RANSOME MANUFACTURING

Revised June 1995

MPM SERIES
MODULATING PROPORTIONING MIXERS

OPERATION MANUAL

CONTENTS PAGE

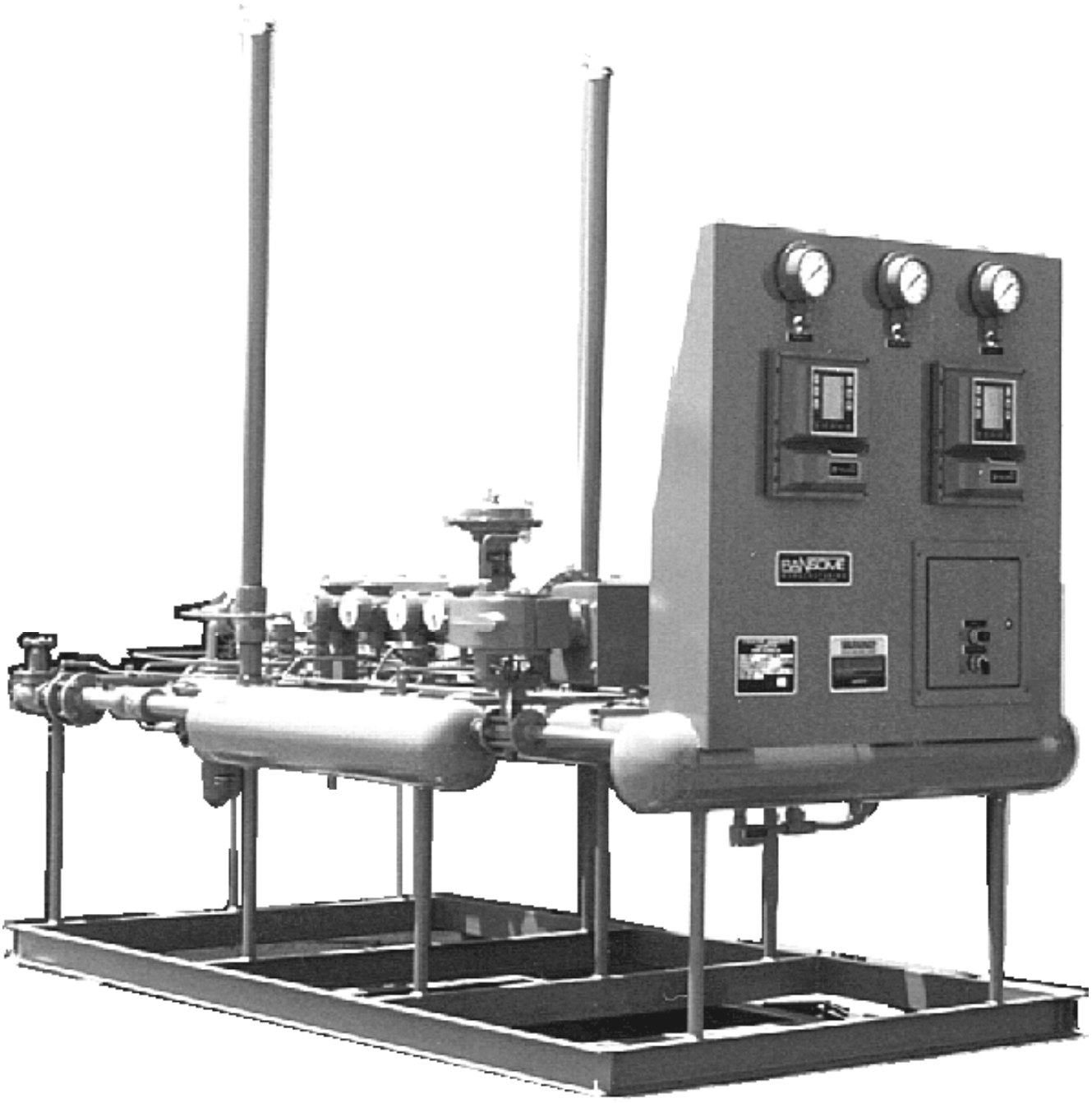


Figure 1-1 - MPM Series Modulating Proportioning Mixer

1. GENERAL

1.01 This manual provides a physical and functional description and operating theory necessary for effective use of Ransome Manufacturing's MPM Series Mixers.

1.02 Ransome MPM Mixers provide an economical, dependable source of Propane/Air mixture to replace natural gas for any industrial or commercial use up to one million SCFH at 10 to 20 psi.

1.03 Propane is a highly concentrated source of energy, with 2500 BTU's per Cubic Foot heat content and must be diluted with air to use as a substitute for natural gas. The Ransome MPM Mixer blends in just the right amount of air for an equivalent mixture, providing the same heat input as natural gas. A mixture with specific gravity of 1.31 (1480 BTU/Cu.Ft.) will match 0.6 specific gravity natural gas with approximately 1000 BTU/Cu.Ft. gross heat content.

1.04 Features of the MPM Series Mixers include:

(a) Completely automatic operation.

(b) 100 to 1 turndown ratio.

(c) Simple installation, requires only three piping connections.

(d) 100% fail safe operation.

(e) Provides continuous operation without surge tanks.

(f) Completely packaged on a skid, ready to connect to a piping system.

(g) Listed by Factory Mutual.

(h) Compact modular design; requires only 5' x 15' floor space for up to an MPM-300 unit.

(i) Quick response controls to maintain accurate LP-Gas-Air ratio even during varying conditions.

(j) Simple one lever adjustment of LP-Gas-Air ratio.

(k) Can be combined with flow recording and control equipment for automatic peak load shaving service.

Options

1.05 High pressure design: "H" Option. For units with mixed gas sendout pressure over 60 psi.

1.06 Outage Panel: "C" Option. The First Outage Control Panel provides the user with cause of safety shutdown, to simplify service. It includes:
(a) Alarm lights for high and low propane and mixed gas pressures.

(b) Alarm lights for high and low air pressure.

(c) Alarm light for low mixed gas temperature.

(d) Alarm light for high air ratio.

(e) Alarm acknowledge switch.

