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ENVIRONMENTAL ENGINEERING SURVEY

NAVAL COASTAL SYSTEMS LABORATORY

PANAMA CITY, FL

N61331

APRIL 1979

BY

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SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

CHARLESTON, SOUTH CAROLINA

I. INTRODUCTION

A. Description of Activity

No major change in activity facilities has occurred since our last survey. The description furnished in the report of that survey remains adequate.

B. Purpose and Scope of Survey

The purpose of the survey was to review activity environmental facilities and to determine the status of action taken on recommendations furnished in report of prior surveys.

C. Authority

This Environmental Engineering Survey Report covering facilities of the Naval Coastal Systems Center at Panama City, FL, was accomplished in conformance with reference (a) on 26-28 February 1979.

D. Personnel Contacted

Mr. M. Southall	Assistant Public Works Officer, Director of Engineering
Mr. R. Klusman	Maintenance Control Director
Mr. I. Holmes	Mechanical Engineer - Environmental Coordinator
Mr. C. Meyers	Electrical Engineer
Mr. C. P. Travis	Superintendent Transportation Department
Mr. R. Ward	Sewage Treatment Plant Operator
HM2 S. Williams	Preventive Medicine Technician
BMC R. Cassady	
Mr. R. Turner	Fire Chief

II. SUMMARY OF DEFICIENCIES AND RECOMMENDATIONS

A. Air Pollution Control

No major source of air pollution exists at this activity.

B. Water Pollution Control

1. Domestic and Industrial Wastewater Collection

Flow data indicates significant infiltration to the system. Corrective action should continue.

The housing area sewage pump operating time is excessive. If infiltration reduction does not significantly reduce pump operating time a larger capacity pump should be installed.

Sources or equipment for emergency operation of the lift station are adequate but a visual and auditory alarm should be installed.

2. Domestic and Industrial Wastewater Treatment

The absolute flow readings of the new flow meter appear in error. The unit should be recalibrated.

A state certified Class C sewage works operator is required by Florida regulations. In order to assure continued compliance with the regulations, it is recommended that roving watch personnel be encouraged to become certified.

A listing of activity pollution abatement projects indicating the status as of 22 March is attached as Appendix A.

3. Swimming Pool Water Treatment

The pool circulating pump line flow meter has been removed. This meter should be replaced.

4. Fire Fighting Training

Training operations appear to be environmentally acceptable except that the fuel storage tank should be surrounded with a containment berm.

C. Potable Water Supply

The contractor supplied potable water is usually adequate in quality. A single failure in quality has been noted which affected only color and turbidity. No unsatisfactory tests of bacteriological purity were obtained. No change to the present service is recommended unless conditions change.

The commercial supply could be interrupted by a major calamity. Existing activity equipment could be modified to serve as a backup supply.

Pierside water services should be equipped with reduced pressure backflow preventers.

Information concerning dispensary hot water quality after inspection and flushing is requested.

D. Oil Spill Prevention

Oil and oily waste stored in barrels outside of Building 318 should be enclosed in a shed of the type included in the pending construction contract for similar conditions. The storage drums located near Structure 370 and Building 228 should have a containment slab and curbing with controlled drainage through the oil separator provided with the boom cleaning facility.

The piping associated with fuel oil transfer to and from Structure 370 should be modified to reduce the possibility of an accidental spill.

None but very minor pollution of Alligator Bayou by oily waste could be noted at the time of this inspection.

The curbing of the truck offload containment area at Structure 325 should be modified to eliminate the dropped section.

E. Hazardous Waste Management

This activity does not have any PCB-filled transformers in use or in storage.

III. DISCUSSION

A. Air Pollution Control

No major source of air pollution exists at the activity. There are several small oil fired boilers in use. The largest boiler, rated 80 HP, is located in Building 110. All boilers were being inspected by other SOUTHNAVFACENGCOM personnel during this environmental facilities inspection.

B. Water Pollution Control

1. Domestic and Industrial Wastewater Collection

In reviewing operating logs for the sewage treatment plant a correlation was noted between monthly rainfall and average daily flow. Therefore, it is believed that the collection system remains subject to significant infiltration. Also, a comparison of lift pump capacity and operating time, with recorded flows provides a rough corroboration of the range of flows being experienced. The program to clean, inspect, and repair the sanitary sewers is appropriate for the present system condition. O&MN project R2-77 (W266D) has been partially completed. System deficiencies have been identified and design of repairs has been authorized.

In comparing lift pump operating time to recorded sewage flow it was noted that the housing area pump station had a running time of 31.2 hours in the 24 hour period ending 0800 on 27 February. This is an excessive operating time which indicates a need to increase the pump capacity at this station. However, as the operating log identifies considerable rainfall during the preceding days and the recorded flow was about double the normal, the pump station was probably responding to infiltration. If it is assumed that the indicated flow was double the normal rate for the station, a 15.6 hour/day operating time is indicated. With normal diurnal flow fluctuations this is probably marginal but satisfactory. Therefore, no action should be taken until project R2-77 is completed. At that time the resultant wastewater flow and pump operating time should be reevaluated.

While the housing lift station has a manually engaged and started auxiliary gasoline engine and right angle pump drive for emergency operation, the main lift station does not have installed emergency equipment. This station can be served by the activity auxilary power system or by portable equipment. Also, both collection systems have ample storage capacity so that response to am emergency condition does not have to be immediate. A high level alarm and light should be installed at the housing area lift station. An alarm at this station could be detected by the gate guard and appropriate utilities personnel notified in a time of emergency.

