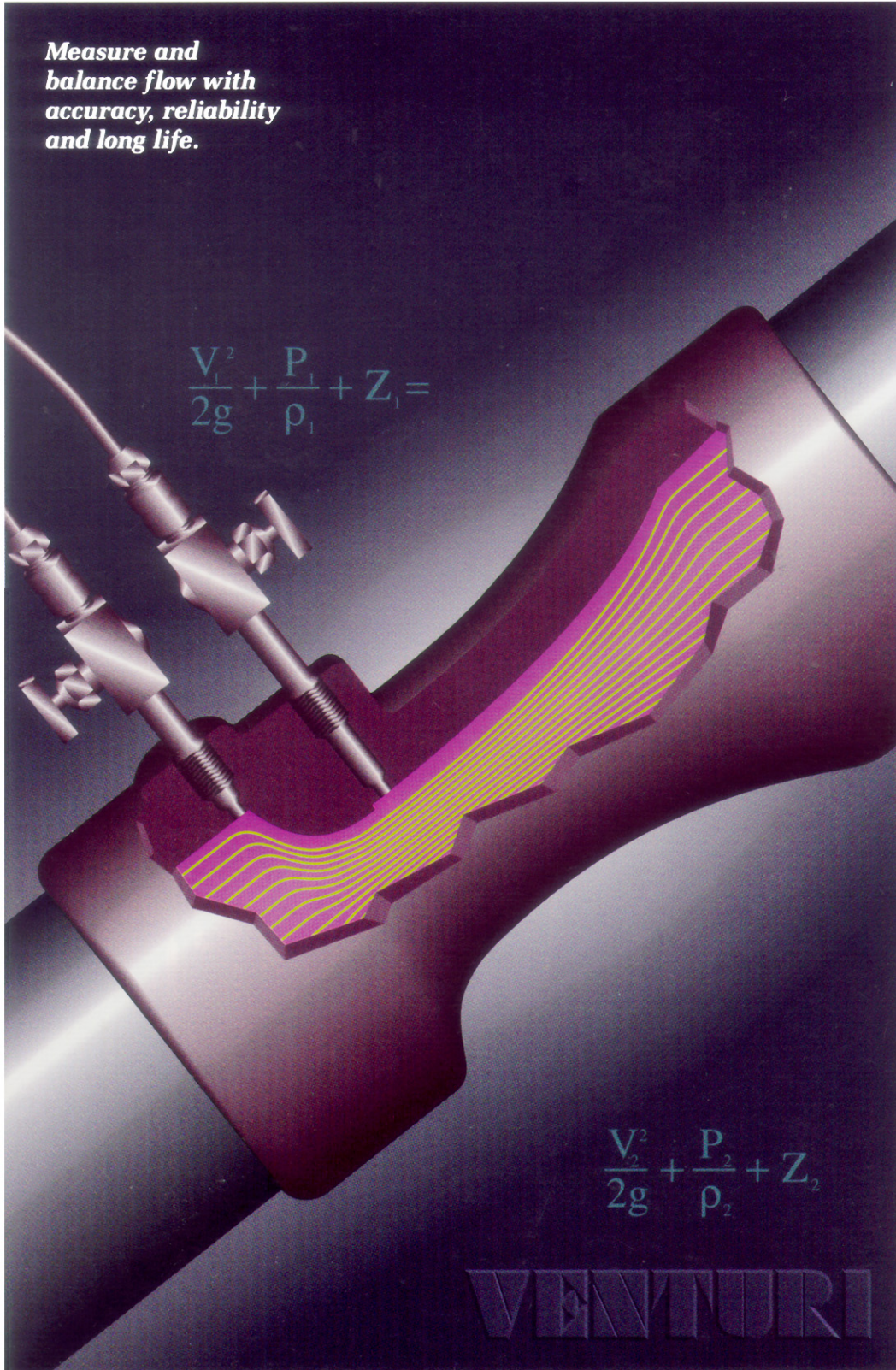


Hyspan VENTURI FLOW MEASUREMENT SYSTEMS

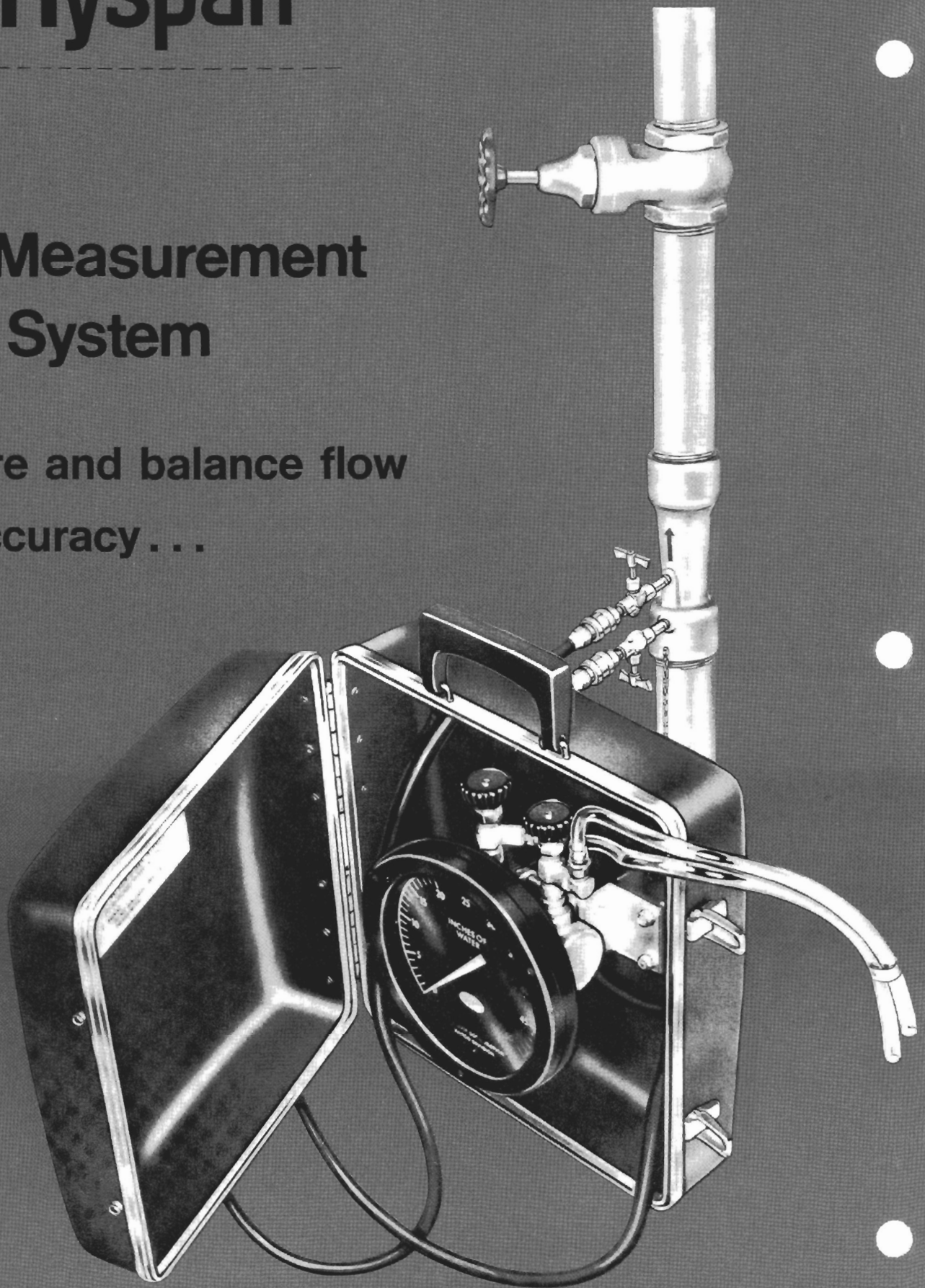
*Measure and
balance flow with
accuracy, reliability
and long life.*



