NEW MEXICO OIL CONSERVATION COMMISSION

MANUAL

of

TABLES AND PROCEDURE
INITIAL POTENTIAL (PITOT TUBE) TESTS

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THE INITIAL POTENTIAL TEST
(Pitot Tube)

Introduction:

The following procedures and tables for taking Initial Potential Flow Tests have been prepared in compliance with Commission Order No. R-333. Since this type of test has become an official initial potential flow test by virtue of Order No. R-333, it is apparent that a standard procedure and method of computation should be used in the interest of consistency and accuracy. Even though this particular type of test is required only in the San Juan Basin of New Mexico, with the exception of the Barker Dome Dakota and Barker Dome Pennsylvanian as noted in Order R-333, it is applicable to testing any well in the state where the pitot tube is used to arrive at gas volumes reported to the Oil Conservation Commission on Forms C-104, C-105 or on U. S. Geological Survey Form 9-330 (in lieu of Oil Conservation Commission Form C-105). This test shall not fulfill the testing requirement set out in Rules 401, 402 and 1121 of New Mexico Oil Conservation Commission Rules and Regulations.

Explanation of Tables:

The New Mexico Standard cubic foot of Gas is 15.025 psi, 60°F, and .60 specific gravity. The tables that follow are corrected to this base, therefore no further correction as to standard base is necessary.

In order to simplify or eliminate calculations in the field Table I was prepared with corrections made for atmospheric and flowing conditions considered to be as near average as possible for the San Juan Basin area. The considered average conditions are 60°F. flowing temperature, .65 specific gravity and 12.0 pounds atmospheric pressure at wellhead. Therefore, practical accuracy may be had by using only Table I, provided actual conditions do not differ from the average conditions stated above by too great an amount.

It is realized that in some cases actual conditions will vary considerably from the average conditions for which Table I is corrected, therefore, Tables II, III, IV, V and VI are included in this manual. These Tables will enable the user to correct volumes shown in Table I for inside pipe diameter, flowing temperature, specific gravity and atmospheric pressure (elevation) at wellhead which vary from the conditions for which Table I is now corrected. This of course makes this manual useable for pitot tube tests in parts of the state other than San Juan Basin.

Test Equipment and Setup:

The flow nipple shall be at least 8 diameters long, with no obstructions, clean and free of scale. The pitot tube shall be made in accordance with drawing shown by Plate 1, page 19 of this manual. This pitot affords accurate and convenient positioning on the flow nipple. The impact pressure shall be measured with a water or mercury manometer for pressures up to 10 pounds. The spring gauge (if used for impact over 10 lbs.) shall have dial calibrations to enable accurate reading to the nearest pound. The manometer or gauge should be mounted separately and with reasonable rigidity to facilitate easier and more accurate reading. A flexible hose connection between pitot and gauge should be used. The hose should be carefully checked for leaks, since leaks in this line will result in a low impact reading and consequently a low Initial Potential.

It is recommended that the flow of gas from the nipple be directed in a direction which will avoid the impinging of the flow against the ground, equipment, or any other object which might cause a spark should foreign matter be expelled in the gas stream.

Taking the Test (All formations):

The well shall be shut in at least 7 days prior to taking an Initial Potential Test. The actual shut-in time shall be reported. A recommended procedure is as follows:

1. Take tubing and casing shut-in pressure with a dead weight gauge and record.

2. Install flow nipple and any other equipment which may be desired.

3. Open gate valve as far as possible, allowing well to blow to atmosphere for 3 hours.

4. Have pitot tube, thermometer, gauges and connections ready to take reading at least 15 minutes before the 3-hour flow period is completed. (It is recommended that a check reading be taken at this time.)

5. Take impact pressure reading with pitot tube in the position as described in paragraph on "Test Equipment and Set Up" exactly 3 hours after well is opened.

6. Disassemble and clean equipment.

7. Report volume of flow on form C-105 if lease is fee or State, and 9-330 if Federal.

EXAMPLE I:

The following examples will explain the use of tables in this manual.

ASSUME:

Impact Pressure:	10 in. Mercury (Hg)
Test Nipple size ID:	2 in. X (1.939 in.)
Flowing Temperature:	63°F.
Specific Gravity:	.67
Elevation of wellhead:	5700 above S.L.

By inspection we can see the correction for flowing temperature, specific gravity and atmospheric pressure at wellhead is negligible and may be disregarded.

FROM TABLES FIND:

Table I, Volume through 2" Test Nipple @ 10 in. Hg. impact = 1374.0

Table II, Multiplier for 2" X (1.939 I.D.) Nipple = .938

COMPUTE: 1374.0 x .938 = 1288.8 MCF/24 hrs. at 15.025 psia, .60 specific gravity and 60°F. flowing temperature.

EXAMPLE II:

ASSUME:

Impact Pressure:	12.0 lbs. sq. in.
Test Nipple size ID	3" X (2.900)
Flowing Temperature:	85°F.
Specific Gravity:	.86
Elevation of wellhead:	7000 feet above S.L.

By inspection we find the above conditions vary considerably from the average conditions of Table I, therefore, other corrections should be applied.

FROM TABLES FIND:

Table I, Volume through 3" I.D. test nipple @ 12 psi impact = 4833.0

Table II, Multiplier for 3" X (2.900) nipple = .934

Table III, Multiplier for 85°F flowing Temp. = .9768

Table IV, Multiplier for .86 sp. grav. gas = .8693

Table V, atmospheric pressure at 7000 ft. El. = 11.3

Table VI, Correction for atmospheric pressure at 12.0 psi impact = .966

(note that this correction is partly dependent on impact pressure, therefor proper impact column should be used.)