1.07 Ransome MPM Series Mixer units may be equipped with a built-in Specific Gravitometer to give a continuous reading of the mixed gas specific gravity.

1.08 Units are wired for Class I, Group D, Division 2 , for locations remote from direct-fired vaporizers and installations using indirect-fired vaporizers.

How to Select a Mixer

1.09 Determine total amount of Propane/Air Mixed Gas required. Add up the maximum inputs of all gas-using equipment in the system from the manufacturer's data plates or literature, usually expressed in BTU/Hr.

NOTE

Be sure this is correct and in BTU/Hr. If in doubt, contact manufacturer of equipment.

(a) Calculate required capacity as follows:

$$Q = \frac{H}{1{,}480}$$

Where:

Q = Reqired Capacity in Cubic Feet/Hr. of Propane/Air Mixed Gas

H = Total input required, BTU/Hr.

Refer to table 4-1 to determine Ransome model. Derating the load is not necessary, but it is wise to allow for future expansion.

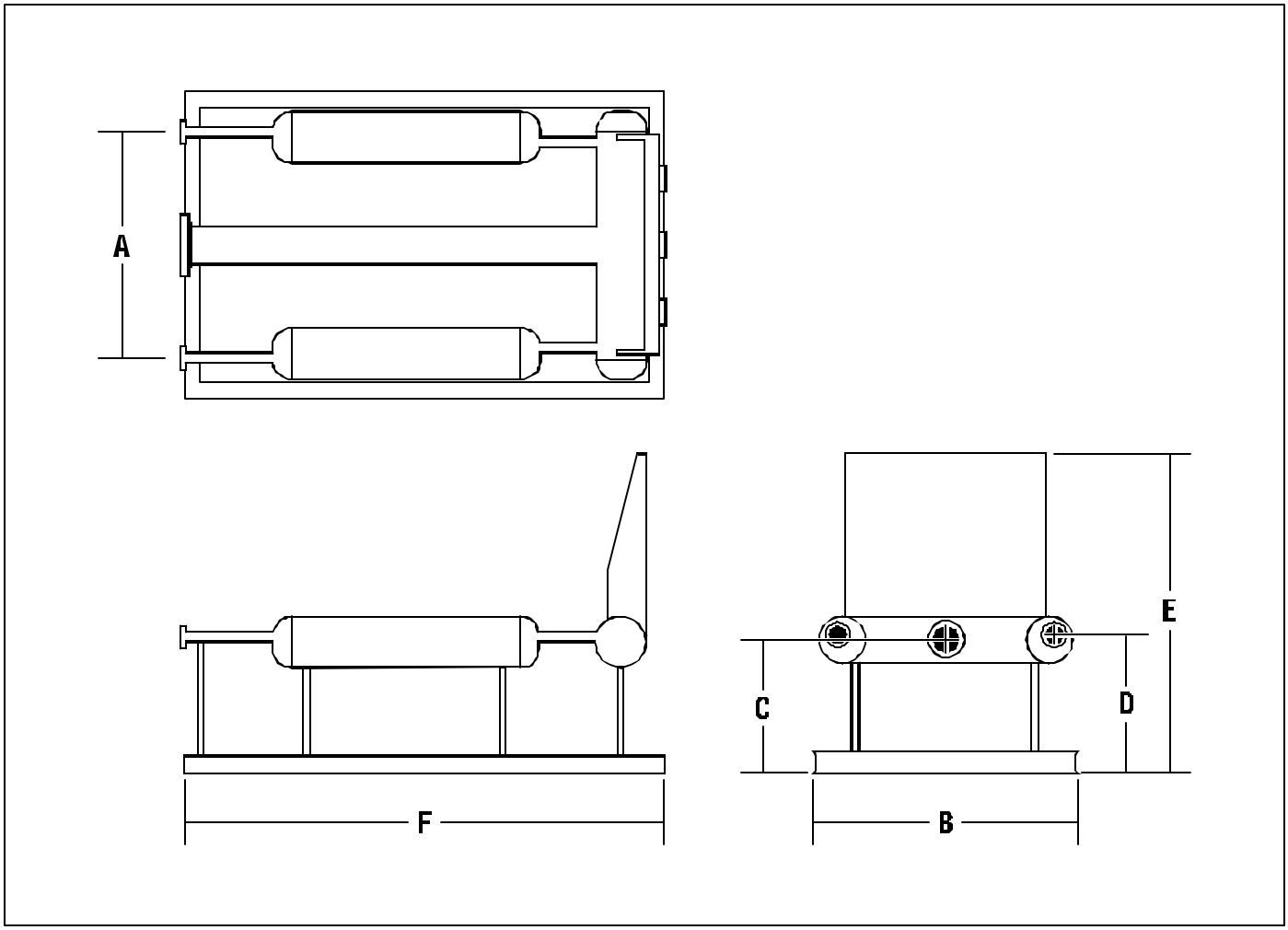
Detetmine the desired pressure of the mixed gas. This pressure should be no higher than necessary to transmit the required capacity of gas through transmission line to load.

2. PHYSICAL DESCRIPTION

2.01 The Ransome MPM Series Mixers are all similar in design and construction. They are designed for mounting on a concrete slab, outdoors in varied weather conditions.

2.02 The principle difference between models is capacity, ranging from 15,000 to 1,000,000 SCFH mixed gas, with sendout pressures available from 10 to 200 psi.

2.03 Figure 2-1 illustrates a typical MPM Series Mixer and is provided with key letter call-outs for MPM-15 thru MPM-300 physical dimensions.