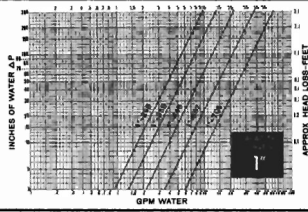

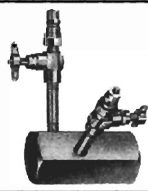
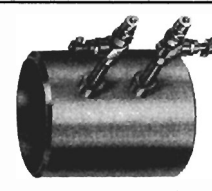
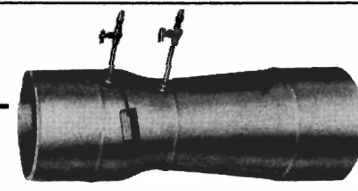


Flow Measurement System

Measure and balance flow
with accuracy...



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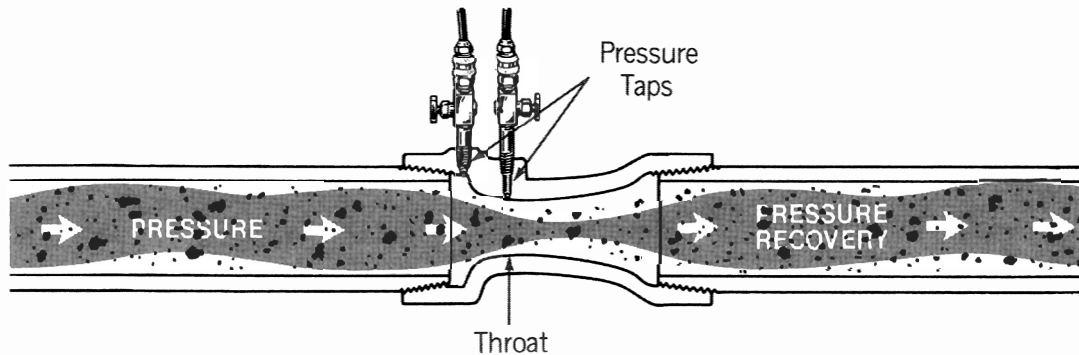
Venturi Principal

If a fluid system is to achieve the designed objectives, an accurate and reliable method of measurability and balancing flow must be specified. A Venturi Flow Measurement System utilizes the basic engineering principle of the venturi installed in a fluid line. Fluid passing through the reduced area of the venturi throat increases in velocity creating a pres-

sure differential between the inlet and throat areas. After passing through the throat, the flow area is gradually increased which decreases the velocity and allows pressure recovery. The differential pressure across the throat of the venturi (see Figure 1) can be read directly or easily translated into actual flow in gals./min. by use of various types of

differential pressure meters and capacity curves.

In order to evaluate the merits of a Venturi Flow Measurement System, all of the advantages must be examined. These advantages are presented here for consideration by the system design engineer.



Accuracy

Venturi accuracy and reliability are based on a well-known engineering principle (Bernoulli's Theorem). This principle covers the relationship between pressure differentials and velocity changes in various fluid flow conditions.

No flow measurement device can achieve greater long term accuracy than a properly calibrated venturi. A properly calibrated venturi can provide accurate measurements within $\pm 1/2\%$ in all sizes.

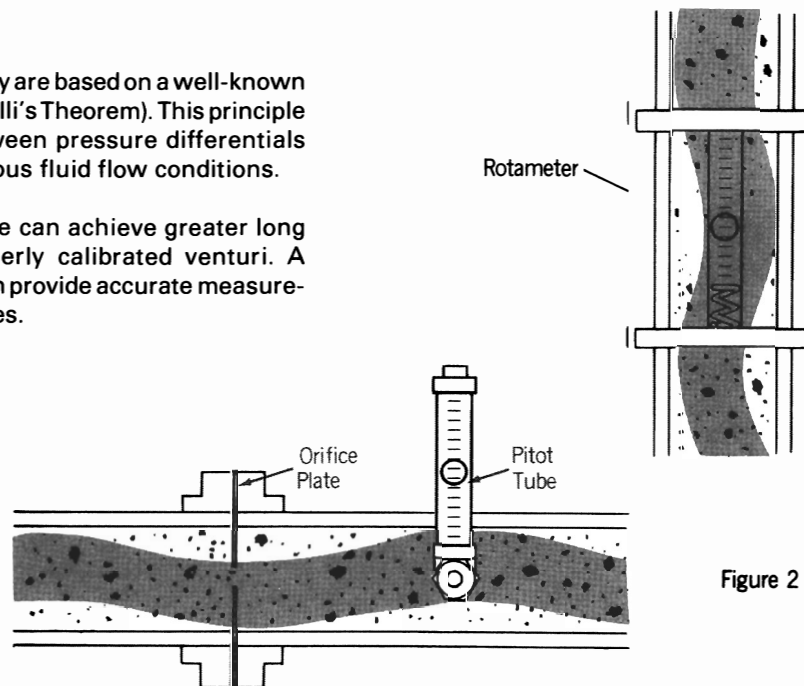


Figure 2

Reliability and Long Life

A venturi will maintain its accuracy over an extremely long period of time. The venturi is really a "self-cleaning" device. Its internal configuration, which permits smooth flow and efficient pressure recovery, eliminates erosion and resists clogging by foreign matter. Hydronic system water is usually "dirty", with particles of foreign matter. Other

devices using small orifices, spring loading, or glass read-outs in bypass arrangements are not self-cleaning and can be adversely affected by clogging or corrosive action (see Figure 2). Such loss of accuracy over years of continuous operation can seriously affect system redesign, system additions, or maintenance efforts when required later.

Maintenance Free

Maintenance of venturis is virtually unnecessary. Venturis have no moving parts, no springs to fatigue, or glass to break or stain. They will remain in the system throughout its life, always available for quick meter attachment and ready measurement.

Versatile

The venturi system is also versatile, because it can provide permanent stations with fixed meters, or portable meters which can be carried to a number of stations. A variety of meter types can be supplied, depending upon the application. Also, the wide range of sizes and beta ratios permits the designer to select the venturi that will exactly suit his needs.

Economy

HYPAN: Venturi Flow Measurement Systems have proven to be economical in the long run. They simplify maintenance, provide more system versatility and maintain their accuracy for many years, providing long range economy for the user.