COMPUTE: 4833.0 x .934 x .9768 x .8693 x .966 = 3702.6

MCF/24 hrs. at 15.025 psia, .60 sp. gravity and 60°F. flowing temp.

NOTICE

In compiling the following tables for average conditions it was necessary to compute each volume and factor from the appropriate formulas. Every effort has been made to insure accuracy but in the event errors are found it is requested they be reported to us as soon as possible so that they may be rectified. Please address such correspondence to Box 871, Santa Fe, New Mexico.

ELVIS A. UTZ,
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TABLE I

VOLUMES FOR PITOT TUBES

(Based on Ried's Formulas, M.C.F./24 hrs.)

Bases: 15.025 psia; 60°F; .65 sp. Gravity, Bar. pressure at wellhead 12.0 psia.

IMPACT PRESSURE			DIAMETER OF PIPE, IN. I.D.					
Inches of Water	Inches of Mercury	Lbs. per Sq. In.	1.0"	2.0"	3.0"	4.0"	5.0"	6.0"
.1			9.3	37.2	83.7	148.8	232.5	334.8
.2			13.1	52.4	117.9	209.6	327.5	471.6
.3			16.1	64.4	144.9	257.6	402.5	579.6
.4			18.6	74.4	167.4	297.6	465.0	669.6
.5			20.8	83.2	187.2	332.8	520.0	748.8
.6			22.8	91.2	205.2	364.8	570.0	820.8
.7			24.6	98.4	221.4	393.6	615.0	885.6
.8			26.3	105.2	236.7	420.3	657.5	946.8
.9			27.9	111.6	251.1	446.4	697.5	1004.4
1.0			29.4	117.6	264.6	470.4	735.0	1058.4
1.1			30.9	123.6	278.1	494.4	772.5	1112.4
1.2			32.3	129.2	290.7	516.8	807.5	1162.8
1.3			33.5	134.0	301.5	536.0	837.5	1206.0
1.4			34.8	139.2	313.2	556.8	870.0	1252.8
1.5			36.0	144.0	324.0	576.0	900.0	1296.0
1.6	.12		37.2	148.8	334.8	595.2	930.0	1339.2
1.7			38.4	153.6	345.6	614.4	960.0	1382.4
1.8	.13		39.5	158.0	355.5	632.0	987.5	1422.0
1.9			40.6	162.4	365.4	649.6	1015.0	1461.6
2.0	.15		41.7	166.8	375.3	667.2	1042.5	1501.2
2.2	.16		43.7	174.8	393.3	699.2	1092.5	1573.2
2.4	.18		45.6	182.4	410.4	729.6	1140.0	1641.6
2.6			47.5	190.0	427.5	760.0	1187.5	1710.0
2.8			49.3	197.2	443.7	788.8	1232.5	1774.8
3.0	.22		51.0	204.0	459.0	816.0	1275.0	1836.0
3.2	.24		53.6	214.4	482.4	857.6	1340.0	1929.6
3.4			54.3	217.2	488.7	868.8	1357.5	1954.8
3.6			55.9	223.6	503.1	894.4	1397.5	[illegible]
3.8	.28		57.4	229.6	516.6	918.4	1435.0	2066.4
4.0	.30		58.9	235.6	530.1	942.4	1472.5	2120.4
4.2			60.3	241.2	542.7	964.8	1507.5	2170.8
4.4			61.8	247.2	556.2	988.8	1545.0	2224.8
4.6			62.4	249.6	561.6	998.4	1560.0	2246.4
4.8	.36		63.2	252.8	568.8	1011.2	1580.0	2275.2
5.0			65.9	263.6	593.1	1054.4	1647.5	2372.4
5.5			68.4	273.6	615.6	1094.4	1710.0	2462.4
6.0	.44		71.4	285.6	642.6	1142.4	1785.0	2570.4
6.5			74.4	297.6	669.6	1190.4	1860.0	2678.4
7.0	.51		77.2	308.8	694.8	1235.2	1930.0	2779.2
7.5			80.7	322.8	726.3	1291.2	2017.5	2905.2
8.0	.58		82.8	331.2	745.2	1324.8	2070.0	2980.8
8.5			85.9	343.6	773.1	1374.4	2147.5	3092.4
9.0	.66		88.4	353.6	795.6	1414.4	2210.0	3182.4
9.5			90.7	362.8	816.3	1451.2	2267.5	3265.2
10.0	.74		93.1	372.4	837.9	1489.6	2327.5	3351.6

TABLE I (Continued)