2. Domestic and Industrial Wastewater Treatment

Since the last survey a new flow meter and chlorinator system have been installed and placed in operation. The meter recording chart reported a minimum flow of 50,000 gpd, which appears very high for this activity, and also was about 20,000 gpd in excess of the value shown by the instantaneous flow indicator. Meter recalibration is recommended to correct these discrepancies.

Despite this deficiency recorded flow meter data has been used to evaluate sewer system infiltration. The data was used because the flow range recorded was confirmed by calculated flows obtained from sewage pump running time meters and because the relative monthly variations were more significant than absolute values.

The new chlorination system corrects all previously noted discrepancies. The system provides for completely adequate flow proportional chlorination and the chlorine room is equipped with a chlorine fume sensor and alarm and an air pack. New laboratory equipment has been obtained and the laboratory space reorganized to improve serviceability. The present arrangement should be completely satisfactory pending changes necessitated by work included in MCON P-255, Sewage Treatment Plant Improvements. This project has been readvertised with a bid opening date of 8 May 1979. The revised project includes additive alternates consisting of a new sludge digester, sludge drying bed, sludge meter, laboratory modification and digester repairs. On completion of this work the plant will have a rated capacity of 0.2 mgd which is adequate for all planned growth if excessive infiltration is eliminated by scheduled work.

The plant is under the operational control of a state certified Class C operator for a 40-hour work week. Weekend duties are accomplished by non-certified boiler watch personnel in accordance with a standard procedure. The certified operator is on call in event of any emergency condition. This satisfies the requirements of the State of Florida for the capacity and type of treatment plant. However, it is recommended that other utility personnel be encouraged to become certified as wastewater plant operators for reserve capability. It is understood that the state will evaluate the experience of applicants who have only part time operating experience.

3. Swimming Pool Water Treatment and Filter Backwash Discharges

The swimming pool circulating water is clarified by a

diatomaceous earth filter as noted in previous reports. No change in treatment equipment or methods was noted although a chlorine gas sensor and alarm system has been installed. Also, the flow meter on the circulating pump discharge remains inoperable.

A project has been prepared to divert filter backwash to the sanitary sewers. This project, identified as C12-78 (W266Q), is included in the FY 79 O&MN Pollution Abatement Program.

4. Fire Fighting Training

Ordinarily, fire fighting training is performed quarterly at the training area west of the sewage treatment plant. Training essentially consists of two practice fires fueled by JP-4 which are extinguished with aqueous film forming form from a fire truck. The JP-4 is stored on-site in a horizontal tank with bottom drain. The drain valve is locked to prevent pilfering or intentional discharge. Visual observation of the area indicates that applied materials soak into the sandy shell sub-grade as no surface drainage routes are visually apparent. The present operational practices are considered acceptable, but the fuel oil storage tank should be surrounded by a fuel containment berm to avert a potential major oil spill.

C. Potable Water Supply

The activity potable water supply is obtained by commercial services contract from the Bay County Water System through a six inch tap to the 24-inch line on Highway 98 located near the housing entrance and through a four inch tap to the 16-inch line on Thomas Drive at the Center's main entrance. Each service line passes through a metering box which contains a flow meter with totalizer, pressure regulator - check valve and by-passing piping. With the exception of the elevated storage tank none of the activity water supply facilities are routinely used for potable water supply. The elevated tank floats on the supply pressure through an altitude valve.

Recently, the supplier had an alum feed line failure which resulted in the delivery of an inadequately treated water. The principal problem caused by this failure was an increase in color and turbidity and an inadequate chlorine residual. Frequent bacteriological samples were collected by dispensary personnel during the failure. The absence of positive coliform tests confirms that, despite operational difficulties, the supplier delivered a safe water with respect to bacteriological purity. If this type of failure were to become frequent, or if, in spite of proper treatment by the supplier, positive results were received on bacteriological samples of the distribution system, added treatment should be provided. This added treatment could consist of a chlorine sensor and feeder installation, as illustrated in Appendix B at each point of supply. Large military installations often do chlorinate purchased water as it is received but this practice is not usually advantageous for smaller activities. In the case of Naval Coastal Systems Center, Panama City, it is not considered necessary to accomplish this work in view of the infrequent supply failure and the lack of a history of bacterial contamination.

The County water supply reaches Naval Coastal Systems Center by a pipeline which is supported on the Highway 98 bridge structure crossing St. Andrews Bay. Therefore, the supply could be susceptible to any major calamity which might affect the bridge. Although this is a remote possibility, the activity can provide for an alternative source of potable water by modifications to existing equipment. The suggested modification is to utilize the newest well (Building 281) as the supply source. This will probably require pump modifications to increase discharge pressure and the installation of a chlorination system.

There are hose reels on the west dock which are directly connected to the potable water system with no apparent backflow protection. In that there is a potential for supply contamination each of these services should be fitted with a reduced pressure backflow preventer.

Recently, work has been accomplished on the dispensary building heating system. Since completion of this work, dispensary personnel have noted a distinct odor of kerosene in the dispensary hot water. The building piping was to be inspected for possible interconnection and the hot water lines thoroughly flushed. It is requested that information be furnished relative to findings of this inspection.

D. Oil Spill Prevention

1. Spill Prevention Facilities

Work on the new boom cleaning facility was near completion at the time of this visit and sealing of the storm drain outlet midway of the west dock near Building 172 was scheduled for the following week. This work is part of the continuing program to correct existing oil pollution and to protect against accidental spills. Construction is pending on various storage and containment systems for minor sources of oil contamination about the station. This work, however, does not include two locations which have similar deficiencies. The oil and waste barrels outside of Building 318 should be stored in a small shed, such as is described in the present project and the oil storage drums near Structure 370 and Building 228 should have a containment slab and curbing. This latter containment could be drained to the oil separator installed with the boom cleaning facility.