Low Pressure Loss—Energy Savings

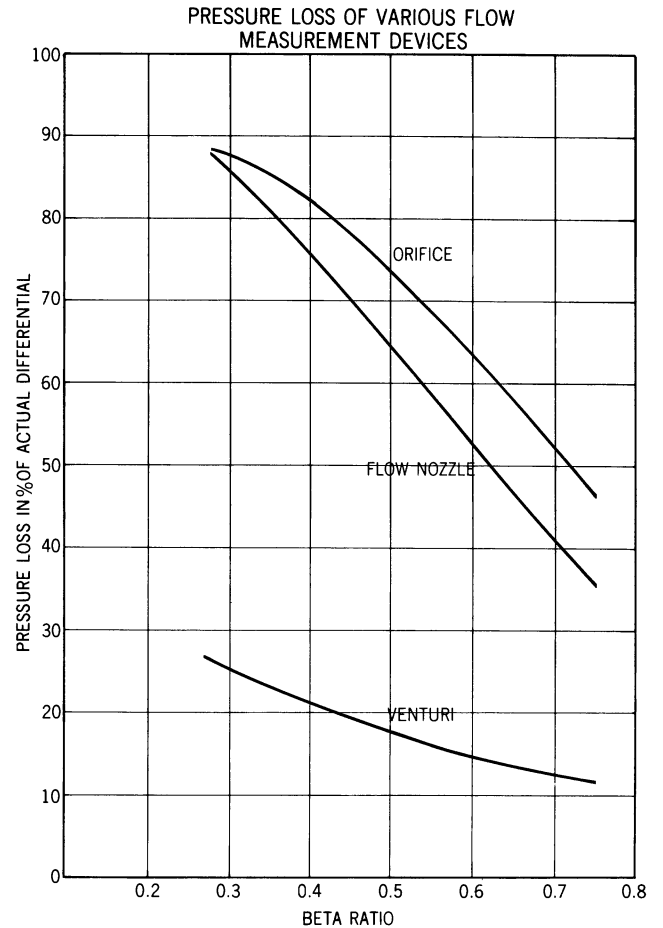
A significant advantage of the venturi is its low pressure loss, particularly when compared to other devices (see Figure 3—graph). For example, a venturi with a 0.6 beta ratio has a pressure loss of only 15% of actual pressure differential compared to 50% with a flow nozzle and 63% with an orifice plate. In addition, pressure recovery is smooth and gradual within a minimum length of pipe after the fluid had passed through the throat area.

Experience

Thousands of venturis have been installed in a variety of fluid systems. This experience contributes to the reliability of this product, and assures users that technical assistance or problem solving know-how is available at any time.

Saves Space

Requires fewer pipe diameters upstream and downstream for pressure recovery.



APPLICATIONS

HYSPAN Venturi Flow Measurement Systems are used in any fluid system where flow measurement and balancing will provide assurance of an efficient, quality job. Venturis are used in hydronic systems, using hot water and

chilled water, for heating and air conditioning. They are found in office buildings, manufacturing plants, high rise apartments, hotels, motels and many other buildings where comfort of occupants is a critical factor. In Detroit, over 300 venturis are installed in the Federal Building and a new office building includes four 4" venturis in its equipment room.

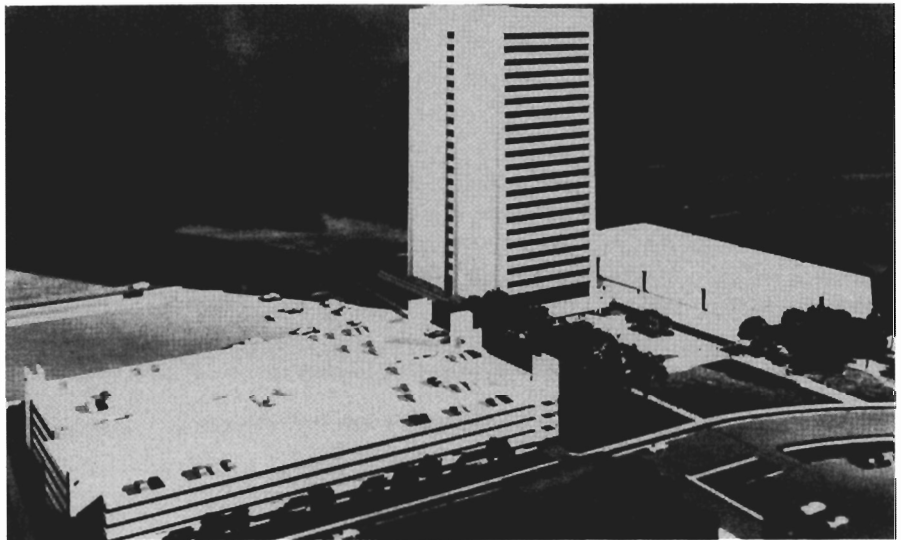
Flow measurement is becoming more important in the processing industries,

where piping systems carrying chemicals, hydrocarbons and other fluids must have flow measuring devices and valves for adjusting and balancing flows.

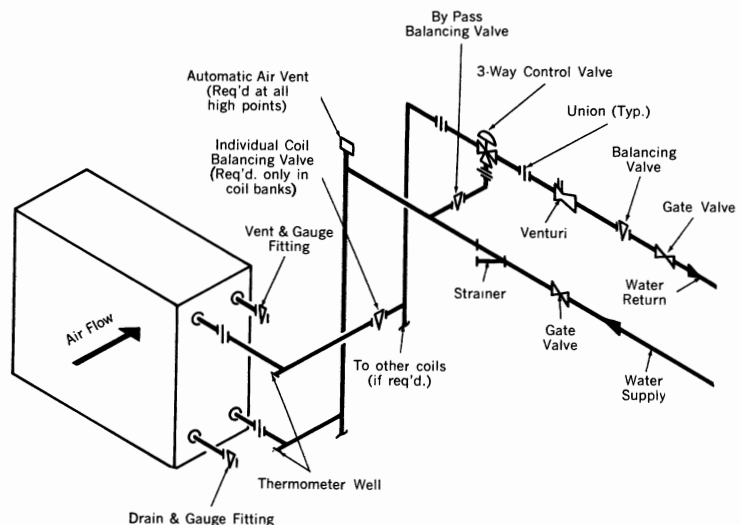
In most fan systems, venturi stations are located on return lines to reheat coils. A balancing valve is installed downstream to permit accurate balancing.



The **HYSPAN** Venturi Flow Measurement System is used in this large office building in the southeast.