VOLUMES FOR PITOT TUBES

IMPACT PRESSURE			DIAMETER OF PIPE, IN. I.D.					
Inches of Water	Inches of Mercury	Lbs. per Sq. In.	1.0"	2.0"	3.0"	4.0"	5.0"	6.0"
10.5			95.4	381.6	858.6	1526.4	2385.0	3434.4
11.0			97.8	391.2	880.2	1564.8	2445.0	3520.8
11.5	.85		99.7	398.8	897.3	1595.2	2492.5	3589.2
12.0	.88		101.0	404.0	909.0	1616.0	2525.0	3636.0
12.5			104.3	417.2	938.7	1668.8	2607.5	3754.8
13.0			106.6	426.4	959.4	1705.6	2665.0	3837.6
13.5			107.1	428.4	963.9	1713.6	2677.5	3855.6
13.59	1.0	.5	108.4	433.6	975.6	1734.4	2710.0	3902.4
14.0			110.1	440.4	990.9	1761.6	2752.5	3963.6
14.5			112.0	448.0	1008.0	1792.0	2800.0	4032.0
15.0			114.0	456.0	1026.0	1824.0	2850.0	4104.0
15.5			116.0	464.0	1044.0	1856.0	2900.0	4176.0
16.0			117.8	471.2	1060.2	1884.8	2945.0	4240.8
16.3	1.2		118.9	475.6	1070.1	1902.4	2972.5	4280.4
16.5			119.5	478.0	1075.5	1912.0	2987.5	4302.0
17.0			121.5	486.0	1093.5	1944.0	3037.5	4374.0
17.5			123.1	492.4	1107.9	1969.6	3077.5	4431.6
18.0			124.8	499.2	1123.2	1996.8	3120.0	4492.8
18.5			126.6	506.4	1139.4	2025.6	3163.0	4557.6
19.0			128.4	513.6	1155.6	2054.4	3210.0	4622.4
19.2	1.4		128.9	515.6	1160.1	2062.4	3222.5	4640.4
19.5			130.1	520.4	1170.9	2081.6	3252.5	4683.6
20.0			131.6	526.4	1184.4	2105.6	3290.0	4737.6
21.0			134.8	539.2	1213.2	2156.8	3370.0	4852.8
21.7			137.2	548.8	1234.8	2195.2	3430.0	4939.2
22.0			138.1	552.4	1242.9	2209.6	3452.5	4971.6
23.0			141.3	565.2	1271.7	2260.8	3532.5	5086.8
24.0			144.3	577.2	1298.7	2308.8	3607.5	5194.8
24.46	1.8		145.4	581.6	1308.6	2326.4	3635.0	5234.4
25.0			147.2	588.8	1324.8	2355.2	3680.0	5299.2
26.0			150.1	600.4	1350.9	2401.6	3752.5	5403.6
27.0			153.1	612.4	1377.9	2449.6	3827.5	5511.6
27.18	2.0	1.00	153.7	614.8	1383.2	2459.2	3842.5	5533.2
28.0			155.8	623.2	1402.2	2492.8	3895.0	5608.8
29.0			158.4	633.6	1425.6	2534.4	3960.0	5702.4
29.89	2.2		160.8	643.2	1447.2	2572.8	4020.0	5788.8
30.			161.4	645.6	1452.6	2582.4	4035.0	5810.4
32.0			166.7	666.8	1500.3	2667.2	4167.5	6001.2
32.6	2.4		168.2	672.8	1513.8	2691.2	4205.0	6055.2
34.0			171.7	686.8	1545.3	2747.2	4292.5	6181.2
35.33	2.6		174.9	699.6	1574.1	2798.4	4272.5	6296.4
36.0			176.7	706.8	1590.3	2827.2	4417.5	6361.2
38.0	2.8		181.4	725.6	1632.6	2902.4	4535.0	6530.4
40.0			186.3	745.2	1676.7	2980.8	4657.5	6706.8
40.77	3.0	1.5	187.9	751.6	1691.1	3006.4	4697.5	6764.4
42.0			190.8	763.2	1717.2	3052.8	4770.0	6868.8
43.48	3.2		194.1	776.4	1746.9	3105.6	4852.5	6987.6

TABLE I (Continued)

VOLUMES FOR PITOT TUBES

IMPACT PRESSURE			DIAMETER OF PIPE, IN. I.D.					
Inches of Water	Inches of Mercury	Lbs. per Sq. In.	1.0"	2.0"	3.0"	4.0"	5.0"	6.0"
44.0			195.5	782.0	1759.5	3128.0	4887.5	7038.0
46.0			199.7	798.8	1797.3	3195.2	4992.5	7189.2
46.2	3.4		200.3	801.2	1802.7	3204.8	5007.5	7210.8
48.0			203.9	815.6	1835.1	3262.4	5097.5	7340.4
48.9	3.6		205.8	823.2	1852.2	3292.8	5145.0	7408.8
50.0			208.2	832.8	1873.8	3331.2	5205.0	7495.2
51.64	3.8		211.5	846.0	1903.5	3384.0	5287.5	7614.0
54.36	4.0	2.0	217.3	869.2	1955.7	3476.8	5432.5	7822.8
57.07	4.2		222.6	890.4	2003.4	3561.6	5565.0	8013.6
.79	4.4		227.5	910.0	2047.5	3640.0	5687.5	8190.0
60.0			228.2	912.8	2053.8	3651.2	5705.0	8215.2
62.51	4.6		229.8	919.2	2068.2	3676.8	5745.0	8272.8
65.23	4.8		237.9	951.6	2141.1	3806.4	5947.5	8564.4
67.95	5.0	2.5	242.4	969.6	2181.6	3878.4	6060.0	8726.4
70.0			246.2	984.8	2215.8	3939.2	6155.0	8863.2
70.66	5.2		247.4	989.6	2226.6	3958.4	6185.0	8906.4
73.38	5.4		252.5	1010.0	2272.5	4040.0	6312.5	9090.0
76.38	5.6		257.4	1029.6	2316.6	4118.4	6435.0	9266.4
78.38	5.8		261.9	1047.6	2357.1	4190.4	6547.5	9428.4
80.0			263.3	1053.2	2369.7	4212.8	6582.5	9478.8
81.54	6.0	3.0	266.3	1065.2	2396.7	4260.8	6657.5	9586.8
88.33	6.5		277.1	1008.4	2493.9	4433.6	6927.5	997
90.0			279.5	1118.0	2515.5	4472.0	6987.5	10062.0
95.13	7.0	3.5	287.5	1150.0	2587.5	4600.0	7187.5	10350.0
100.0			294.5	1178.0	2650.5	4712.0	7362.5	10602.0
101.9	7.5		297.8	1191.2	2680.2	4764.8	7445.0	10720.8
108.72	8.0		307.6	1230.4	2768.4	4921.6	7690.0	11073.6
110.0		4.0	308.9	1235.6	2780.1	4942.4	7722.5	
115.5	8.5		317.4	1269.6	2856.6	5078.4	7935.0	11426.4
120.0			323.4	1293.6	2910.6	5174.4	8085.0	11642.4
122.3	9.0	4.5	326.0	1304.0	2934.0	5216.0	8150.0	11736.0
129.1	9.5		334.9	1339.6	3014.1	5358.4	8372.5	12056.4
130.0			336.0	1344.0	3024.0	5376.0	8400.0	12096.0
139.9	10.0	5.0	343.5	1374.0	3091.5	5496.0	8587.5	12366.0
140.0			348.4	1393.6	3135.6	5574.4	8710.0	12542.4
150.0	11.0		360.7	1442.8	3246.3	5771.2	9017.5	12985.2
	11.2	5.5	363.6	1454.4	3272.4	5817.6	9090.0	13089.6
	12.0		376.3	1505.2	3386.7	6020.8	9407.5	13546.8
	12.2	6.0	379.9	1519.6	3419.1	6078.4	9497.5	13676.4
	13.0		394.5	1578.0	3550.5	6312.0	9862.5	14202.0
	13.26	6.5	395.8	1583.2	3562.2	6332.8	9895.0	14248.8
	14.0		406.5	1626.0	3658.5	6504.0	10162.5	14634.0
	14.3	7.0	410.9	1643.6	3698.1	6574.4	10272.5	14792.4
	15.0		421.2	1684.8	3790.8	6739.2	10530.0	15163.2
	15.3	7.5	425.5	1702.0	3829.5	6808.0	10637.5	15318.0
	15.0		434.7	1738.8	3912.3	6955.2	10867.5	15649.2
	16.3	8.0	439.1	1756.4	3951.9	7025.6	10977.5	15807.6