Ransome Model	DIMENSIONS, IN.						Approx Weight LB.
	A	B	C	D	E	F	
MPM-15	48	60	28.5	30	75	107	1,650
MPM-30	48	60	28	30	76	113	1,750
MPM-50	48	60	27.75	30	77	119	1,950
MPM-75	48	60	27.5	30	78	123	2,250
MPM-100	48	60	27	30	79	128	2,350
MPM-150	48	60	26.75	30	80	134	2,550
MPM-200	48	60	26.5	30	81	140	2,950
MPM-250	48	60	25.75	30	82	148	3,300
MPM-300	48	60	24.75	30	83	154	3,900

Ransome Model	DIMENSIONS, CM.						Approx Weight KG.
	A	B	C	D	E	F	
MPM-15	122	152	72	76	190	272	748
MPM-30	122	152	71	76	193	287	794
MPM-50	122	152	70	76	196	302	885
MPM-75	122	152	70	76	198	312	1,021
MPM-100	122	152	69	76	201	325	1,066
MPM-150	122	152	68	76	203	340	1,157
MPM-200	122	152	67	76	206	356	1,338
MPM-250	122	152	65	76	208	376	1,497
MPM-300	122	152	63	76	211	391	1,769

Models MPM-500, MPM-750 and MPM-1000 also available. Consult factory for sizing information.

Figure 2-1 - MPM Series Physical Specifications

2.04 Figure 2-2 provides a full front view of a typical MPM Series Mixer, as well as a detailed view of the control panel. Associated Table 2-2 provides a cross reference for each call-out, identifying the respective element as to function and/or description.

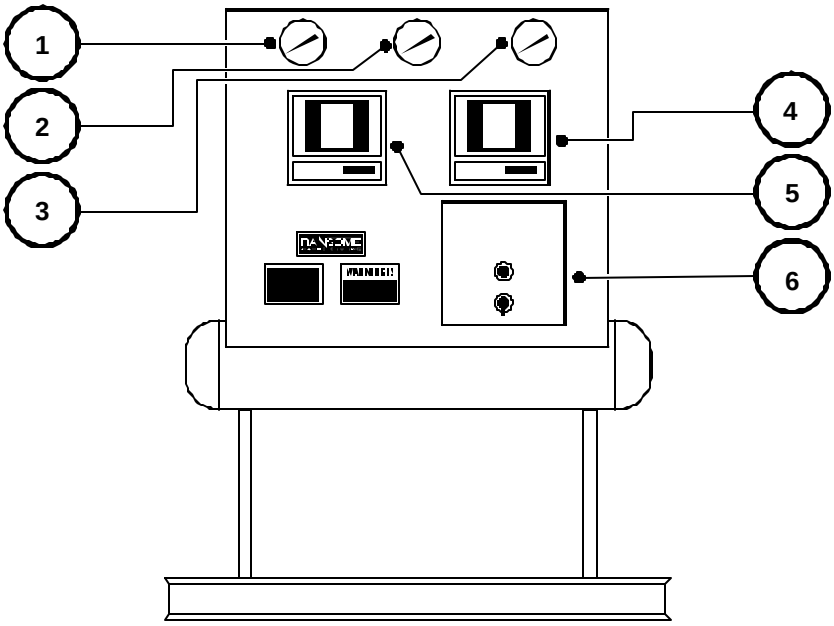


Figure 2-2 - Typical MPM Series Assembly

Key	Element	Function
1.	Gas Inlet Pressure Gauge (0-300)	Indicates incoming gas pressure.
2.	Mixed Gas Pressure Gauge (0-60)	Indicates outgoing mixed gas pressure.
3.	Air Inlet Pressure Gauge (0-100)	Indicates incoming air pressure.
4.	Air Controller	Controls pressure drop across air side to maintain gas/air ratio.
5.	LP Controller	Controls pressure drop across gas side to maintain mixed gas pressure.
6.	Control Box	Housing for START/STOP switches and electrical controls.

Table 2-2 - Typical MPM Series Assembly

2.05 Figure 2-3 illustrates a typical MPM Series Mixer with key number call-outs for all the major elements an controls. Associated Table 2-3 provides a cross reference for each call-out, identifying the respective element as to function and/or description.

