	10	12 3/8	13 3/4	7 7/8	13	10 3/8	27 1/2	1 1/8	3	13 3/4	9 3/8	17
155	15	1.29	17	12	15 1/8	16 7/8	9 3/4	15 7/8	12 3/4	30	1 5/8	3	16 3/4	11 3/8	17

Size	R	S	T	V	W	Y	a*	b*	c*	d*	Shaft	Keyway	Base holes
125	6 1/8	12 7/8	9 1/4	8 1/8	10 1/8	5/8	11 5/8	16 1/4	12 7/8	9 1/4	1	1/4 x 1/8	9/16
155	7 1/8	12 7/8	9 1/4	8 1/8	10 1/8	5/8	14 1/8	19 3/4	15 3/4	11 3/8	1	1/4 x 1/8	9/16

*Discharge dimensions . . . see page 5.

SIZE 125

Capacities based on air density of .075 lbs. per cu. ft.
Maximum safe speed at 70°F.: 1715 RPM

CFM	OV	1/4" SP		1/2" SP		3/4" SP		1" SP		1 1/2" SP		2" SP		2 1/2" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1031	1200	420	.09	498	.12	638	.20	772	.29						
1203	1400	464	.13	535	.17	658	.25	777	.34	893	.44				
1375	1600	509	.19	575	.23	688	.31	793	.41	896	.51				
1547	1800	557	.26	616	.30	723	.39	818	.49	910	.59	1094	.84		
1719	2000	608	.34	660	.39	760	.48	850	.59	934	.70	1100	.95	1262	1.23
1891	2200	658	.44	706	.49	801	.60	884	.71	963	.83	1116	1.08	1266	1.37
														1412	1.68
2063	2400	711	.56	752	.61	842	.73	922	.85	997	.98	1137	1.23	1276	1.53
2235	2600	764	.72	801	.76	884	.88	961	1.02	1032	1.14	1166	1.42	1293	1.71
2407	2800	819	.88	852	.93	928	1.05	1002	1.20	1071	1.33	1197	1.62	1317	1.92
														1436	2.25
2579	3000	873	1.07	903	1.12	972	1.26	1044	1.40	1109	1.54	1230	1.85	1345	2.17
2751	3200	927	1.29	954	1.34	1019	1.48	1086	1.63	1150	1.79	1267	2.10	1375	2.43
2923	3400	982	1.54	1007	1.59	1066	1.73	1130	1.88	1192	2.06	1305	2.39	1409	2.73
3095	3600	1038	1.82	1060	1.87	1114	2.01	1174	2.18	1234	2.35	1343	2.70	1445	3.06
														1542	3.43

NOTE: Performance shown is for Junior Fans with outlet duct and with or without inlet duct. BHP shown does not include belt drive loss, but does include bearing drag. Tinted capacities indicate BHP requirements which may exceed maximum motor limitations . . . see below.

COMPLETE PACKAGE MODEL NUMBERS

Junior Model No.	Motor		Adj. drive RPM range
	HP	RPM	
125GD	1/3	1150	420/640
125GB	1/3	1725	630/960
125HB	1/2	1725	630/960
125IB	3/4	1725	730/1110
125JB	1	1750	840/1240
125KB	1 1/2	1750	920/1380
125LB	2	1750	1040/1430
125MB	3	1750	1190/1540

SIZE 155

Capacities based on air density of .075 lbs. per cu. ft.
Maximum safe speed at 70°F.: 1400 RPM

CFM	OV	1/4" SP		1/2" SP		3/4" SP		1" SP		1 1/2" SP		2" SP		2 1/2" SP	
		RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
1535	1200	342	.13	401	.17	510	.26	609	.36						
1791	1400	380	.19	433	.24	529	.33	619	.44	704	.56				
2047	1600	418	.27	467	.32	554	.44	637	.55	715	.67	858	.93		
2303	1800	459	.37	503	.43	584	.55	658	.67	731	.80	866	1.08	991	1.39
2559	2000	500	.48	540	.55	615	.69	685	.82	751	.96	878	1.26	997	1.58
2815	2200	542	.63	579	.71	649	.86	714	1.00	776	1.16	895	1.46	1007	1.80
														1106	1.92
3071	2400	584	.81	620	.89	685	1.05	745	1.20	803	1.37	914	1.70	1020	2.05
3327	2600	628	1.01	660	1.09	721	1.27	780	1.45	833	1.62	939	1.97	1039	2.34
3583	2800	672	1.24	702	1.33	759	1.52	814	1.72	865	1.90	964	2.27	1060	2.66
														1150	3.06
3839	3000	715	1.51	743	1.61	798	1.82	850	2.02	899	2.21	993	2.61	1083	3.01
4095	3200	759	1.81	785	1.93	838	2.14	887	2.36	934	2.57	1023	2.99	1109	3.41
4351	3400	804	2.16	828	2.28	877	2.51	924	2.73	970	2.97	1056	3.41		
4607	3600	848	2.55	872	2.67	918	2.91	963	3.16	1006	3.40				