TABLE I (Continued)

VOLUMES FOR PITOT TUBES

IMPACT PRESSURE			DIAMETER OF PIPE, IN. I.D.					
Inches of Water	Inches of Mercury	Lbs. per Sq. In.	1.0"	2.0"	3.0"	4.0"	5.0"	6.0"
	17.0		448.3	1793.2	4034.7	7172.8	11207.5	16138.8
	17.3	8.5	452.1	1808.4	4068.9	7233.6	11302.5	16275.6
	18.0		461.9	1847.6	4157.1	7390.4	11547.5	16628.4
	18.4	9.0	466.3	1865.2	4196.7	7460.8	11657.5	16786.8
	19.0		473.9	1895.6	4265.1	7582.4	11847.5	17060.4
	19.4	9.5	479.3	1917.2	4313.7	7668.8	11982.5	17254.8
	20.0		486.4	1945.6	4377.6	7782.4	12160.0	17510.4
	20.4	10.0	486.9	1947.6	4382.1	7790.4	12172.5	17528.4
	21.0		497.8	1991.2	4480.2	7964.8	12445.0	17920.8
	22.0	11.0	509.7	2038.8	4587.3	8155.2	12742.5	18349.2
	23.0		521.3	2085.2	4691.7	8340.8	13032.5	18766.8
	24.0		532.6	2130.4	4793.4	8521.6	13315.0	19173.6
	24.5	12.0	537.0	2148.0	4833.0	8592.0	13425.0	19332.0
	25.0	12.29	543.4	2173.6	4890.6	8694.4	13585.0	19502.4
	26.0	12.78	554.3	2217.2	4988.7	8868.8	13857.5	19954.8
	26.5	13.0	559.3	2237.2	5033.7	8948.8	13982.5	20134.8
	27.0	13.26	565.0	2260.0	5085.0	9040.0	14125.0	20340.0
	28.0	13.76	576.2	2304.8	5185.8	9219.2	14405.0	20743.2
	28.6	14.0	581.6	2326.4	5234.4	9305.6	14540.0	20937.6
	29.0	14.25	587.2	2348.8	5284.8	9395.2	14680.0	21139.2
	30.0	14.74	598.2	2392.8	5383.8	9571.2	14955.0	21535.2
	30.6	15.0	603.9	2415.6	5435.1	9662.4	15097.5	21740.4
		16.0	626.4	2505.6	5637.6	10022.4	15660.0	22550.4
		17.0	648.7	2594.8	5838.3	10379.2	16217.5	23353.2
		18.0	671.0	2684.0	6039.0	10736.0	16775.0	24156.0
		19.0	693.5	2774.0	6241.5	11096.0	17337.5	24966.0
	40.0	19.6	706.9	2827.6	6362.1	11310.4	17672.5	25448.4
		20.0	715.8	2863.2	6442.2	11452.8	17895.0	25768.8
		21.0	738.2	2952.8	6643.8	11811.2	18455.0	26575.2
		22.0	760.6	3042.4	6845.4	12169.6	19015.0	27381.6
		23.0	782.9	3131.6	7046.1	12526.4	19572.5	28184.4
		24.0	805.3	3221.2	7247.7	12884.8	20132.5	28990.8
	50.0	24.6	818.7	3274.8	7368.3	13099.2	20467.5	29473.2
		25.0	827.7	3310.8	7449.3	13243.2	20692.5	29797.2
		26.0	850.0	3400.0	7650.0	13600.0	21250.0	30600.0
		27.0	872.4	3489.6	7851.6	13958.4	21810.0	31406.4
		28.0	894.8	3579.2	8053.2	14316.8	22370.0	32212.8
		29.0	917.2	3668.8	8254.8	14675.2	22930.0	33019.2
		30.0	939.5	3758.0	8455.5	15032.0	23487.5	33822.0
		32.0	984.3	3937.2	8857.7	15748.8	24607.5	35434.8
		34.0	1029.0	4116.0	9261.0	16464.0	25725.0	37044.0
		36.0	1073.8	4295.2	9664.2	17180.8	26845.0	38656.8
		38.0	1118.5	4474.0	10066.5	17896.0	27962.5	40266.0
		40.0	1163.2	4652.8	10468.8	18611.2	29080.0	41875.2
		42.0	1207.9	4831.6	10871.1	19326.4	30197.5	43484.4
		44.0	1252.7	5010.8	11274.3	20043.2	31317.5	45097.2
		46.0	1297.4	5189.6	11676.6	20758.4	32435.0	46706.4