The new boom cleaning facility appears to have been constructed over pipelines associated with fuel oil storage tank Structure 307, and it also appears that hoses must be extended over the concrete walls of the cleaning facility during tank fill operations. Modifications of the equipment and procedures used to transfer fuel oil in this area should be accomplished to reduce the possibility of an accidental spill. It is recommended that the fill line be routed directly to Structure 307, thereby eliminating the hose and reel presently used for transfer of fuel oil to the tank, and that the pressure line from Structure 307 pumps be extended to a fill station at the pier face. This also should be provided spill protection.

At this visit temporary boom was in place extending across Alligator Bayou in a generally east-west direction from both the north and south ends of the west docks to points on the west shore. This boom had been installed to contain oil which appeared on disturbance of bottom sediments in the area. Attempts were made to illustrate the problem by disturbing the bottom at several locations along the west pier. The attempts were without success. Also, the surface of the Bayou between the stretches of oil boom were free of sheen during this visit. Apparently the problem is not general in nature.

Work to repair and seal openings through the pier bulkhead has been successful in eliminating oily pollution of the Bayou by the oil products trapped behind the pier face. During this visit only two minor areas of oil sheen were noted in the Bayou. One, located at the storm drain outlet on the west dock, was being trapped by a small boom with absorbent pending completion of the repairs to the storm drain. The other appeared to be the result of barrel pump hose drippage during transfer of a small quantity of oil to a docked ship.

The new south dock waste oil collection system is planned to terminate at the waste oil holding tank located at the new fueling facility (Structure 325). This tank was constructed to receive and hold oily waste products. As noted in our previous report the curbing of the truck fill ramp includes a dropped section which permits overflow. This section should be raised to the elevation of the other curbing.

E. Hazardous Waste Management

1. PCB-Filled Transformers

No PCB-filled transformers are in use or are stored at this activity.

IV. REFERENCES AND APPENDICES

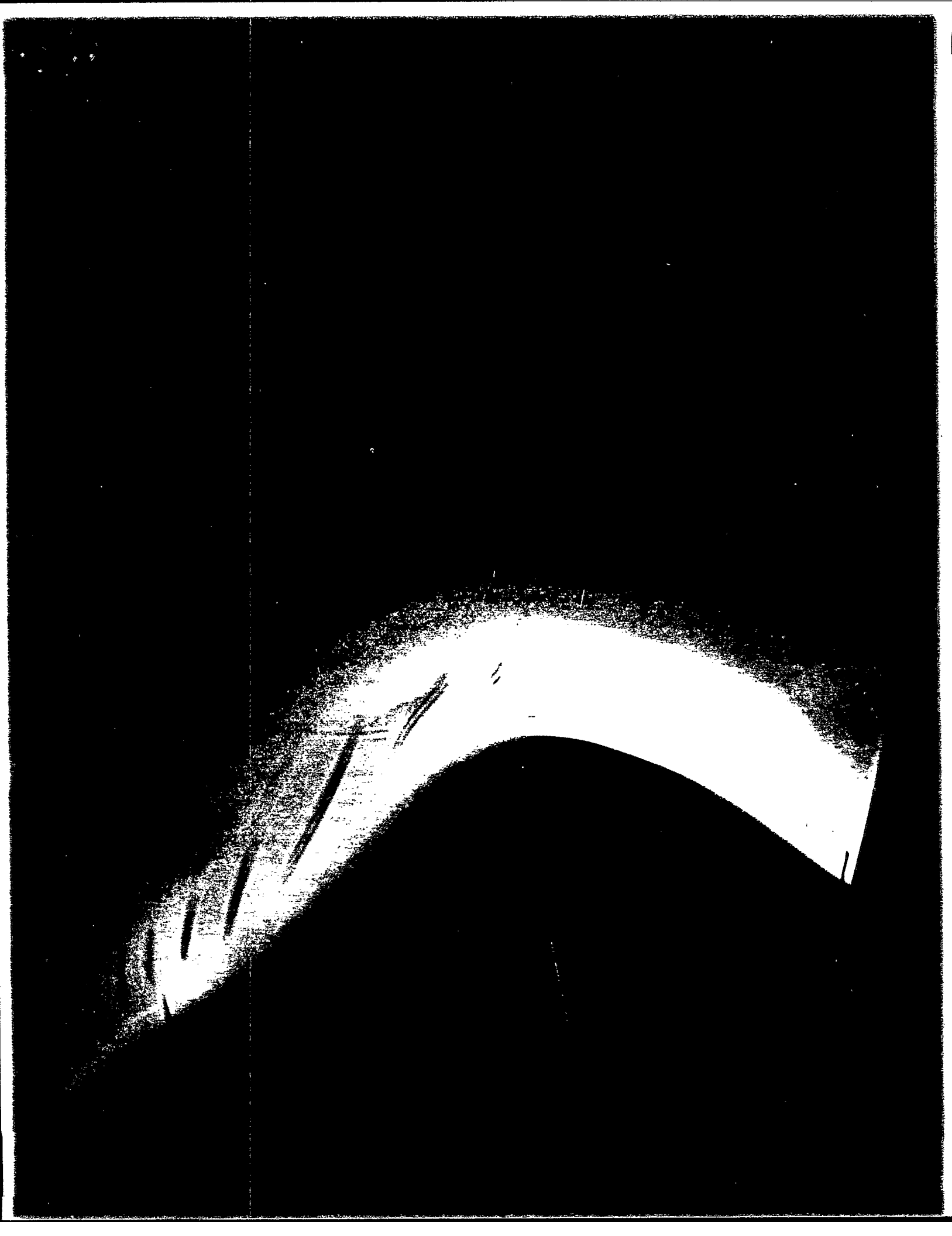
Reference (a) NAVFACINST 5450.19B of 15 Oct 1974

APPENDIX A - NEPSS Pollution Control Selection Report
APPENDIX B - Anachlor Residual Chlorine Analyzer Systems

Prepared by:

GLENN C. BRADLEY, P.E.