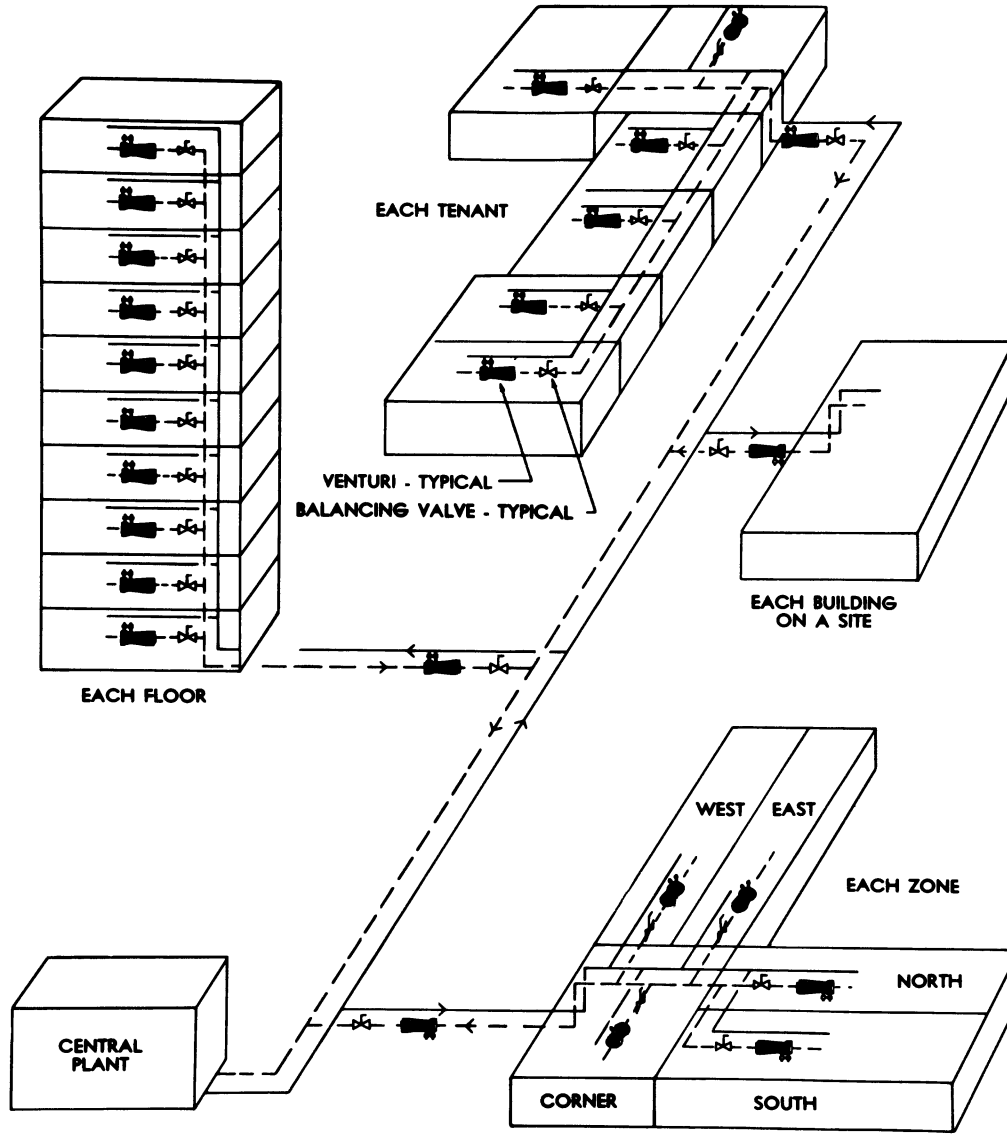


The Blue Cross/Blue Shield building in Detroit, Michigan, designed by Giffels Associates, calls for more than 300 venturi stations installed on return lines in the building's 33 fan systems.



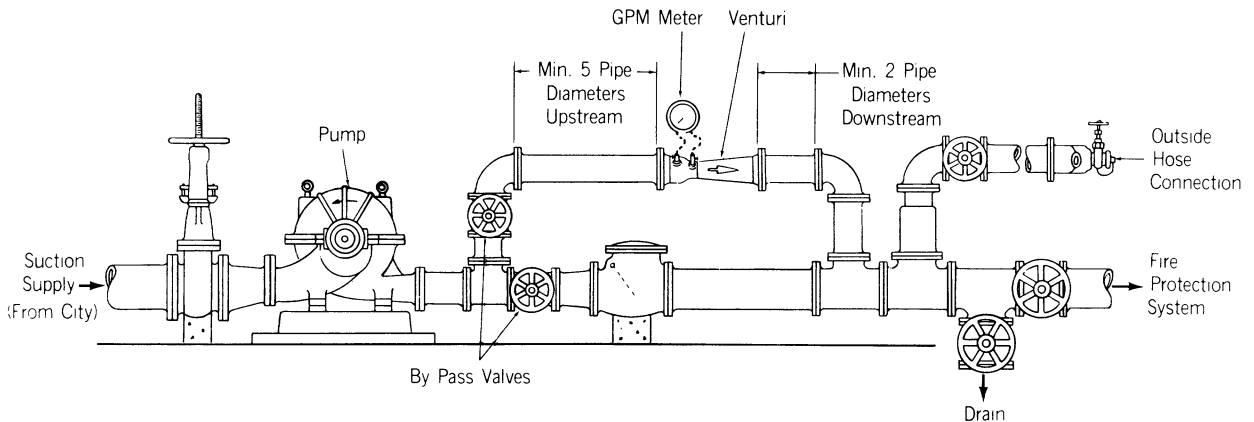
Shown above is a typical water coil piping design similar to those used in the Blue Cross/Blue Shield building in Detroit.

TYPICAL INSTALLATION



FIRE PUMP FLOW TESTING

One man can flow test fire pump systems in minutes, using a venturi with fixed meter installed in a bypass, as shown here. Designed to meet Factory Mutual specifications with long-term accuracy. See separate bulletin for details.



HOW TO SPECIFY

1. Size Pipe
2. Study Capacity Curve
3. Select Beta Ratio
4. Specify Part Numbers

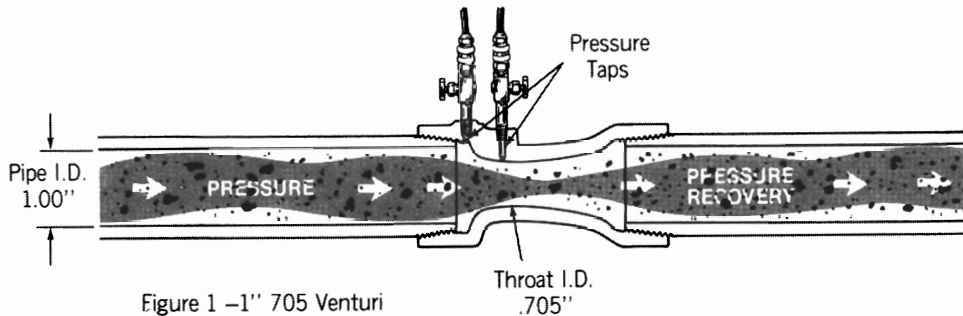
The **HYSPAN** Venturi Flow Measurement System uses one or more venturis as primary measuring devices; one or more meters which translate the pressure differential into actual flow rates; and associated fittings, hoses, or piping.

At each point in any line where the flow rate should be checked a **HYSPAN** Venturi is installed. Two pressure taps are built into each venturi, one at a point near the narrowest part of the throat and one upstream. Each pressure tap includes a quick disconnect coupling and valve so that when portable meters are used they can be moved quickly from one venturi to another. If continuous indication, or recording of rate of flow is necessary, the **HYSPAN** Venturi can be combined with permanently mounted meters, recorders, totalizers, or similar instrumentation.

This section will provide all the information necessary for the proper selection of the venturis in the Flow Measurement System. For Meter Selection see pages 24-25.