TABLE I (Continued)

VOLUMES FOR PITOT TUBES

IMPACT PRESSURE			DIAMETER OF PIPE, IN. I.D.					
Inches of Water	Inches of Mercury	Lbs. per Sq. In.	1.0"	2.0"	3.0"	4.0"	5.0"	6.0"
		48.0	1342.2	5368.8	12079.8	21475.2	33555.0	48319.2
		50.0	1386.9	5547.6	12482.1	22190.4	34672.5	49928.4
		52.0	1431.7	5726.8	12885.3	22907.2	35792.5	51541.2
		54.0	1476.4	5905.6	13287.6	23622.4	36910.0	53150.4
		56.0	1521.2	6084.8	13690.8	24339.2	38030.0	54763.2
		58.0	1565.9	6263.6	14093.1	25054.4	39147.5	56372.4
		60.0	1610.6	6442.4	14495.4	25769.6	40265.0	57981.6
		62.0	1655.4	6621.6	14898.6	26486.4	41385.0	59594.4
		64.0	1700.1	6800.4	15300.9	27201.6	42502.5	61203.6
		66.0	1744.8	6979.2	15703.2	27916.8	43620.0	62812.8
		68.0	1789.6	7158.4	16106.4	28633.6	44740.0	64425.6
		70.0	1834.3	7337.2	16508.7	29348.8	45857.5	66034.8
		72.0	1879.0	7516.0	16911.0	30064.0	46975.0	67644.0
		74.0	1923.8	7695.2	17314.2	30780.8	48095.0	69256.8
		76.0	1968.6	7874.4	17717.4	31497.6	49215.0	70869.6
		78.0	2013.3	8053.2	18119.7	32212.8	50332.5	72478.8
		80.0	2058.0	8232.0	18522.0	329?8.0	51450.0	74088.0
		82.0	2102.8	8411.2	18925.2	33644.8	52570.0	75700.8
		84.0	2147.5	8590.0	19327.5	34360.0	53687.5	77310.0
		86.0	2192.3	8769.2	19730.7	35076.8	54807.5	78922.8
		88.0	2237.0	8948.0	20133.0	35792.0	55925.0	80532.0
		90.0	2281.7	9126.8	20535.3	36507.2	57042.5	82141.2
		92.0	2326.5	9306.0	20938.5	37224.0	58162.5	83754.0
		94.0	2371.2	9484.8	21340.8	37939.2	59280.0	85363.2
		96.0	2415.9	9663.6	21743.1	38654.4	60397.5	86972.4
		98.0	2460.7	9842.8	22146.3	39371.2	61517.5	88585.2
		100.0	2505.4	10021.6	22548.6	40086.4	62635.0	90144.4
		110.0	2729.1	10916.4	24561.9	43665.6	68227.5	98247.6
		120.0	2952.8	11811.2	26575.2	47244.8	73820.0	106300.8
		130.0	3176.5	12706.0	28588.5	50824.0	79412.5	114354.0
		140.0	3400.2	13600.8	30601.8	54403.2	85005.0	122407.2
		150.0	3623.9	14495.6	32615.1	57982.4	90597.5	130460.4
		160.0	3847.6	15390.4	34628.4	61561.6	96190.0	138513.6
		170.0	4071.3	16285.2	36641.7	65140.8	101782.5	146566.8
		180.0	4295.0	17180.0	38655.0	68720.0	107375.0	154620.0
		190.0	4518.7	18074.8	40668.3	72299.2	112967.5	162673.2
		200.0	4742.4	18969.6	42681.6	75878.4	118560.0	170726.4

TABLE II

MULTIPLIERS FOR TUBING, PIPE & CASING

Open flow pitot tube multipliers for determining gas volumes through various diameter openings (May also be used for side pressure and closed pitot tube measurement.)

Multiply Volume from Table I for size shown in Column I by correction factor in Column II