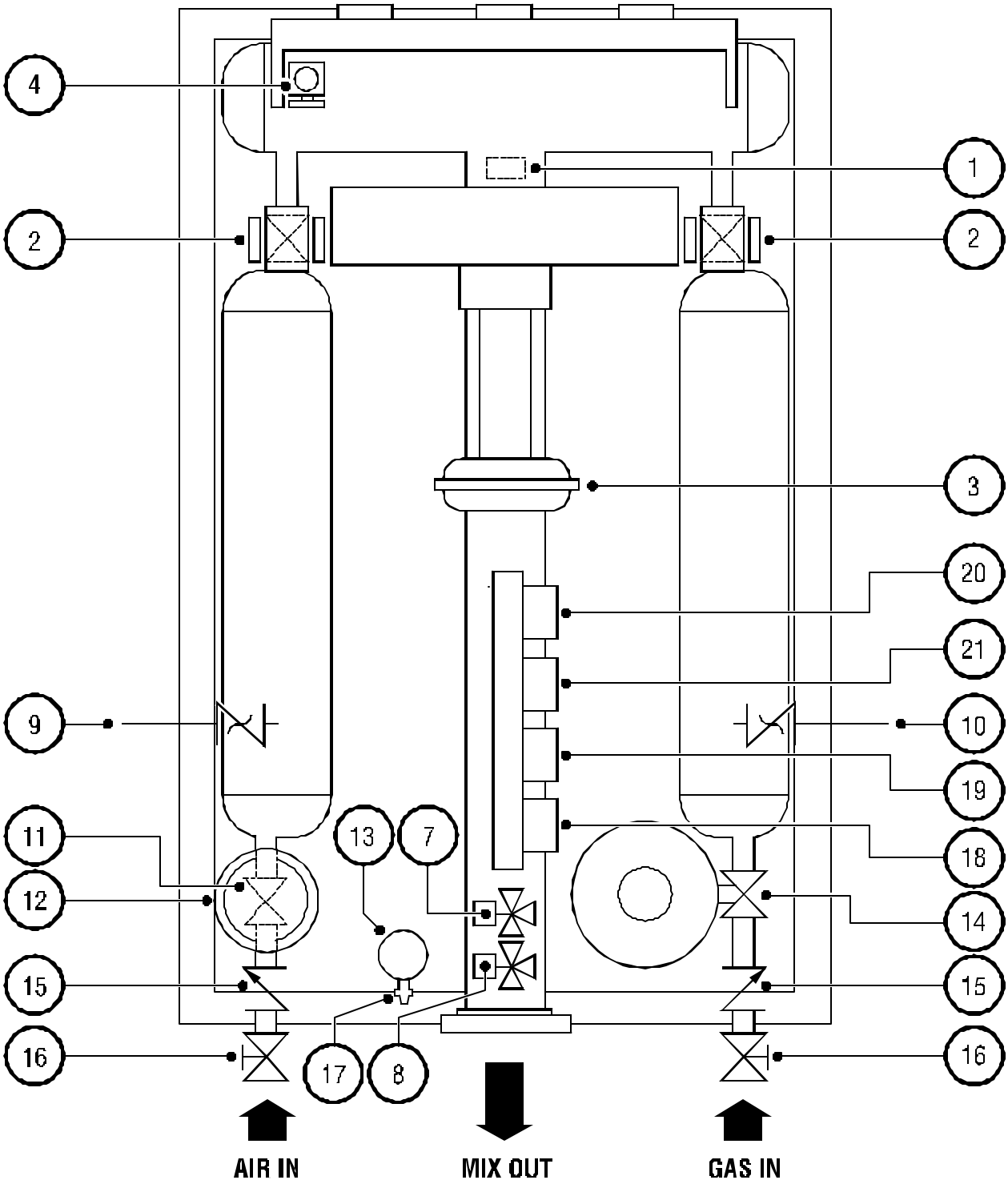


Figure 2-3 - Typical MPM Series Assembly

Key	Element	Function
1.	Low Temperature Switch	Safety interlock, monitors outgoing mixed gas temperature.
2.	Flow Control Valve	Modulates based on a signal from the LP controller.
3.	LP Actuator	Provides the force necessary to modulate the flow control valves.
4.	Instrument Air Regulator	Provides regulated instrument air to the flow controls.
5.	N/A	N/A
6.	N/A	N/A
7.	3-Way Solenoid Valve (air)	Exhausts instrument air supply to atmosphere which closes all control valves.
8.	3-Way Soleniod Valve (gas)	Exhausts pilot gas supply to atmosphere which closes main gas regulator.
9.	Air Relief	Vents excessive air pressure in the event of regulator failure.
10.	Gas Relief	Vents excessive gas pressure in the event of regulator failure.
11.	Air Control Valve	Modulates based on a signal from the air controller.
12.	Air Actuator	Provides the force necessary to modulate the air control valve.
13.	Instrument Air Filter	Provides filtration necessary to supply clean, dry air to the flow controls.
14.	Gas Regulator	Provides regulated gas at 5 psi over the mixed gas pressure.
15.	Check Valves	Prevents back-flow of air into the gas system.
16.	Shut-Off Valves	Allows manual shut-off of gas line for inspection, repair or shut down.
17.	Instrument Air Inlet	Must be supplied with compressed air @ 50 to 100psi.
18.	Explosion -Proof Pressure Switch (HIGH/LOW Propane Limit)	Safety interlock, monitors incoming gas pressure.
19.	Explosion-Proof Pressure Switch (HIGH/LOW Mix Limit)	Safety interlock, monitors outgoing mixed gas pressure.
20.	Explosion-Proof Pressure Switch (HIGH/LOW Air Limit)	Safety interlock, monitors incoming air pressure.
21.	Explosion-Proof Pressure Switch (High Air Ratio Limit)	Safety interlock, monitors gas/air ratio.

Table 2-3 - Typical MPM Series Assembly

3. FUNCTIONAL DESCRIPTION

3.01 Your Ransome Modulating Proportioning Mixer (MPM) may look complicated at a glance, but in fact it operates on simple pneumatic principles. It is as reliable as the gas system that supplies gas to your town, factory and your home - because it uses the same regulators and controls.

3.02 Figure 3-1 illustrates the general schematic for MPM Series Mixers. The Schematic is functionally equivalent for all sizes.

3.03 LP-Gas supplied to the vaporizer, which in turn is supplied to the mixer, from the user's storage tank(s) system at a pressure dependent on temperature. (refer to Table 3-1)

Safety Interlock

3.04 Automatic shutdown protection is provided in Ransome's MPM Series Mixer systems with a Safety Interlock Circuit and sensors at critical points.

(a) 117V AC power interruption.

(b) High and Low LP-Gas vapor pressure.

(c) Low Mixed Gas temperature.

(d) High and Low Mixed Gas pressure.

(e) High and Low Air pressure.

(f) High Air ratio.

Interruption of the Interlock Circuit results in the system being shut down. The two 3-way safety solenoid valves will de-energize causing all pneumatically actuated control and shutoff valves to fail closed. The interrupted interlock point is displayed on the First Outage Panel if the mixer is configured with this option.

3.05 Mixers are provided with check valves on both propane and air inlets to prevent the backflow of air or gas into supply lines. A high air ratio pressure switch is also provided to shut the system down in the event air pressure should exceed propane pressure and facilitate the forming of an explosive mixture.

3.06 All MPM Mixers require a uniform supply of compressed air for proper operation and control.

NOTE

An Air Pressure Regulator is highly recommended between air compressor receiver tank and MPM Mixer inlet.

What it Does

3.07 The Ransome MPM is designed to act as gas supply system that is used whenever your natural gas is curtailed. The mixer takes vaporized propane and mixes it with air in the proportion of approximately 55% propane to 45% air. It does this accurately over a very wide range. This mixture then can be used as a direct replacement for natural gas. It will burn in boilers, process ovens, appliances and any burner that burns natural gas. There should not be any need to readjust the burners when propane air mixture is being used as a replacement for natural gas.

Table 3-1 - Storage Tank Pressure vs. Ambient Temperature Chart

Temperature (F)	Approximate Pressure PSIG	
	Propane	Butane
100	220.0	46.0
100	190.0	37.0
90	165.0	29.0
80	140.0	22.0
70	120.0	16.5
60	102.0	11.5
50	86.0	6.9
40	72.0	3.0
30	58.0	
20	47.0	
10	37.0	
0	28.0	
-10	20.0	
-20	13.5	
-30	8.0	
-40	3.6	

How it Operates

3.08 To understand the operation of the MPM, a basic knowledge of the operation of regulators must be established. Suffice to say that a gas regulator will control the flow of gas by controlling the downstream pressure. Briefly then, if the downstream flow of the regulator is cut off, or curtailed, there will be a slight build up of pressure — the spring in the regulator will be compressed and the regulator seat will close or throttle in order to maintain a constant downstream pressure.