1. Determine the flow requirements and establish each line size. In order to provide for various flow rates in each pipe size, venturis are available in several different "beta ratios" in each size. The beta ratio is a mathe-

matical relationship between the throat I.D. and the pipe I.D. (e.g. see Figure 1 which shows a 1" venturi with a .705" throat, i.e., a 1" .705 venturi).



2. Study the proper capacity curve.

Each separate beta ratio has its own capacity or flow curve. These capacity curves, shown on the following pages, indicate the differential pressure reading at various flow rates. Flow in gallons per minute is shown along the bottom of the chart. The corresponding differential pressure from 3 to 300 inches of water, is found along the left side of the chart. Since the graph is logarithmic, the curve appears as a straight line.

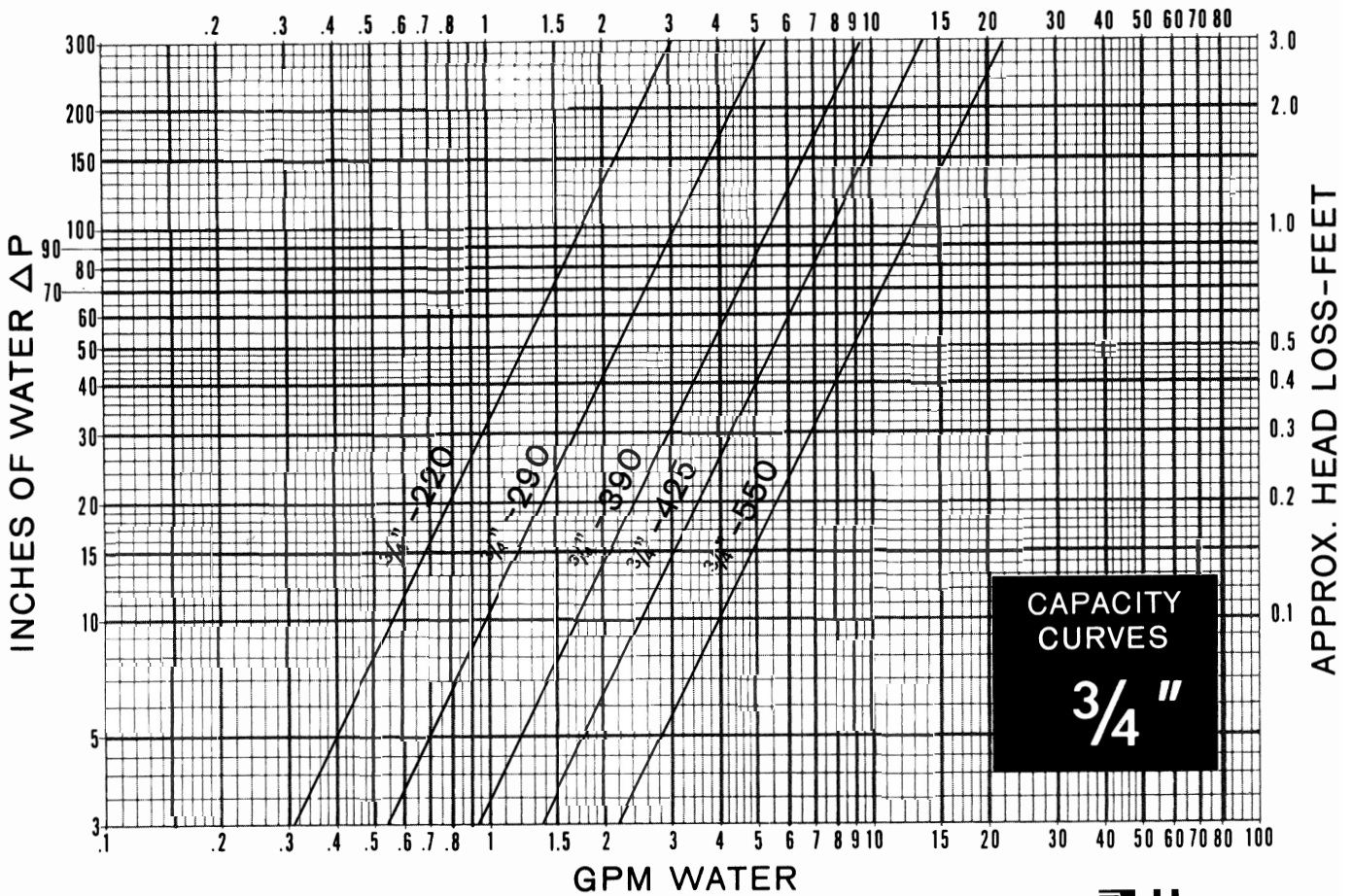
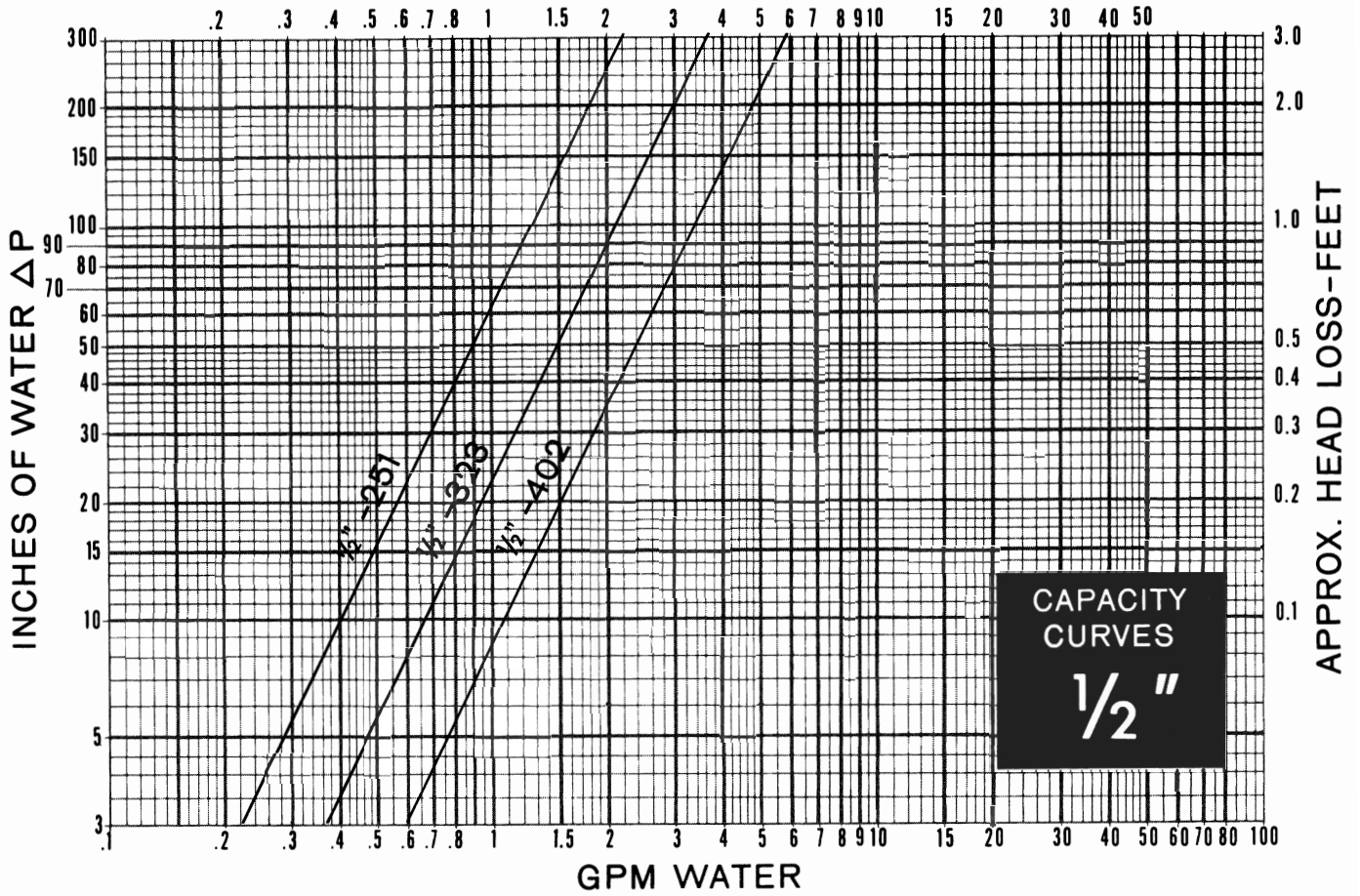
Because of space limitations in this catalog, these capacity curves are limited in size, and therefore, accuracy. They are suggested for use as venturi selection guidelines only and for applications where extreme accuracy is not needed. **HYSPAN** can provide larger charts where more accuracy is essential. Please also note the capacity curves are for water at +70°F. For conversion to other media, or other temperatures, see pages 26 & 27.