Diam. Ins. Nominal Size	Wt. per ft. threads & Couplings	Inside Diam. D	Column I	Column II
		Seamless A.P.I. Tubing (External upset)		
1 ¼	2.40	1.380	1"	1.904
1½	2.90	1.610	1"	2.592
2	4.70	1.995	2"	.995
2 ½	6.50	2.441	2"	1.49
3	9.30	2.992	3"	.995
3 ½	11.0	3.476	3"	1.342
		LINE PIPE		
1 X	2.17	.967	1"	.916
1	1.70	1.049	1"	1.100
1 ¼ X	3.00	1.278	1"	1.633
1 ¼	2.30	1.380	1"	1.904
1 ½ X	3.63	1.500	1"	2.250
1 ½	2.75	1.610	1"	2.592
2 X	5.02	1.939	2"	.938
2	3.75	2.067	2"	1.068
3 X	10.25	2.900	3"	.934
3	7.70	3.068	3"	1.046
4 X	14.98	3.826	4"	.915
4	11.00	4.026	4"	1.013
5 X	20.78	4.813	5"	.926
5	15.00	5.047	5"	1.019
6 X	28.57	5.761	6"	.922
6	19.45	6.065	6"	1.022
8 X	43.39	7.625	6"	1.615
8	25.55	8.071	6"	1.809
8	29.35	8.981	6"	1.769
10 X	54.74	9.750	6"	2.640
10	32.75	10.192	6"	2.885
10	35.75	10.136	6"	2.853
10	41.85	10.020	6"	2.789
12 X	65.42	11.750	6"	3.851
12	45.45	12.090	6"	4.060
12	51.15	12.000	6"	4.000

Note: X denotes extra strong or thick walled pipe.

TABLE II (Cont.)

A.P.I. CASING

Diam. Ins. Nominal Size	Nominal Wgt. Threads & Couplings	Inside Diam. D	Column I	Column II
4 1/2	9.50	4.090	4"	1.045
	11.60	4.000	4"	1.000
	13.50	3.920	4"	.960
5	11.50	4.560	5"	.832
	13.00	4.494	5"	.808
	15.00	4.408	5"	.777
	18.00	4.276	5"	.731
5 1/2	13.00	5.044	5"	1.018
	14.00	5.012	5"	1.004
	15.50	4.950	5"	.980
	17.00	4.892	5"	.957
	20.00	4.778	5"	.913
	23.00	4.670	5"	.872
6	15.00	5.524	6"	.848
	18.00	5.424	6"	.817
	20.00	5.352	6"	.796
	23.00	5.240	6"	.763
6 5/8	17.00	6.135	6"	.768
	20.00	6.049	6"	1.016
	24.00	5.921	6"	.974
	28.00	5.791	6"	.931
	32.00	5.675	6"	.894
7	17.00	6.538	6"	1.187
	20.00	6.456	6"	1.158
	23.00	6.366	6"	1.126
	26.00	6.276	6"	1.094
	29.00	6.184	6"	1.062
	32.00	6.094	6"	1.032
	35.00	6.004	6"	1.001
	38.00	5.920	6"	.973
7 5/8	20.00	7.125	6"	1.410
	24.00	7.025	6"	1.370
	26.40	6.969	6"	1.349
	29.70	6.875	6"	1.313
	33.70	6.765	6"	1.271
	39.00	6.625	6"	1.219
8 5/8	24.00	8.097	6"	1.821
	28.00	8.017	6"	1.785
	32.00	7.921	6"	1.743
	36.00	7.825	6"	1.700
	40.00	7.725	6"	1.657
	44.00	7.625	6"	1.615
	49.00	7.511	6"	1.567
9 5/8	29.30	9.063	6"	2.281
	32.30	9.001	6"	2.250
	36.00	8.921	6"	2 210
	40.00	8.835	6"	2.168
	43.50	8.755	6"	2.129
	47.00	8.681	6"	2.093
	53.50	8.535	6"	2.023

TABLE III

MULTIPLIERS FOR FLOWING TEMPERATURE

60° F. Standard Base

FLOWING TEMP. °F.	FACTOR	FLOWING TEMP. °F.	FACTOR
1	1.0621	51	1.0088
2	1.0609	52	1.0078
3	1.0598	53	1.0068
4	1.0586	54	1.0058
5	1.0575	55	1.0048
6	1.0564	56	1.0039
7	1.0552	57	1.0029
8	1.0541	58	1.0019
9	1.0530	59	1.0010
10	1.0518	60	1.0000
11	1.0507	61	.9990
12	1.0496	62	.9981
13	1.0485	63	.9971
14	1.0474	64	.9962
15	1.0463	65	.9952
16	1.0452	66	.9943
17	1.0441	67	.9933
18	1.0430	68	.9924
19	1.0419	69	.9915
20	1.0408	70	.9905
21	1.0398	71	.9896
22	1.0387	72	.9887
23	1.0376	73	.9877
24	1.0365	74	.9868
25	1.0355	75	.9859
26	1.0344	76	.9850
27	1.0333	77	.9840
28	1.0323	78	.9831
29	1.0312	79	.9822
30	1.0302	80	.9813
31	1.0291	81	.9804
32	1.0281	82	.9795
33	1.0270	83	.9786
34	1.0260	84	.9777
35	1.0249	85	.9768
36	1.0239	86	.9759
37	1.0229	87	.9750
38	1.0218	88	.9741
39	1.0208	89	.9732
40	1.0198	90	.9723
41	1.0188	91	.9715
42	1.0178	92	.9706
43	1.0168	93	.9697
44	1.0158	94	.9688
45	1.0147	95	.9680
46	1.0137	96	.9671
47	1.0127	97	.9662
48	1.0117	98	.9653
49	1.0108	99	.9645
50	1.0098	100	.9636

TABLE III (Cont.)