NOTE: Performance shown is for Junior Fans with outlet duct and with or without inlet duct. BHP shown does not include belt drive loss, but does include bearing drag. Tinted capacities indicate BHP requirements which may exceed maximum motor limitations . . . see below.

COMPLETE PACKAGE MODEL NUMBERS

Junior Model No.	Motor		Adj. drive RPM range
	HP	RPM	
155GD	1/3	1150	315/540
155HB	1/2	1725	470/715
155IB	3/4	1725	550/830
155JB	1	1750	590/870
155KB-1	1 1/2	1750	650/900
155KB-2	1 1/2	1750	720/980
155LB	2	1750	740/1110
155MB	3	1750	830/1150

MAXIMUM MOTOR LIMITATIONS

Maximum motor frame*		ML dimension maximum overall motor length
Open	TE	
182T	182T	14 3/4"

Frame sizes vary in length with motor manufacturer. Check NEMA "C" dimension against ML dimension above if specific make of motor is required.

MINIMUM/MAXIMUM V-BELT DRIVE CENTER DISTANCES

Motor frame size	Minimum/maximum centers in inches
48	7.75/10.75
56, 143T, 145T	7.25/10.25
182T	8.25/9.75

VAB.0001106595



Conoco Inc
Engineering Center
Ponca City, Oklahoma
SPECIFICATION SHEET

SPECIFICATION SHEET

PROJECT NO. _____

DATE _____

DATE 2-13-88 _____

DATE EGS _____

DATE VLT _____

PLANT Aberdeen Chemical PROJECT VCM Gas Monitoring

ITEM NO
SERVICE

HS-130, Handswitch

Service: F-150

Location: Next to F-150

Description: Local HAND/OFF/AUTO push button
for pressurization blower F-150

Power Requirement: 120 V AC

Notes:

(1) Tie in this switch with the 25% LEL control panel alarm for all of the gas monitors so that in the AUTO mode, the alarm will automatically start the blower.