Let's assume that you have a requirement which would need 100,000 cubic feet of propane/air mixture at X psig.

The first consideration is the supply of propane vapor. According to the foregoing, we need 55% propane vapor, or 55,000 CFH (cubic feet per hour). The propane vaporizer will supply this amount. Since the system will be used during the winter months, we cannot rely on the vapor pressure of the propane being sufficient to satisfy the system. Therefore, a pressurizing pump is necessary to assure that adequate pressure is available and to keep the pressure constant. Constant pressures and temperatures are mandatory for good control.

Having assured ourselves that we have adequate propane vapor, we now need 45%, or 45,000 CFH, of air. Air compressors are rated in CFM (cubic feet per minute), so we divide 45,000 by 60 to obtain 750 CFM. Since we are trying to supply mixed gas at X psig (your required outlet pressure), we need 750 CFM of clean air at (X+10) psig. We ask that you supply regulated air at 10 psi over the mixed gas send out pressure.

Referring to Figure 3-1 (page 9), we have propane at the propane vapor pressure control regulator (VPC-1) at 100 psig minimum from a vaporizer. VPC-1 reduces the pressure to (X+5) psig in chamber "C" and DPCV-2 (differential pressure control valve) is set to maintain a 5 psi difference. Therefore, the pressure in chamber "B" is the desired X psig. If the set point on DPC-2 (controller) is changed, it will alter the downstream pressure. For example, if you change the set point of DPC-2 to 3 psi differential, since the upstream of valve V-2 is set at (X+5) psig, the downstream pressure will be (X+2) psig. Therefore, once the desired differential is set, any pressure change should be made by altering the pressure setting of VPC-1 regulator.

Note: both V-2 and V-3 valves are controlled by DPC-2 controller. They are stroked and matched so that they open and close equally. If the pressure in chamber "C" was the same as chamber "A", and assume that the control valves V-2 and V-3 were open equally, the resultant flow of air and propane would be equal. But we need 55% propane the differential on the controller at 2 psi. This controller (DPC-1) sends an air signal to cont rol valve V-1 and maintains the pressure in chamber "A" at (X+2) psig. We now have two variable orifices or valves (V-2 and V-3) both opening and closing equally. The downstream pressure is set at X psig. Pressure in chamber "A" is (X+2) psig and pressure in chamber "C" is (X+5) psig. More propane will pass than air through the same size orifice. If the gas requirement climbs, the pressure in chamber "B" will drop ever so slightly. The controller DPC-2 senses the drop and sends a signal to the control valves (V-2 and V-3) to open. So as the machine operates, DPC 1 controls the mixture and DPC-2 maintains a steady send out pressure.

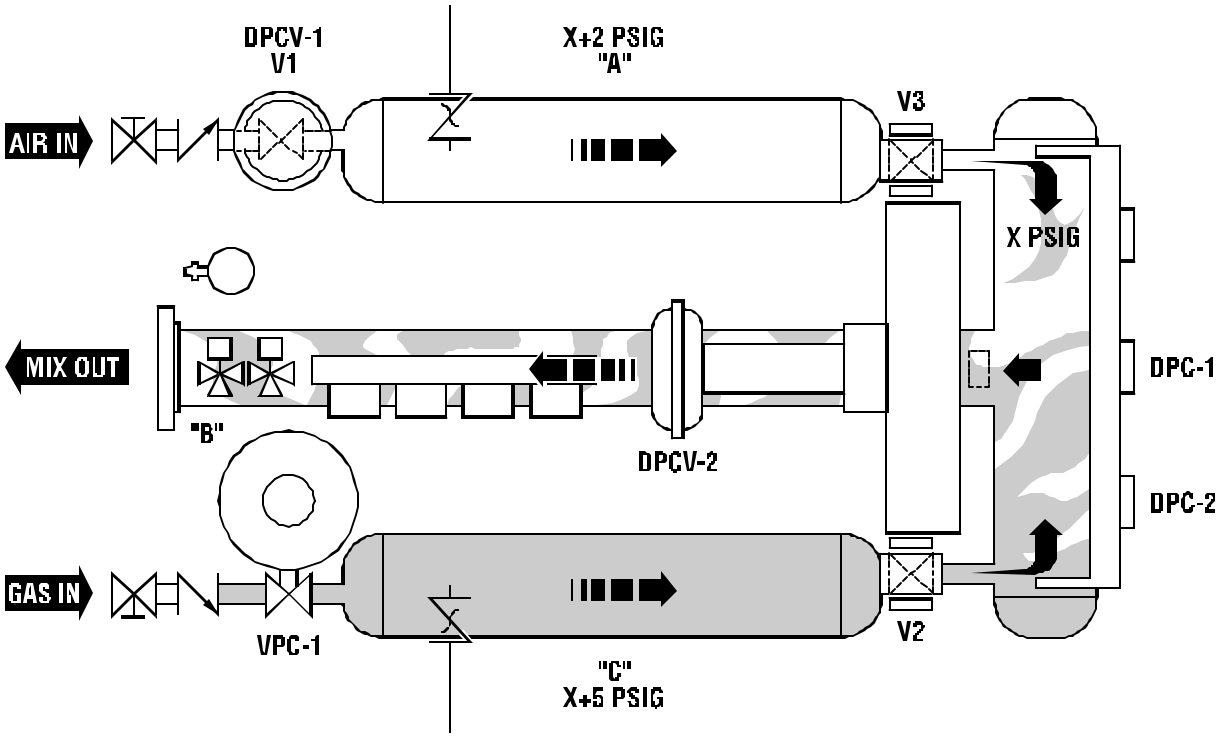


Figure 3-1 - General Schematic for MPM Series Mixers

4. SPECIFICATIONS

4.01 Table 4-1 will provide the user with tabulated performance specifications for MPM Series Mixers. Figure 2-1 illustrates the physical specifications for MPM Mixers. The user will find this useful when planning new installations.