MULTIPLIERS FOR FLOWING TEMPERATURE

60° F. Standard Base

FLOWING TEMP. °F.	FACTOR	FLOWING TEMP. °F.	FACTOR
101	.9628	150	.9233
102	.9619	151	.9225
103	.9610	152	.9217
104	.9602	153	.9210
105	.9594	154	.9202
106	.9585	155	.9195
107	.9577	156	.9187
108	.9568	157	.9180
109	.9560	158	.9173
110	.9551	159	.9165
111	.9543	160	.9158
112	.9535	161	.9150
113	.9526	162	.9143
114	.9518	163	.9135
115	.9510	164	.9128
116	.9501	165	.9121
117	.9493	166	.9112
118	.9485	167	.9106
119	.9477	168	.9099
120	.9469	169	.9092
121	.9460	170	.9085
122	.9452	171	.9077
123	.9444	172	.9069
124	.9436	173	.9063
125	.9428	174	.9055
126	.9420	175	.9048
127	.9412	176	.9042
128	.9404	177	.9035
129	.9396	178	.9028
130	.9388	179	.9020
131	.9380	180	.9014
132	.9372	181	.9007
133	.9364	182	.9000
134	.9356	183	.8992
135	.9349	184	.8985
136	.9341	185	.8979
137	.9333	186	.8972
138	.9325	187	.8965
139	.9317	188	.8956
140	.9309	189	.8951
141	.9302	190	.8944
142	.9294	191	.8937
143	.9286	192	.8931
144	.9279	193	.8923
145	.9271	194	.8916
146	.9263	195	.8910
147	.9256	196	.8903
148	.9248	197	.8896
149	.9240	198	.8889
150	.9233	199	.8882
		200	.8876

$$\text{Factor} = \sqrt{\frac{460 + 60}{460 + \text{Flowing Temp.}}}$$

TABLE IV

MULTIPLIERS FOR SPECIFIC GRAVITY

.65 Base

SPECIFIC GRAVITY	FACTOR	SPECIFIC GRAVITY	FACTOR
0.500	1.1400	0.665	.9885
0.505	1.1344	0.670	.9849
0.510	1.1289	0.675	.9811
0.515	1.1234	0.680	.9776
0.520	1.1180	0.685	.9740
0.525	1.1126	0.690	.9705
0.530	1.1074	0.695	.9671
0.535	1.1022	0.700	.9636
0.540	1.0971	0.705	.9601
0.545	1.0920	0.710	.9568
0.550	1.0871	0.715	.9535
0.555	1.0822	0.720	.9501
0.560	1.0773	0.725	.9463
0.565	1.0724	0.730	.9436
0.570	1.0678	0.735	.9403
0.575	1.0631	0.740	.9372
0.580	1.0585	0.745	.9340
0.585	1.0540	0.750	.9308
0.590	1.0495	0.755	.9277
0.595	1.0450	0.760	.9247
0.600	1.0408	0.765	.9217
0.605	1.0364	0.770	.9187
0.610	1.0322	0.775	.9151
0.615	1.0279	0.780	.9128
0.620	1.0238	0.785	.9099
0.625	1.0197	0.790	.9070
0.630	1.0157	0.795	.9041
0.635	1.0117	0.800	.9013
0.640	1.0077	0.805	.8987
0.645	1.0030	0.810	.8958
0.650	1.0000	0.815	.8930
0.655	.9961	0.820	.8903
0.660	.9924	0.825	.8875

TABLE IV (Cont.)

MULTIPLIERS FOR SPECIFIC GRAVITY

SPECIFIC GRAVITY	FACTOR	SPECIFIC GRAVITY	FACTOR
0.830	.8848	0.920	.8405
0.835	.8821	0.925	.8382
0.840	.8796	0.930	.8359
0.845	.8769	0.935	.8337
0.850	.8744	0.940	.8314
0.855	.8718	0.945	.8293
0.860	.8693	0.950	.8271
0.865	.8667	0.955	.8249
0.870	.8643	0.960	.8228
0.875	.8618	0.965	.8206
0.880	.8593	0.970	.8185
0.885	.8569	0.975	.8165
0.890	.8546	0.980	.8144
0.895	.8521	0.985	.8123
0.900	.8498	0.990	.8102
0.905	.8474	0.995	.8081
0.910	.8451	1.000	.8062
0.915	.8428		

$$\text{Factor} = \sqrt{\frac{.65}{\text{Specific Gravity}}}$$

TABLE V

ATMOSPHERIC PRESSURES AND BAROMETER READINGS AT DIFFERENT ALTITUDES (Approximate Values)

Altitude Above Sea Level Feet	Barometer Reading Inches Merc. at 32° F.	Atmospheric Pressure Lbs.-Sq. In.
0	29.921	14.7
+ 500	29.38	14.4
+1000	28.86	14.2
1500	28.33	13.9
2000	27.82	13.7
2500	27.31	13.4
3000	26.81	13.2
3500	26.32	12.9
4000	25.84	12.7
4500	25.36	12.4
5000	24.89	12.2
5500	24.43	12.0
6000	23.98	11.8
6500	23.53	11.5
7000	23.09	11.3
7500	22.65	11.1
8000	22.22	10.9
8500	21.80	10.7
9000	21.38	10.5
9500	20.98	10.3
10000	20.58	10.1

TABLE VI

MULTIPLIERS FOR ATMOSPHERIC PRESSURES

Multiply Table I volume by multiple for impact and atmospheric pressure nearest that observed.