PROJECT	INT PROJ	STATUS	END CNST	APPN	FY	DESIGN$	CONSTR$	FUNDED	PROJECT DESCRIPTION
W266A		COMPL	JUL 75	O&MN	75	1	11	YES	WASHRACK OIL/WATER SEPARATOR PANAMA CITY FL NCSC
W266B	P-999	COMPL	MAR 76	MCON	75	6	267	YES	SHIP TO SHORE SEWAGE CONNECTIONS PANAMA CITY FL NCSC
W266C	C2-77	CONSTR	MAR 79	O&MN	78	1	19	YES	SHORE SUPPORT FOR OIL SPILL CLEANUP EQUIPMENT PANAMA CITY FL NCSC
W266D	R2-77	DES	AUG 79	O&MN	78	0	53	YES	TV INSPECTION/REPAIR OF SANITARY SEWER PANAMA CITY FL NCSC
W266D	R2-77	DES	AUG 79	O&MN	79	4	70	NO	TV INSPECTION/REPAIR OF SANITARY SEWER PANAMA CITY FL NCSC
W266E	C1-77	DES	OCT 79	O&MN	78	2	0	YES	#92 OIL POLLUTION EQUIPMENT PROTECTION LEAN-TO. PANAMA CITY FL NCSC
W266E	C1-77	DES	OCT 79	O&MN	79	0	24	NO	#92 OIL POLLUTION EQUIPMENT PROTECTION LEAN-TO. PANAMA CITY FL NCSC
W266F	R1-77	CONSTR	MAR 79	O&MN	78	0	419	YES	OIL POLLUTION PREVENTION - SOUTH AND WEST DOCKS PANAMA CITY FL NCSC
W266G	C1-78	DES	OCT 79	O&MN	78	1	0	YES	SECURITY OIL STORAGE PANAMA CITY FL NCSC
W266G	C1-78	DES	OCT 79	O&MN	79	0	7	NO	SECURITY OIL STORAGE PANAMA CITY FL NCSC
W266H	C2-78	COMPL	JAN 79	O&MN	78	1	12	YES	PERMANENT OIL BOOM INSTALLATION- SOUTH & WEST DOCK PANAMA CITY FL NCSC
W266I	R1-78	DES	OCT 79	O&MN	78	1	0	YES	WEST DOCK STORM DRAIN CORRECTIONS PANAMA CITY FL NCSC
W266I	R1-78	DES	OCT 79	O&MN	79	0	6	NO	WEST DOCK STORM DRAIN CORRECTIONS PANAMA CITY FL NCSC
W266J	C3-78	DES	OCT 79	O&MN	78	1	0	YES	CONNECT PAINT SHOP TO SANITARY SEWER PANAMA CITY FL NCSC
W266J	C3-78	DES	OCT 79	O&MN	79	0	6	NO	CONNECT PAINT SHOP TO SANITARY SEWER PANAMA CITY FL NCSC
W266K	C4-78	DES	OCT 79	O&MN	79	0	1	NO	PHOTO LABORATORY SEWER CONNECTION PANAMA CITY FL NCSC

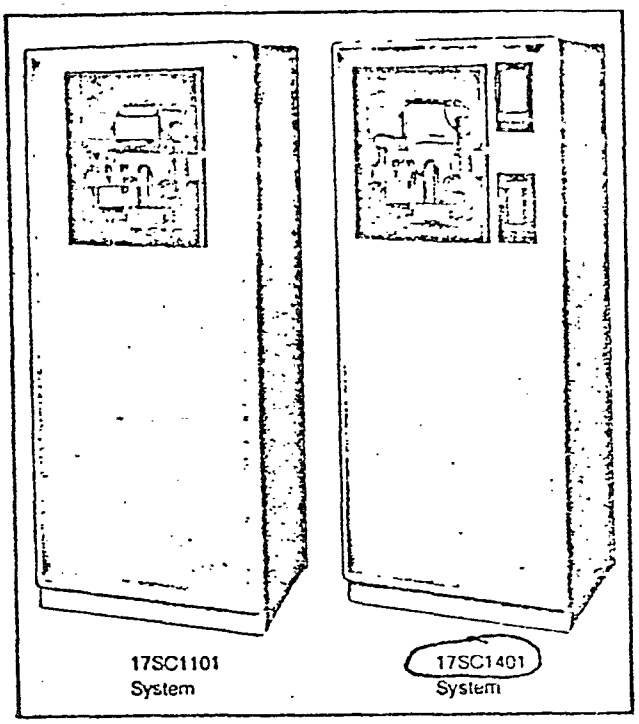


Anachlor™ Residual Chlorine Analyzer Systems

SERIES 17SC1000

The Series 17SC1000 Anachlor Residual Chlorine Analyzer System consists of the analyzer itself and associated secondary instruments mounted in an attractive plastic-impregnated fiberglass cabinet. The analyzer used is the Series 17B4200 Anachlor Analyzer Transmitter, an amperometric unit with an electronic output signal. Numerous types of secondary instruments are compatible with the analyzer which permits indication, recording and controlling of chlorine residual as required by the application.