4.02 Standard units are built to Factory Mutual specifications. Factory-tested and calibrated to deliver 1.31 nominal specific gravity (1480 BTU/CF) **propane-air** mixture. Specific desired mixed gas pressure from 10 to 60 psi.

Selection Chart

If your Peak Load requirements are up to			Vaporization Required GPH Propane	Air Required SCFM	Line Sizes (IN.)			Ransome Model
Millions of BTU/HR	Thousands of SCFH Natural Gas (1)	Thousands of SCFH Mixed Gas (2)			Air In	Propane In	Mix Out	
22.1	22.1	15	244	102	2	2	6	**MPM-15**
44.25	44.25	30	488	204	2	2	6	**MPM-30**
73.75	73.75	50	813	340	2	2	6	**MPM-50**
110.6	110.6	75	1,220	510	2	2	6	**MPM-75**
148	148	100	1,626	680	2	2	6	**MPM-100**
221	221	150	2,440	1,020	3	2	6	**MPM-150**
296	296	200	3,253	1,360	4	3	6	**MPM-200**
369	369	250	4,066	1,700	4	3	6	**MPM-250**
443	443	300	4,879	2,040	4	3	8	**MPM-300**
738	738	500	8,132	3,400	4	3	8	**MPM-500**
1,106	1,106	750	12,198	5,100	4	3	8	**MPM-750**
1,475	1,475	1,000	16,264	6,800	6	4	12	**MPM-1000**

Selection Chart - SI Conversion

If your Peak Load requirements are up to			Vaporization Required KG/HR	Air Required M3/M	Line Sizes (CM.)			Ransome Model
M KCAL/HR	M3/HR Natural Gas (1)	M3/HR Mixed Gas (2)			Air In	Propane In	Mix Out	
5.57	626	425	469	2.89	5	5	15	**MPM-15**
11.15	1,253	850	937	5.78	5	5	15	**MPM-30**
18.59	2,089	1,416	1,561	9.63	5	5	15	**MPM-50**
27.87	3,132	2,124	2,343	14.44	5	5	15	**MPM-75**
37.30	4,191	2,832	3,123	19.26	5	5	15	**MPM-100**
55.69	6,259	4,248	4,686	28.89	7	5	15	**MPM-150**
74.59	8,383	5,664	6,247	38.52	10	8	15	**MPM-200**
92.99	10,450	7,080	7,808	48.18	10	8	15	**MPM-250**
111.64	12,546	8,496	9,370	57.77	10	8	20	**MPM-300**
185.98	20,900	14,160	15,617	96.29	10	8	20	**MPM-500**
278.71	31,322	21,240	23,425	144.43	10	8	20	**MPM-750**
371.7	41,772	28,320	31,234	192.58	15	10	30	**MPM-1000**

(1) Natural Gas; S.G.U. = .6, Gross Heat Content 1000 BTU/CF **(2)** Mixed Gas; Propane-Air, S.G.U. = 1.31, Gross Heat Content 1480

Table 4-1 - MPM Series Functional Specifications

5. OPERATION

5.01 The intent of part 5 is to give the LP-Gas user general information on installation and turn-on procedure for the Ransome MPM Series Mixers. Each user's application will differ slightly, but it is hoped that the user will gain from the generalized instructions.

5.02 After consultation with a Ransome Sales and Service Engineer or Distributer, the user will make a plan for the LP-Gas storage, vaporizer and mixer locations.

5.03 A Ransome mixer is part of a complete system, all elements of which must be properly designed and installed before it can do it's job. It is critical that sufficient supplies of both LP-Gas and air are brought to the mixer.

Installation

5.04 When the Ransome equipment arrives, examine the shipping container for obvious shipping damage. All claims for shipping damage should be made to the shipper, not to Ransome Manufacturing or the distributer. Obvious workmanship problems or incomplete shipments should be immediately referred to Ransome Manufacturing (or distributer) following the warranty procedured described in part 6 of this manual. The Shippment will include a Ransome MPM Test Report illustrated in Figure 5-2. This should be retained with the Operation Manual as part of the user's Maintenance records.

Start Up and Operating Procedures

5.05 Ransome MPM mixers are built in several configurations to suit field requirements, and may differ in appearance. However, all operate the same way, and use the same basic valve and control systems. Therefore, the same start-up, calibration and operation manual applies in all cases.

5.06 Ransome equipment is thoroughly tested at the factory and proven to be free from leaks. However, vibration and jarring during subsequent handling, shipment and in stallation can cause leaks! Therefore, using a soap solution or a suitable leak detector, a thorough leak test must be conducted after installation and any leaks repaired prior to operation.
DO NOT use matches or other flame to conduct such tests.

5.07 All Ransome MPM mixers are factory tested and calibrated using commercial propane. It is not necessary to recalibrate the machine before start-up unless a major component, such as a differential pressure control valve, has been replaced or damaged in transit.

5.08 Start up instructions are based on proper design and installation of entire system including storage tanks, valves, piping, pumps, bypass valves, electrical systems, etc. All must be inaccordance with NFPA No. 58 standards and all states, provincial, and local regulations. Use of clean LP-gas supply, free of excessive contamination. Use of clean, dry compressed air. Thorough purging of sand, dirt, weld slag and any other foreign material from all lines prior to start-up.

Initial Start Up and Testing

Step 1 - Provide flare system or other means to allow testing of MPM up to 20% of capacity.

Step 2 - Attach specific gravitometer or other suitable measuring device to a 1/4" sample connection on MPM gas outlet.

Step 3 - Air may be purged from line between injection point at natural gas line and MPM outlet by allowing natural gas to flow backwards through line and out through flare. Provide continuous ignition source to flare until purging is complete. Check specific gravity at test connection on MPM as purging operation progresses, continuing to purge until specific gravity indicates air has been removed. Then, close shut-off valve on mixed gas line downstream of MPM to prevent flow of mixed gas into natural gas line during initial start-up and testing.

Step 4 - Check propane and air controllers, readjusting if necessary to assure set point, proportional band (gain) and reset (integral) are in accordance with values shown on factory test report.