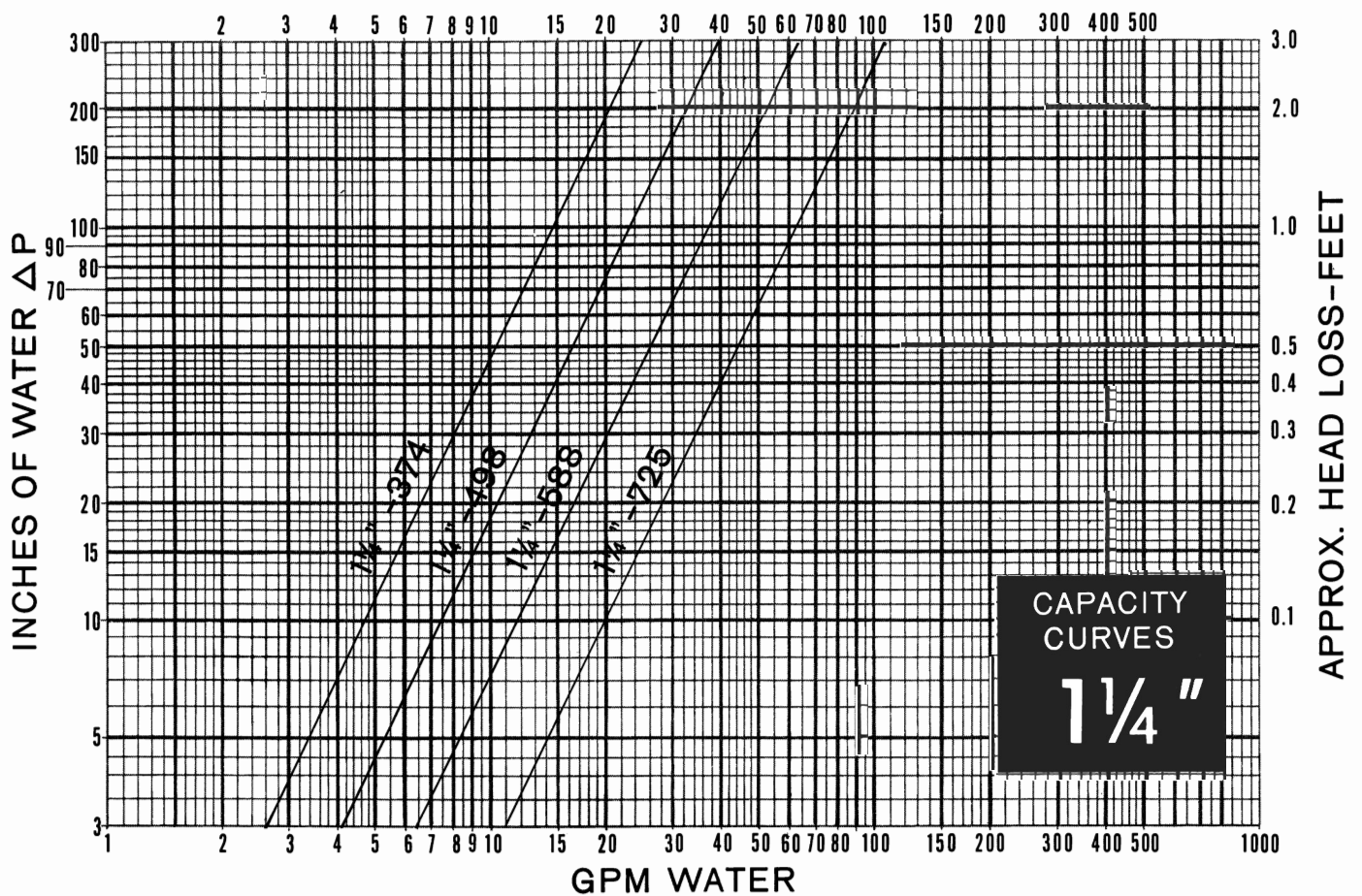
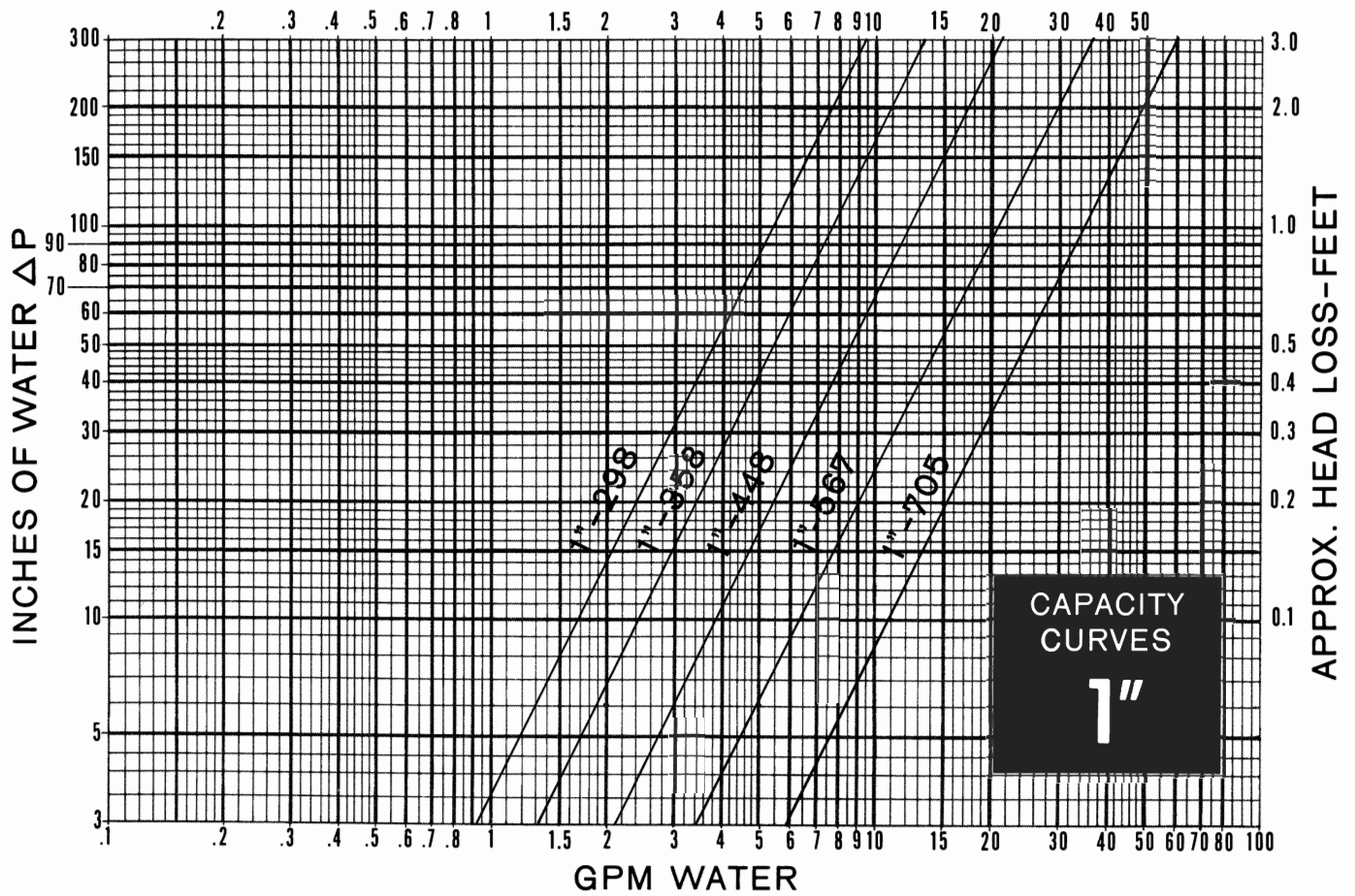
3. Select suitable beta ratios for each specific venturi required. It is important to select a beta ratio in each case that will produce a differential pressure reading in the middle range (between 20% and the full scale range) of the meter being used.