The analyzer's measurement cell is the flow through type with sample water continually flowing past two dissimilar metal electrodes. In the cell a current is generated that is directly proportional to the amount of free or total chlorine residual present in the sample. This signal is conditioned through special circuitry to produce a 4-20 mAdc output which is applied to the secondary instruments. Circular or strip chart recorders are available to provide a record of chlorine residual, and an electronic controller is available to automatically adjust the chlorine feed rate (or sulfur dioxide rate for dechlorination control).



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DESIGN FEATURES

- Cabinet Mounted: Permits close coupling of analyzer and secondary instruments for complete protection. Attractive fiberglass cabinet matches associated chlorination equipment.
- Convenient: Continuous operation frees operator for other duties by eliminating the need for frequent laboratory testing.
- Reliable: Automatic temperature compensation is standard. Electrode surfaces are continuously cleaned by action of non-abrasive pellets.
- Versatile: Numerous standard systems are available containing various combinations of indicators, recorders, controllers and alarms.
- Automatic Control: Continuous electronic control is available to control chemical feed rates and maintain the desired chlorine residual

ENGINEERING SPECIFICATIONS

Operating Range: 0-.5, 0-1, 0-2, 0-3, 0-5, 0-10, 0-20 milligrams per liter (mg/l)* ranges are standard, other ranges are available upon request.

Sample Requirements: Water for analysis must be supplied at a reasonably constant pressure of between 0.5 and 2 psig (3.5 - 13.8 kPa) at a flow of 0.5 gpm (2 l/min) minimum.

*1 mg/l = 1 part per million (ppm)

Sample Conditioning: Turbidity and chemicals normally found in raw and treated waters do not affect cell operation. Potassium permanganate and ozone, however, do have an adverse affect. A motor-driven filter is recommended when settleable solids are present in the sample.

Output: 4-20 mAdc into 0-750 ohms max. is available at the analyzer. This signal which is proportional to chlorine concentration is transmitted to cabinet mounted instruments.

Sensitivity: The unit will recognize and respond to residual changes as low as 0.01 mg/l chlorine.

Ambient and Sample Temperature Limits: 0-50°C (32-122°F)

Temperature Compensation: A thermistor provides automatic signal compensation for changes in sample temperature.

Power Supply Requirements: 120 Vac ± 10% @ 50/60 Hz. -18 watts maximum.

Chemicals: The Anachlor analyzer is designed to use dilute acetic acid for pH reduction. If desired, hi-capacity pH 4 buffer solution may be used. Potassium Bromide (Ref. U.S. Patent No. 3,412,199) is used for free residual measurement. Potassium Iodide and Sodium Hydroxide are used for total residual measurement. A 30-day supply is furnished with each analyzer system.

Appendix B

SPECIFICATION 17SC1000
Supersedes Specification 17SC1000
Issued June 1973

Connections

Sample Inlet: 1/2-inch (12,7 mm) ID hose adaptor

Drain: 1-inch (25,4 mm) ID hose adaptor.

Electrical: Junction box provided with two 3/4 NPTI conduit connections. Instruments supplied are interconnected and wired to the Junction Box.

Materials of Construction

Cabinet: Attractive, self-supporting unit of fiberglass-reinforced plastic for corrosion resistance. Two-tone aqua and white finish is permanently impregnated in the fiberglass material.

Anachlor Residual Chlorine Analyzer: All materials in contact with the water sample resist corrosion from chlorinated water, waste water, and added reagents. Measurement cell, thermistor, and other components are housed in a die-cast aluminum case finished with corrosion-resistant paint.

Shipping Weight: A typical Anachlor analyzer system consisting of analyzer, secondary instruments and a fiberglass cabinet weighs approx. 250 lbs (113 kg).

SECONDARY INSTRUMENTS

The Series 17SC1000 Anachlor Residual Chlorine Analyzer Systems can include various electronic secondary instruments as follows:

Recorders —

Type 1321 Miniature Electronic Strip Chart Recorder.

Type 1100DB Large Case Electronic Circular Chart Recorder.

Controller — Type 53EG4 Indicating Electronic Fixed Scale Controller.

Alarms — High and/or Low switch contacts can be supplied in the Large Case or Miniature Electronic Instruments.

Note: For details of the analyzer and secondary instruments listed above, refer to the appropriate Specifications: 17B4200, 51-1321, 51-1102DB and 53EG/EH4000.

OPERATION OF ANALYZER

Sample water enters the analyzer; is filtered and then flows through the flow control valve, the flow rate indicator, the head control block and finally into the measurement cell. A thermistor, mounted in the sample stream, senses changes in the sample water temperature and automatically compensates the cell output. Prior to sample entry into the measuring cell, reagents are added to adjust sample pH and to select free or total residual measurement.

In the cell, the sample water flows upward between the concentrically-mounted, outer (copper), Counter Electrode and the inner (gold), Measuring Electrode. A motor coupled to the Measuring Electrode, rotates it at 1550 rpm to maintain ideal, reproducible, electrolysis conditions at the electrode surface and have the cell output independent of slight flow variations. The measurement cell functions like an ordinary wet cell except that the current varies linearly with changes in residual chlorine content of the sample. When water is present in the cell, the measuring electrode becomes polarized or charged and essentially no current flows in the circuit. However, if chlorine is present, the measuring electode is depolarized in proportion to the chlorine concentration and allows current to flow in the cell. The Counter Electrode is oxidized and completes the electrical circuit.