Step 5 - Assure that all pressure sensing lines to Pressure Transmitters are open.

Step 6 - Activate LP-Gas vapor and compressed air systems, assuring continuous supply of gas and air at required minimum pressures to inlets of MPM. (See factory test report).

Step 7 - Depress "OFF/ON" switch and release. The "POWER" light will come on. Momentarily depress the start switch and release. Solenoid valves on MPM will click in and out as switch is operated, and the Annunciator lights will come on indicating the status of the safety interlocks. If the above does not occur, check power supply and wiring between MPM and control panel, correcting as necessary.

NOTE

Skip steps 1 thru 7 for normal day-to-day operation. Flare need not be used.

Testing

5.09 Test MPM as follows:

Step 8 - Open air inlet valve.

Step 9 - Open propane inlet valve.

Step 10 - Actuate flare ignitor, and open 2" flare valve approximately two turns.

Step 11 - Depress the "START" switch.

Step 12 - Solenoids will energize, and flow of gas and air will commence, building mixed gas pressure and starting flare.

Step 13 - Hold "START" switch until mixed gas pressure reaches original factory calibrated level, and controllers stabilize.

Step 14 - If controllers do no stabilize within 20 seconds, increase flow to flare in slight increments until they do.

Step 15 - Observe LP vapor inlet and air inlet pressures, assuring that valves are within limits specified in factory test report. If the green "READY" light is illuminated, the start switch can be released, and the MPM will operate automatically at original factory calibrated levels.

CAUTION

Do not use matches or other flames to conduct leak test.

Step 16 - Open flare valve fully to operate MPM at 20% capacity. MPM will automatically proportion flows of gas and air to maintain specific gravity according to factory test report. Some momentary change in specific gravity may be indicated while flow rate to flare is being changed, but will return to proper level in short period of time. (This temporary change is normal, and is noted because pressure tap is located immediately downstream of mixer, and because of reaction time of gravitometer. For permanent monitoring of specific gravity, a test tap should be provided in mixed gas line a considerable distance downstream of mixer.

Step 17 - Turn flare valve back to initial flow setting. MPM will continue to operate, proportioning gas and air flow and maintaining proper mixed gas pressure.

Step 18 - Depress "OFF/ON" switch. All main valves in MPM will close, mixed gas pressure will drop and flare will go out as residual gases are evacuated from flare line. KEEP FLARE IGNITION SYSTEM ON.

Step 19 - Restart MPM by depressing the "START" switch. Flare will come back on and MPM will stabilize in about 15 seconds. Release "START" switch, when the green "READY" light is illuminated and MPM will operate automatically.

Step 20 - Slowly turn flare flow valve full open and back to initial setting several times and observe operation of MPM. MPM should continue to operate normally stabilizing at any given flow setting.

Step 21 - Pressure switches are provided to shut the machine down in the event of excessively high or low mixed gas, high or low propane inlet, high or low air pressures and low mixed gas temperature. Factory calibration of these switches is noted in the factory test report. Adjustments may be checked using suitable source of pressure and a test meter. Instructions for adjustments of the switches are contained inside the switch cover.

Step 22 - The Fenwal temperature switch dose not have a temperature indicator, and would have to be removed from the machine and tested in a suitable liquid bath if this should be necessary.

CAUTION

Only a trained experienced vaporizer/mixer serviceman should inspect, test, start-up or service this equipment.

Operation

5.10 Provided all above steps are satisfactory, MPM is now ready to be put into operation.

Step 23 - Open valves in mixed gas line and at natural gas injection point. Open LP-gas inlet valve. Open air inlet valve. Depress the "START" switch and hold. MPM will come on the line automatically. As soon as mixed gas pressure and controllers stabilize and the "READY" light is illuminated, release the "START" switch. The MPM is then ready to provide mixed gas as required by customer demand.

Step 24 - To shut down system, merely depress the "OFF/ON" switch. Adjustment of gas-air mixture can be accomplished during operation of MPM by slight adjustment of set point on air controller. Raise set point for leaner mixture and reduce set point for richer mixture. Mixture should be checked with specific gravitometer whenever such adjustments are made. Adjustment should be made in small increments allowing specific gravity to stabilize for three or four minutes between adjustments.

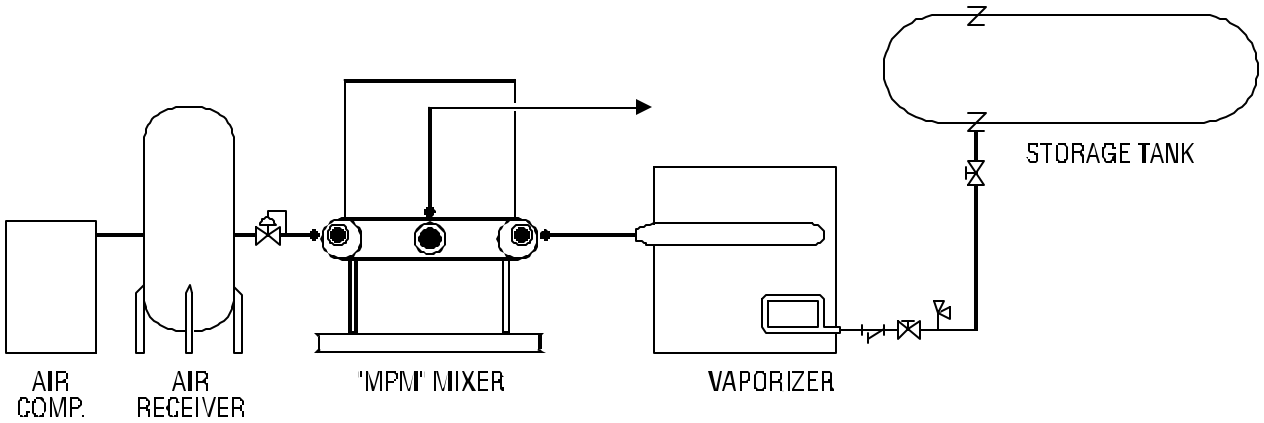


Figure 5-1 - Typical MPM Series Installation

RANSOME
MANUFACTURING
3495 South Maple Ave. / Fresno, Ca. 93725
Phone (559) 485-0979 / Fax (559) 485-8869

MODULATING PROPORTIONING MIXER (MPM Series) TEST REPORT

WORK ORDER NUMBER: _____ DATE: _____

MODEL NUMBER: _____ SERIAL NUMBER: _____

SOLD TO: _____ SHIP TO: _____

_____ _____

_____ _____

Capacity, _____ SCFH Mixed Gas @ _____ PSIG Nominal Outlet Pressure

Minimum Required LP-Gas Inlet Pressure _____ PSIG

Air Required _____ SCFM @ _____ PSIG

Accessories: _____

_____

TEST CONDITIONS, Average Ambient Temperature, degrees _____ F.