VCM GAS MONITORING SYSTEM

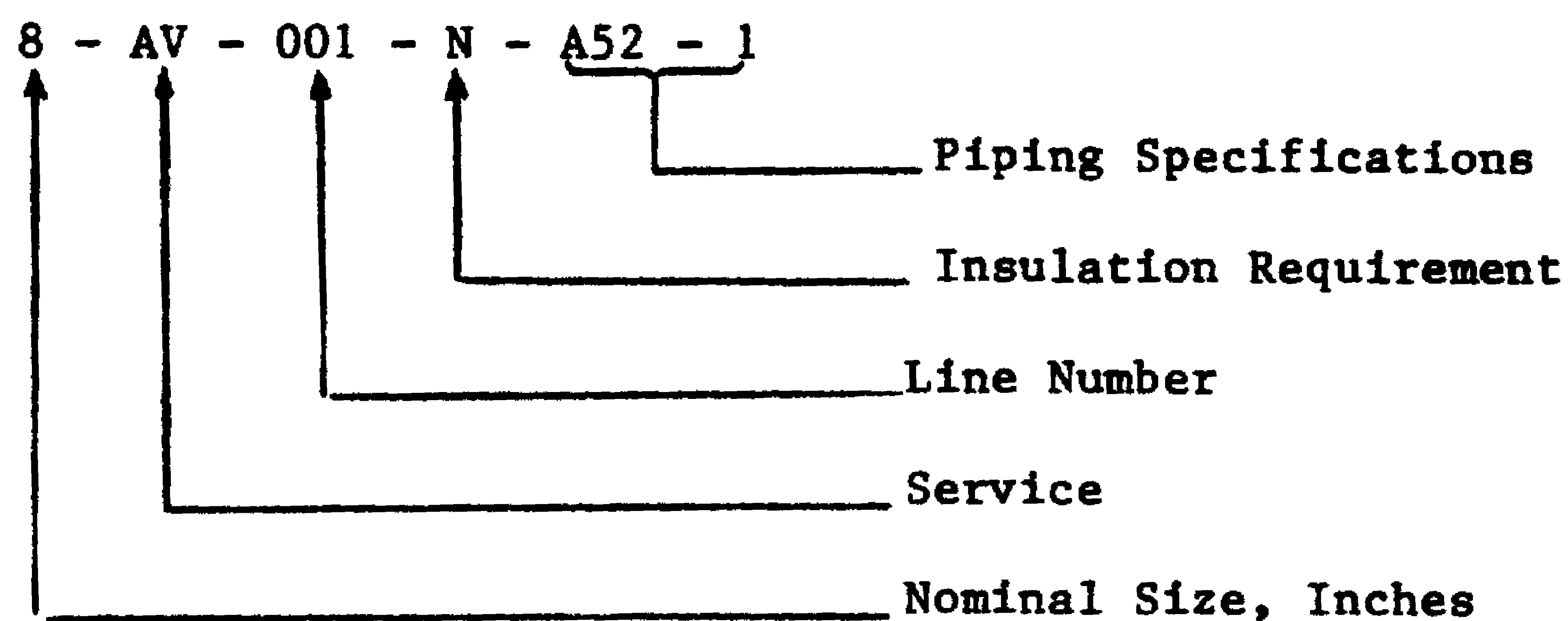
VCM TANK FARM AREA

ABERDEEN CHMEICAL PLANT

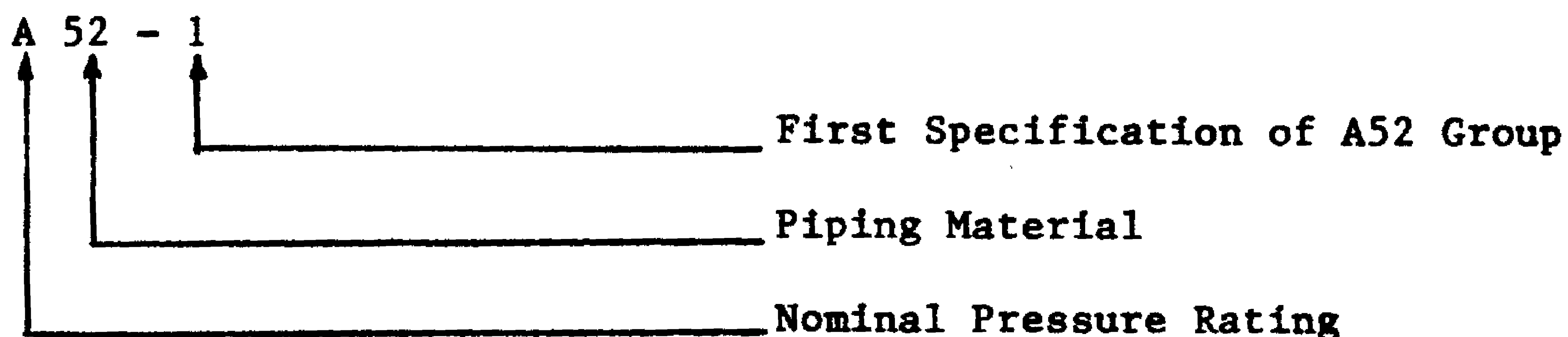
IV. Process Piping Schedule

The following piping schedule uses a system of numbers and letters as a line designation. This system denotes the following information: line size, service, line number, insulation requirements, and piping specifications.

Sample Line Designation



Sample Piping Designation



Service Designation Used

Designation

AV

Service

Ventilation Air

Insulation Requirement

N

None

Nominal Pressure Rating

A

150 Pound Class

Piping Material

52

Galvanized Steel Duct

PROCESS PIPING SCHEDULE
PROCESS ENGINEERING DEPARTMENT

Date 2-13-85 Made By FGJ
Project VCM Gas Monitoring
Plant Aberdeen Chemical

[illegible]

(~ 20')