The depolarization current passes through a load resistor network causing a potential drop which is applied to a specially-designed, solid-state amplifier and signal conditioner. Suitable zero and span adjustments can be made at this point to calibrate the electronic 4-20 mAdc amplifier output to read in terms of residual chlorine concentration. Suitable electronic secondary instruments use the 4-20 mAdc amplifier output to indicate, record or control chlorine residual.

Chlorinators With Automatic Control; Cylinder, Wall or Ton Container Mounted

SERIES 70C1760/70/80

Fischer & Porter Series 70C1760, 70 and 80 chlorinators are vacuum operated, solution feed, sonic flow devices which provide automatic control of gas flow in response to transmitted control signals. Each chlorinator includes a vacuum regulator, a flow meter, a Chloromatic T.M. control valve and an ejector.

The vacuum regulator may be cylinder, wall or ton container mounted. A cylinder mounted unit can feed up to 100 lbs/day (2 kg/h); the wall or ton container mounted unit can feed up to 500 lb/day (10 kg/h).

The flow meter is available in a wide selection of capacities. It is usually mounted on the vacuum regulator; however, optionally it may be wall mounted. In systems where the chlorine flow is manually controlled, the flow meter is equipped with a manual rate valve. When a Chloromatic valve is used for automatic control, this manual rate valve is removed and replaced with a plug.

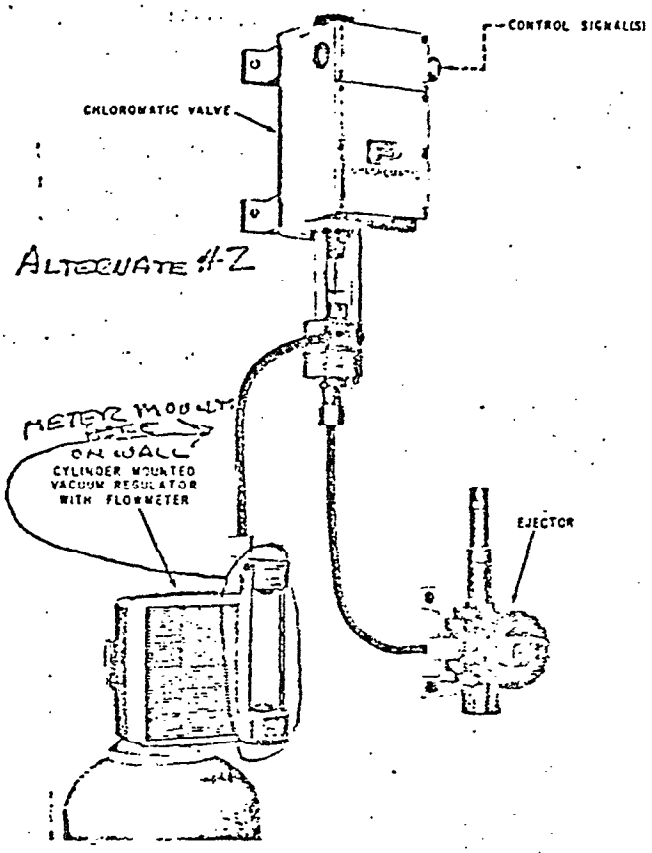
The Chloromatic control valve is wall mounted and responds to control signals from a flow measuring instrument and/or a chlorine residual analyzer controller. Valve characteristics are provided to accept a pacing signal proportional to flow or a signal, the square root of which, is proportional to flow.

The ejector has a fixed diameter nozzle and throat; the size of which depend on the maximum chlorine feed rate and the hydraulic conditions existing in the water supply and chlorine solution lines. Two design options are offered, one for back pressures up to 40 psig (276 kPa) maximum and one for back pressures up to 200 psig (1.38 MPa) maximum.

The four components described above may be used to construct systems for multipoint application of chlorine. The gas flow from the vacuum regulator may be divided to feed more than one application point with the flow to that point being either manually or automatically controlled.

Each application point requires its own flow meter, either a manual or a Chloromatic rate valve and an ejector. The sum of the flows to each application point cannot exceed the capacity of the vacuum regulator.

Dispensers similar to the unit designed for feeding Chlorine (but with different materials of construction) are available for feeding Ammonia, Carbon Dioxide or Sulfur Dioxide gases.



DESIGN FEATURES

- Safety – Vacuum operation provides safety for plant operating personnel and equipment. Built-in safety features prevent damage to the chlorinator under abnormal operating conditions.
- Modern Design – The chlorinators feature sonic flow differential pressure control requiring no moving parts resulting in increased life expectancy and dependability. Integrated circuits in a single NEMA 4X enclosure increase reliability.
- Control Signals – The Chloromatic valve insures positive response to a wide variety of electric signals representing either water flow or chlorine residual measurement. Optionally, both flow pacing and residual control signals can be accepted simultaneously in the Chloromatic control valve.
- Versatility – The availability of separate chlorinator components allows for the selection and mounting in locations most suitable for the operation of the chlorination system.

Vacuum Regulator and Flowmeter: Cylinder mounted vacuum regulators Series 70C1760 and 70 will feed up to 100 lb/day (2 kg/h) of chlorine gas. The wall or ton container mounted vacuum regulator Series 70C1780 will feed up to 500 lbs/day (10 kg/h). Standard metering tubes 5 in. (127 mm) in length are available with the following max. capacities: 10, 25, 50, 75, 100, 200, 300, 500 lb/day, or 200, 500 gm/h 1, 1.5, 2, 4, 6 and 10 kg/h of chlorine gas. Flowmeter rangeability is 20:1 for any one metering tube. For example, a chlorinator with a maximum capacity of 100 lb/day can measure and control gas feed over a range from 5 to 100 lb/day.