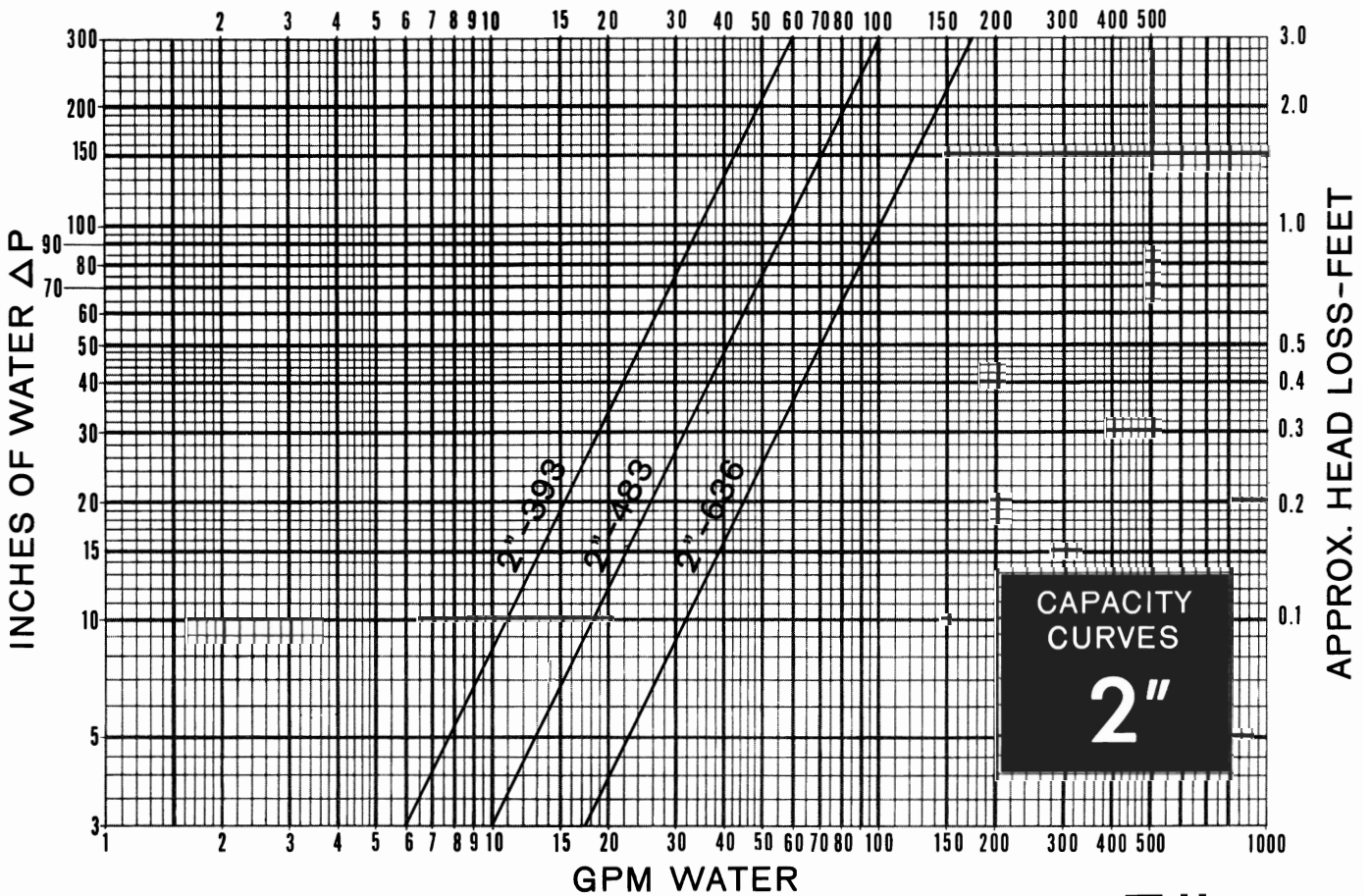
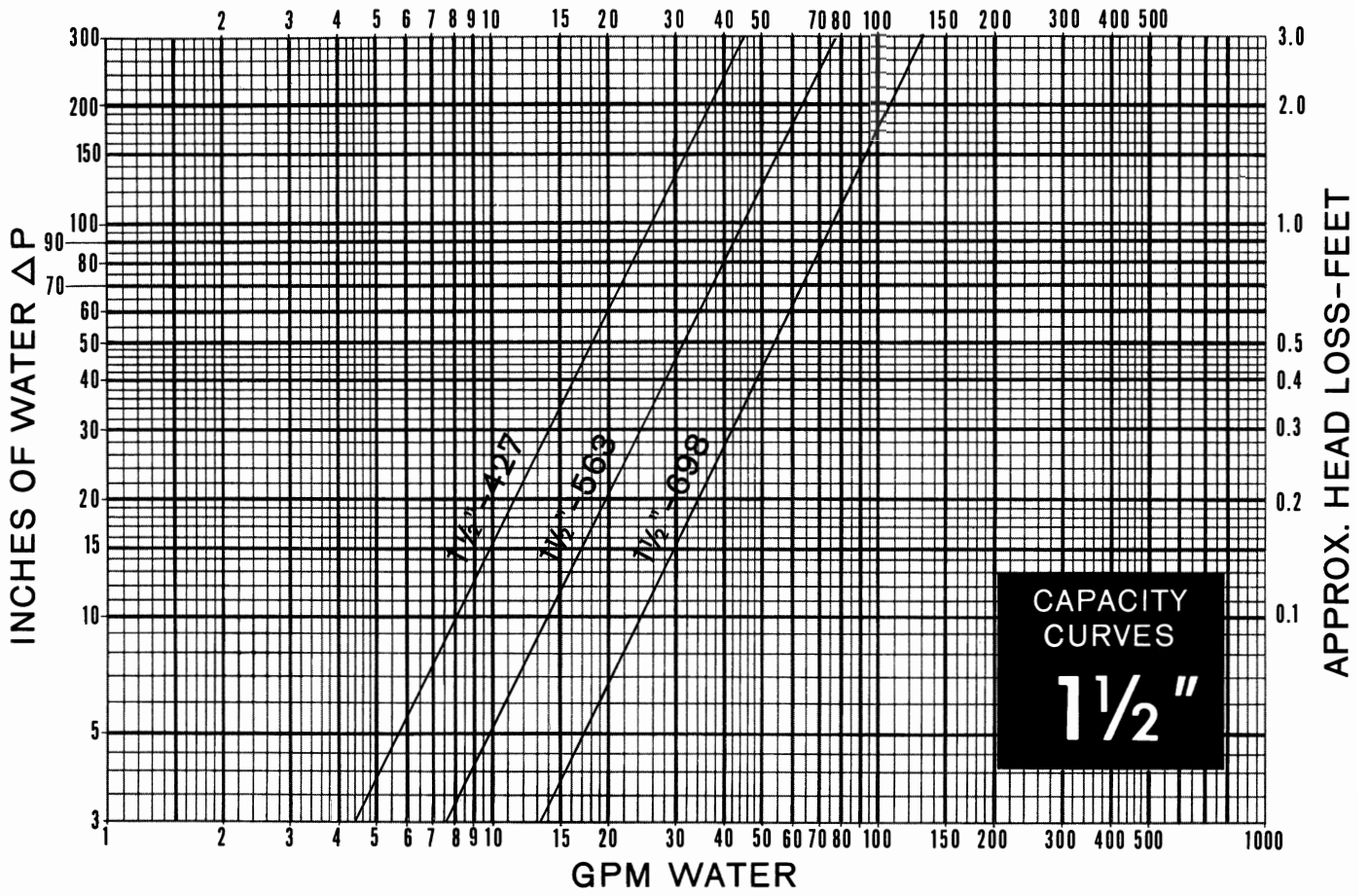
For example, if we wish to flow 20 gpm of water through a 1 1/4" pipe (see page 8) we select the 588 beta ratio venturi, which gives us a differential pressure of 30 inches of water on a 0-50" linear meter.