RAILCAR

RAILROAD TRACKS

STAIRS

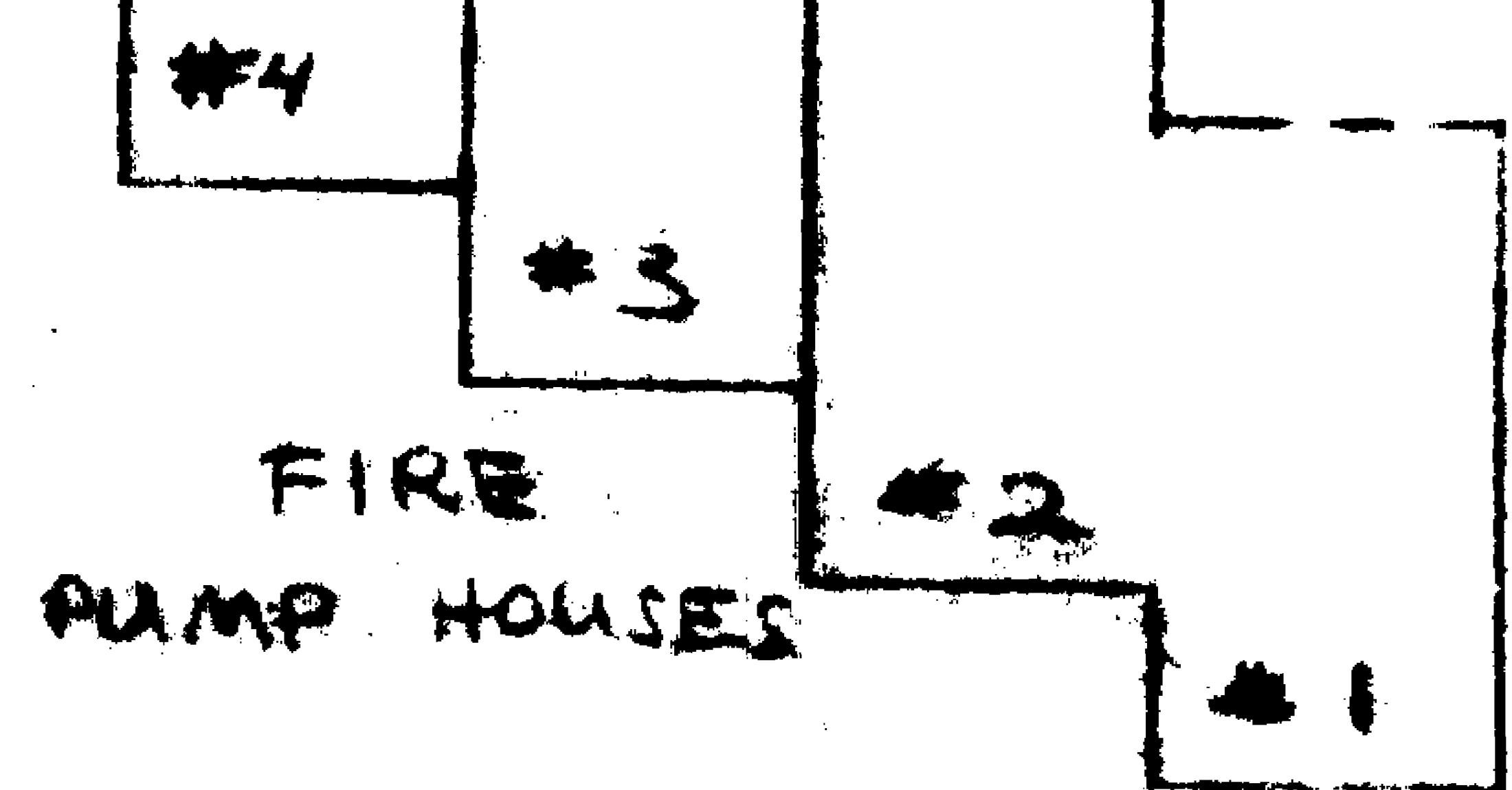
AT MP (1)

(3) [Symbol]

2-AV-001-A

-AS2-1

F-150



FIRE PUMP HOUSES

AFE

	12/6/85	ORIGINAL	FGT	ULT	RAF
ISU	DATE	DESCRIPTION	BY	CKD	APD
CONOCO CHEMICALS					
ABERDEEN			MISSISSIPPI		
VCM GAS MONITORING SYSTEM VCM TANK FARM AREA PLOT PLAN					
SCALE: NCM 1/2					
APPD: RAF DATE: 2-26-85			No.		

DWR.