Fuel used during Testing		LP-Gas Inlet Press., PSIG	
Fuel Tested @	S.G.U.	Air Inlet Pressure, PSIG	

MIXER CALIBRATION, Nominal Specific Gravity _____

LP CONTROLLER		AIR CONTROLLER	
Process Differential		Process Differential	
PB / Gain		PB / Gain	
Reset / Integral		Reset / Integral	
Rate / Derivative		Rate / Derivative	

SAFETY INTERLOCK CALIBRATION

High Vapor Press., PSIG		High Air Press., PSIG	
Low Vapor Press., PSIG		Low Air Press., PSIG	
High Mix Press., PSIG		High Air Ratio, PSID	
Low Mix Press., PSIG		Low Mix Temp, defrees F.	

Complete Operational Test Conducted, and unit found Leak-Free by: _____

Certified by: _____ Test Date: _____

Figure 5-2 - MPM Series Test Report

6. MAINTENANCE

6.01 All maintenance procedures in part 6 should be in accordance with local regulations and the user's maintenance plan.

Safety Precautions

6.02 The MPM Series Mixers contain flammable gas under various pressures while in normal operation. Any gas leaks within the vaporizer system or in any part of the installation are potentially dangerous and must be eliminated immediately or a fire may occur. Any odor, gas or dark oily stains on joints or fittings indicate a possible gas leak. If such leak does exist, pilots or other sources of ignition must be immediately extinguished. Electrical power should be disconnected at a location remote from the suspected leak.

6.03 Thorough inspections for leaks should be conducted frequently. Any leaks should be repaired immediately. Since this equipment, as well as any other components in the installation use threaded joints, gaskets, and O-rings that are subjected to vibration and thermal stresses, the possibility of leaks developing over a period of time is always present.

Emergency Instructions

6.04 If a large leak is discovered, do not attempt to repair.

(a) Evacuate all personnel from the area.

(b) Call the Fire Department.

(c) If it can be done SAFELY, shut off main gas supply valve(s) at the LP-Gas storage tank(s).

The leak will stop when all gas downstream from the gas supply valve(s) has been exhausted.

(d) Make certain all gas has dispersed before attempting repairs.

Routine Inspections

6.05 OPERATING SWITCHES AND CONTROLS - should be checked for correct performance at frequent intervals. Repair or replacement should be accomplished at the first indication or sticking, erratic performance or any abnormal condition.

6.06 SAFETY RELIEF VALVES - should be replaced at any time possible damage is suspected. Vent piping connected to safety relief valves must be kept open - free from condensation, ice or other foreign material that might restrict release of excessive pressure in any emergency.

6.07 PRESSURE REGULATOR - vents must be clear or erratic operation, lack of stability or loss of control may result.

6.08 EXTERIOR PAINT - Keep all external surfaces well painted to prevent deterioration and rust.

Purging Gas from System

6.09 If service requires removal of gas from the system, do not merely vent gas to the atmosphere. This could result in fire with the possibility of injury or damage.

(a) A Flare Burner should be installed at a safe distance from any gas leakage.

(b) Dispose of gas by burning.

(c) Make sure all gas is actually removed from the equipment before any connections are loosened.

6.10 If LP-Gas liquid is present in the Ransome equipment, it will chill as the pressure is relieved, slowing the rate at which it will boil and discharge as vapor through the Flare Burner. BE CERTAIN all liquid is actually vaporized before loosening any connections. The presence of frost on the outlet of a component part is an indication of the presence of LP-Gas liquid and no connection should be loosened until it melts.

6.11 All servicing must be done in a safe, thorough, step-by-step manner. If in doubt about what to do, the serviceman should:

(a) Consult the Operation Manual.

(b) Consult the gas system installer.

(c) Contact Ransome, following the instructions under Warranty Service in this manual.

Gas System Trouble Shooting

6.12 The trouble shooting procedures described in Table 6-1 are intended to help a serviceman isolate the cause or trouble encountered during routine operation to a replaceable part listed in Table 6-2 and Table 6-3. Only the kinds of trouble most likely to be encountered in service are listed; the list is by no mean comprehensive. The Probable Cause column of Table 6-1 lists in order of most likely occurrence. To make best use of these trouble shooting procedures, the serviceman should be thoroughly familiar in the Physical and Functional Descriptions of the Ransome system, described in Parts 2 and 3 of this manual.

6.13 Before beginning any trouble shooting, make certain the Ransome MPM Series Mixer has been properly installed. All system components including storage tanks, valves, piping, pumps and bypass valves must conform to NFPA No. 58 Standards and all state, provincial or local regulations, codes and laws.

RANSOME
MANUFACTURING

3495 South Maple Ave. / Fresno, California 93725
Telephone (559) 485-0979 / Fax (559) 485-8869

Warranty Service

6.14 Faulty system components should be returned to Ransome following the conditions set out in this warranty. Defective material or technical questions should be referred to: When the material is returned to Ransome, the following information will expedite repair or replacement and return if it is included:

(a) Complete Material Return Authorization (MRA) form. These can be obtained from Ransome Customer Service upon request.

(b) The Name and telephone number (including area code) of the individual most familiar with the failure.

(c) A brief statement of the problem with the unit.

(d) Make(s) of other gas equipment in the user's system.

(e) The approximate date of purchase and the Purchase Order Number used for the Ransome equipment (if known).

(f) The Model and Serial Number of the Ransome equipment.