For multipoint applications of chlorine solution, any combination of capacities may be used as long as the total gas flow does not exceed the capacity of the vacuum regulator. One or two flowmeters may be mounted directly on the vacuum regulator. If more than two flowmeters are required, they must be wall mounted. The flowmeter body is used to house the rate valve components on manually controlled applications.

When the supply of chlorine gas is exhausted or interrupted, a manually reset indicator on the vacuum regulator is actuated. Optionally, a SPDT switch contact is available for connection to an electric out-of-gas alarm system.

On wall or ton container mounted vacuum regulators, the unit is protected from liquid chlorine damage (up to one full ton container eductor tube) by means of a combination manifold-trap. Trapped liquid chlorine is evaporated by an 8 watt heater. Power is obtained from a 120 volt, 60 Hz source through a 10 ft. (3m) cord equipped with a 3 pin (grounded) plug.

Chloromatic Valve: The Chloromatic valve has two major components; the control valve and the control valve operator. The control valve consists of a housing, a shaped precision plug and a corrosion resistant plastic seat. The plug is positioned with respect to the seat by the valve operator to provide precise control of chlorine feed rates in accordance with the electric input signal(s) to the valve operator.

The control valve operator consists of a solid state electronic circuit, a stepping motor and a precision screw mechanism to position the control valve plug. Two versions of the operator are available; one for a single input signal and one for dual input signals. The single input valve operator can be adapted to respond to any one of the following signals: 4-20, 0-16 or 0-20 mAdc; 1-5, 0-4 or 0-5 Vdc and a direct drive open-close option requiring external contact closures. The first six listed would normally be pacing signals while the first and last could be residual chlorine signals from an analog controller or an intermittent controller.

The dual input valve operator is designed to respond to one of the flow pacing signals listed above as well as an additional 4-20 mAdc signal from a chlorine residual controller. Within the valve operator an electronic multiplying circuit combines the two inputs into a single motor drive signal.

On single input valve operators responding to flow pacing, a dosage adjustment is provided to set the chlorine to water ratio to compensate for differences in chlorine demand. This dosage adjustment is combined with an on-off switch for power shut off-to the motor. On dual input valve operators, only the on-off switch is supplied. With power to the motor shut off, the valve can be operated manually by means of a knob connected to the motor drive shaft. Sixteen turns are required to go from maximum to minimum feed. As an option, valve alarm contacts are available to indicate full open or full closed position of the valve. These contacts, rated at 0.1 amp, close on alarm and are factory set at 1% ±1% and 99% ±1% with no field adjustment.

Control Signals: Fischer & Porter primary flow measuring meters produce signals which are compatable with the Chloromatic valve; however, if the available signal is not compatable, Fischer & Porter manufactures several signal converters which will produce a 4-20 mAdc signal:

Input	F&P Converter Type or Series
3-15 psig	50EW
Pulse Duration	1400MF65
Pulse	50CP
Resistance	50ER
Additive Rate	71L2030

Specification sheets describing the above are available upon request. †

Electrical Requirements: 0.3 amps at 120 Vac, 0.15 amps at 240 Vac.

Ejector Requirements: Water passing through the ejector generates the vacuum required to operate the chlorinator. Water consumption and the required inlet pressure are dependent on the amount of chlorine being fed and the ejector back pressure created by the chlorine solution piping system. Water passing through the ejector must be reasonably clean. If high temperature water is to be used, above 80°F (26°C), reference should be made to Technical Information Bulletin 71-3* for decreased pressure ratings of PVC piping. Series 70C1770 chlorinators are supplied with ejectors for solution lines with back pressures up to 40 psig (276 kPa). Series 70C1760 and 80 are designed for solution lines with back pressures up to 200 psig (1.38 MPa). Both ejectors may be wall mounted and ejectors for capacities of 100 lb/day (2 kg/hr) or less may be pipe line mounted.

Materials of Construction: ABS, PVC, Tantalum, Viton[1], silverplated Hastelloy Alloy C[2], Teflon[1], Kynar[3], Silver and extra heavyduty Borosilicate Glass are used in the construction of the chlorinator. The mounting manifold is ductile iron coated with a corrosion resistant paint. The Chloromatic valve is PVC and the Valve operator is in a cast Aluminum housing.

1. T.M., E.I. DuPont Company
2. T.M., Union Carbide and Carbon Corp.
3. T.M., Pennwalt Corp.

† Note that the Chloromatic Valve does not provide the loop current power source.

*available upon request

Shipping Weights:

70C1760/70	20 lbs. (9 kg)
70C1780	35 lbs. (16 kg)

Add 20 lbs. (9 kg) for each Chloromatic Valve.

DESCRIPTION OF OPERATION

Water flowing through the ejector creates a partial vacuum which acts on a diaphragm assembly to open the inlet valve admitting gas from the source into the vacuum regulator. The spring-opposed diaphragm regulates the vacuum to a closely controlled value. At this point the gas flow may or may not be divided to feed chlorine gas to one or more locations. For each application point, the gas passes through a flowmeter to either a manual or an automatically controlled rate valve. This controlled flow then goes to the ejector where it is thoroughly mixed and dissolved in the water and carried to the application point as a solution.