Atmospheric Pressure lbs. sq. in.	Impact Pressures, psig. 15 and under	20	25	30	40	50	100
10.0	.913	.937	.946	.952	.962	.968	.982
10.2	.922	.944	.951	.957	.965	.971	.984
10.4	.931	.950	.957	.962	.969	.974	.985
10.6	.939	.956	.962	.967	.973	.977	.987
10.8	.949	.963	.967	.971	.977	.981	.989
11.0	.958	.969	.973	.976	.981	.984	.991
11.2	.966	.975	.978	.981	.985	.987	.993
11.4	.975	.981	.984	.986	.988	.990	.995
11.6	.983	.987	.989	.990	.992	.994	.996
11.8	.991	.994	.994	.995	.996	.997	.998
12.0	1.000	1.000	1.000	1.000	1.000	1.000	1.000
12.2	1.007	1.006	1.005	1.005	1.004	1.003	1.002
12.4	1.016	1.013	1.011	1.009	1.008	1.006	1.004
12.6	1.024	1.019	1.016	1.014	1.012	1.010	1.005
12.8	1.033	1.025	1.022	1.019	1.015	1.013	1.007
13.0	1.040	1.031	1.027	1.024	1.019	1.016	1.010
13.2	1.049	1.037	1.032	1.028	1.023	1.019	1.011
13.4	1.056	1.044	1.038	1.033	1.027	1.023	1.012
13.6	1.064	1.050	1.043	1.038	1.031	1.026	1.014
13.8	1.072	1.056	1.049	1.043	1.035	1.029	1.016
14.0	1.079	1.063	1.054	1.047	1.038	1.032	1.018
14.2	1.087	1.069	1.059	1.052	1.042	1.035	1.020
14.4	1.095	1.075	1.065	1.057	1.046	1.039	1.021
14.6	1.105	1.083	1.072	1.063	1.051	1.043	1.024
14.8	1.110	1.089	1.076	1.067	1.054	1.045	1.025

$$\text{Factor} = \sqrt{\frac{\text{Bar. Press.}}{12.0}}$$ For 15 psig and under impact.

$$\text{Factor} = \frac{\text{P + Atmos. Press.}}{\text{P + 12.0}}$$ For 15 psig and over impact.

Where: P = Impact Pressure psig

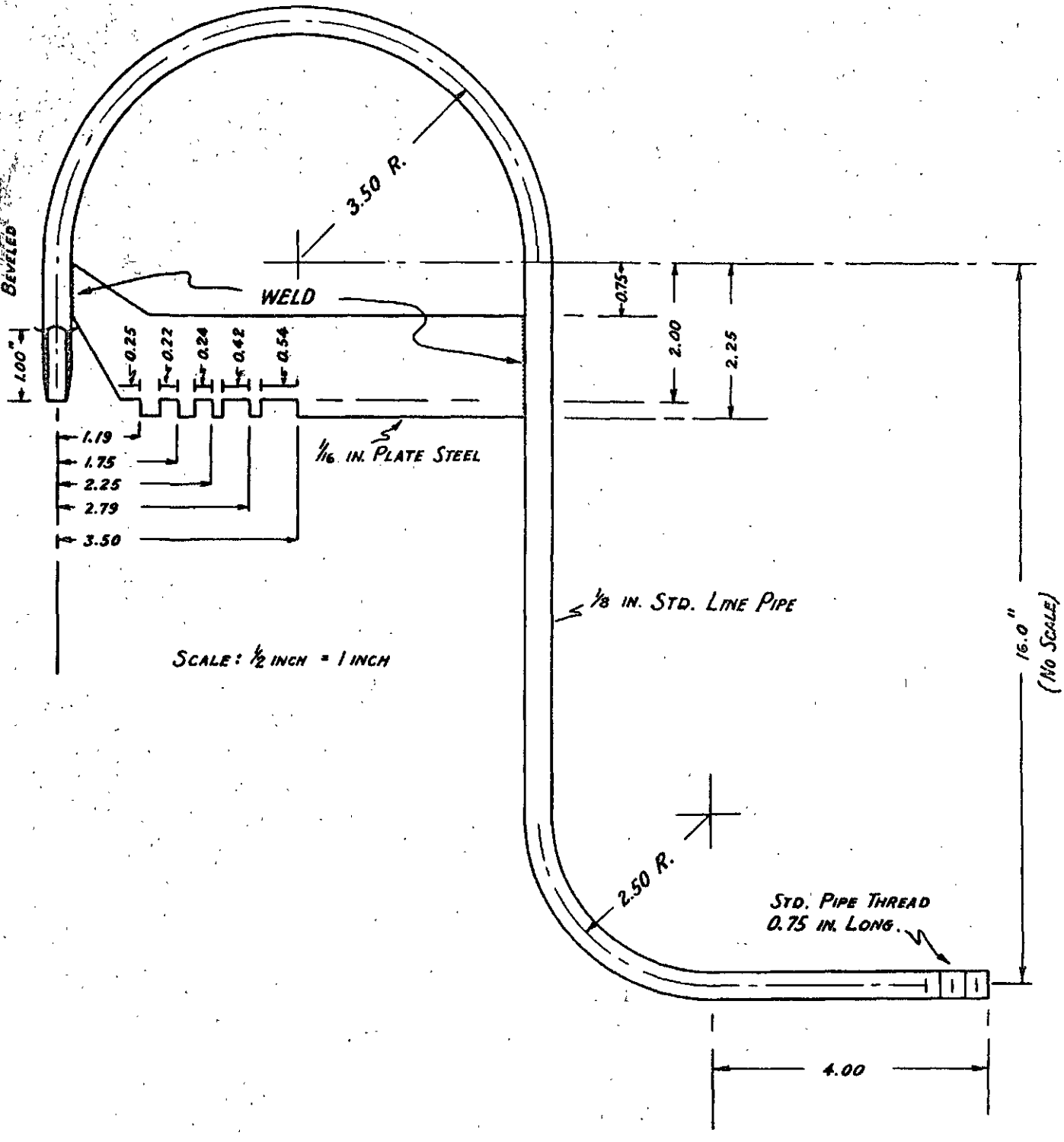

PLATE I

STANDARD PITOT TUBE

APPROVED BY NEW MEXICO OIL CONSERVATION COMMISSION