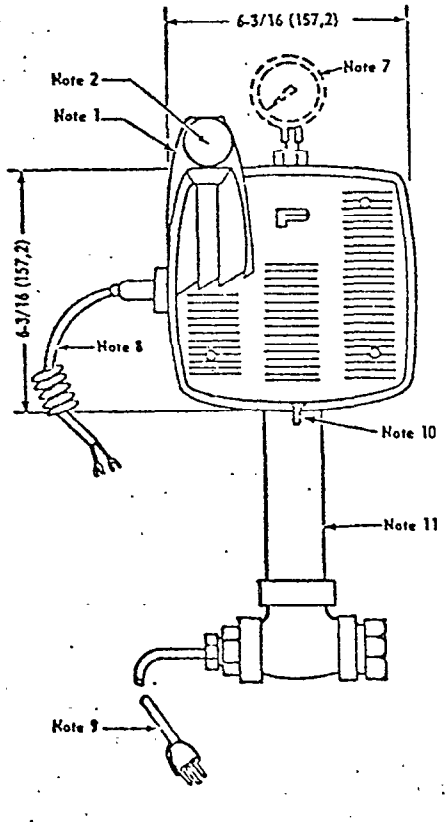
When the flow is divided and multiple metering tubes and ejectors are used, each operates independently of the others. Adjustment of one of the gas flow rates has no effect on the other rates.

The system is always under a partial vacuum from the ejector to the gas inlet valve during operation. If the water supply to the ejector is stopped, or the operating vacuum is lost for any other reason, the spring loaded gas inlet valve immediately closes to isolate the chlorinator from the gas supply. Any gas under pressure which might enter the regulator is vented from the system through the built-in pressure relief valve. If the source of chlorine gas is exhausted or the gas line plugged, an excess vacuum valve in the regulator closes to prevent any moisture being pulled back into the gas supply lines. At the same time the red signal indicator pops out of the regulator to indicate that the gas supply has been interrupted.

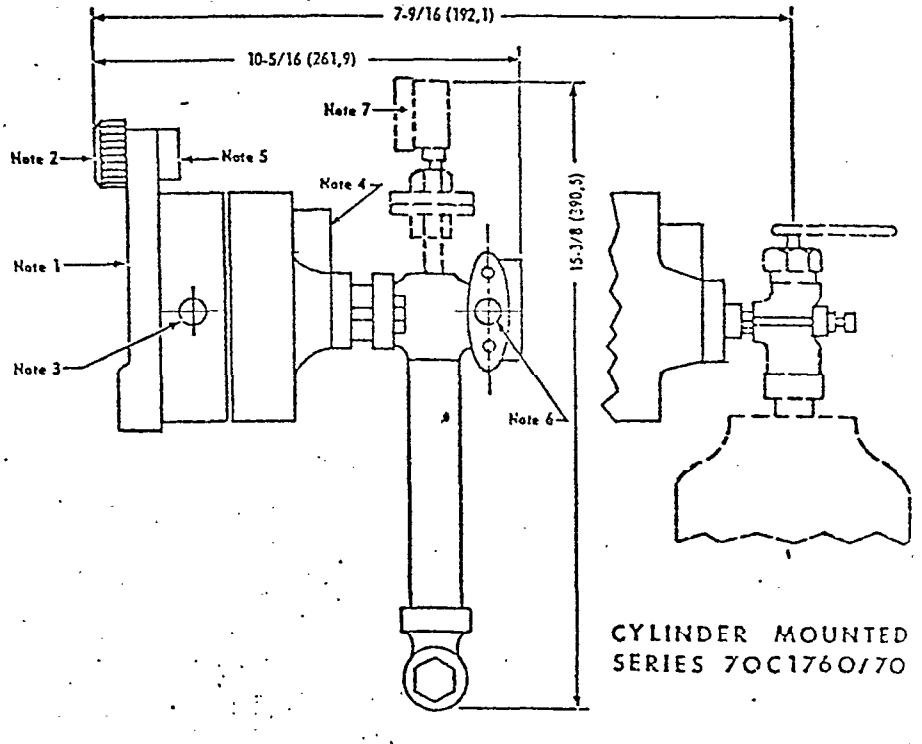
Within the ejector there is a diaphragm operated check valve to prevent water from reaching the regulator. In the Series 70C1760 and 80 ejectors, there is also a ball check valve and an emergency drain connection.

DIMENSIONS

Vacuum Regulator



WALL OR TON CONTAINER MOUNTED
SERIES 70C1780



CYLINDER MOUNTED
SERIES 70C1760/70

NOTES:

1. One or two flowmeters may be mounted directly on the vacuum regulator. If more than two are required they must be wall mounted.
2. Manual rate valve knob, when Chloromatic valve is used, knob is replaced by plug.
3. Vent connection, 1/4 NPTI, 3/8-inch (9,5 mm) tubing adapter fitting provided.
4. Gas outlet connection, 1/2 NPTI, when flowmeters are wall mounted. (see note 12)
5. Gas outlet connection, 1/2 NPTI, when flowmeters are vacuum regulator mounted (see note 12)
6. Gas inlet connection (low side) 3/4 NPTI. For ton container mounting, a special adapter and valve are supplied. For wall mounting, a flexible connector and adapter are supplied.
7. Optional gas pressure gage
8. Optional 10 ft. (3m) of 3 conductor cable and plug assembly to connect alarm switch to a remote mounted exhaust gas alarm system.
9. Heater cord, 10ft (3m) long with 3 pin (grounded) plug, 120 V, 60hz required.
10. Outlet gas indicator. Bottom location when flowmeters are vacuum regulator mounted. Top location when flowmeters are wall mounted.
12. 5/8-inch (15,9 mm) tubing adapter fitting provided.