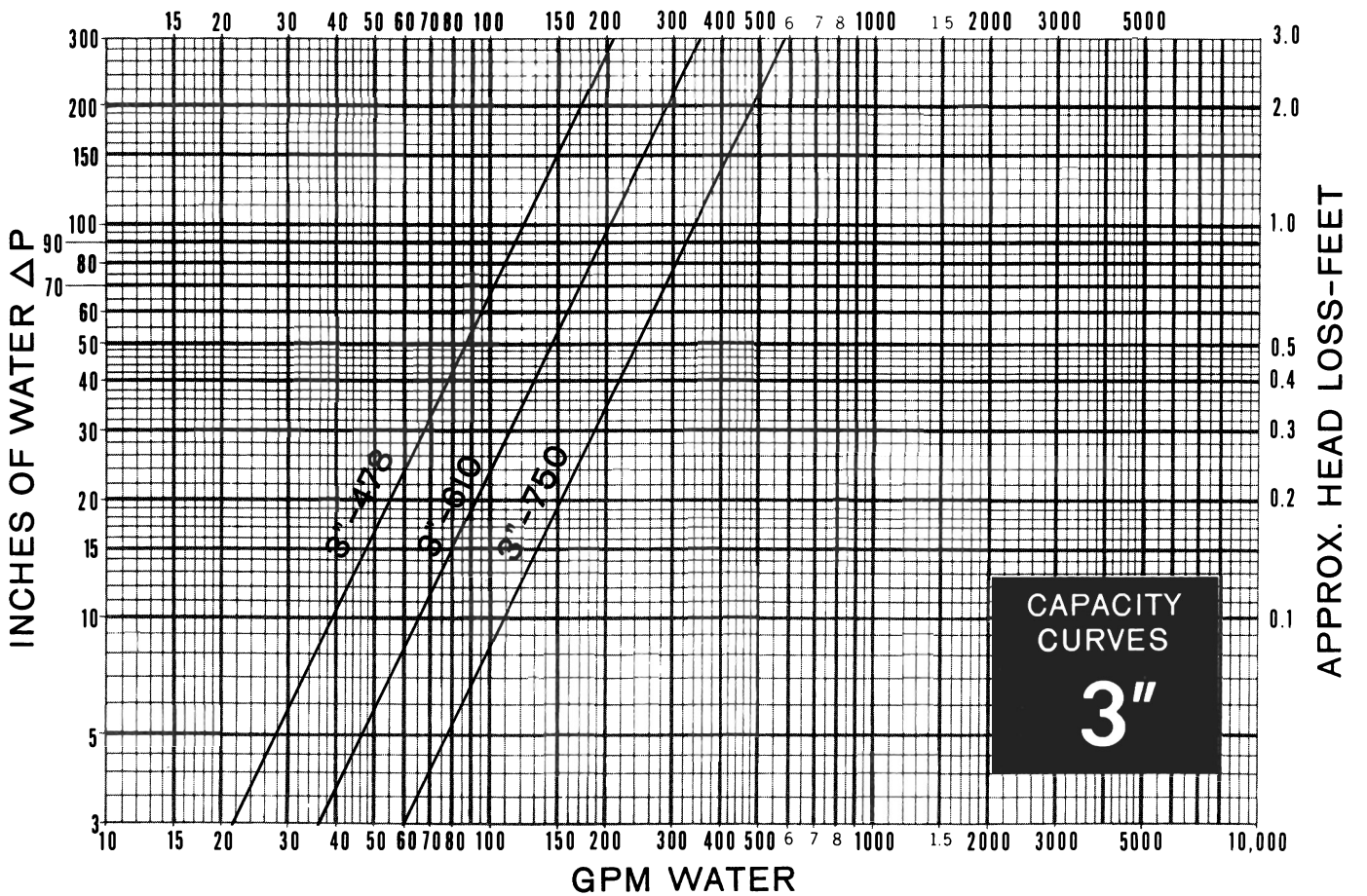
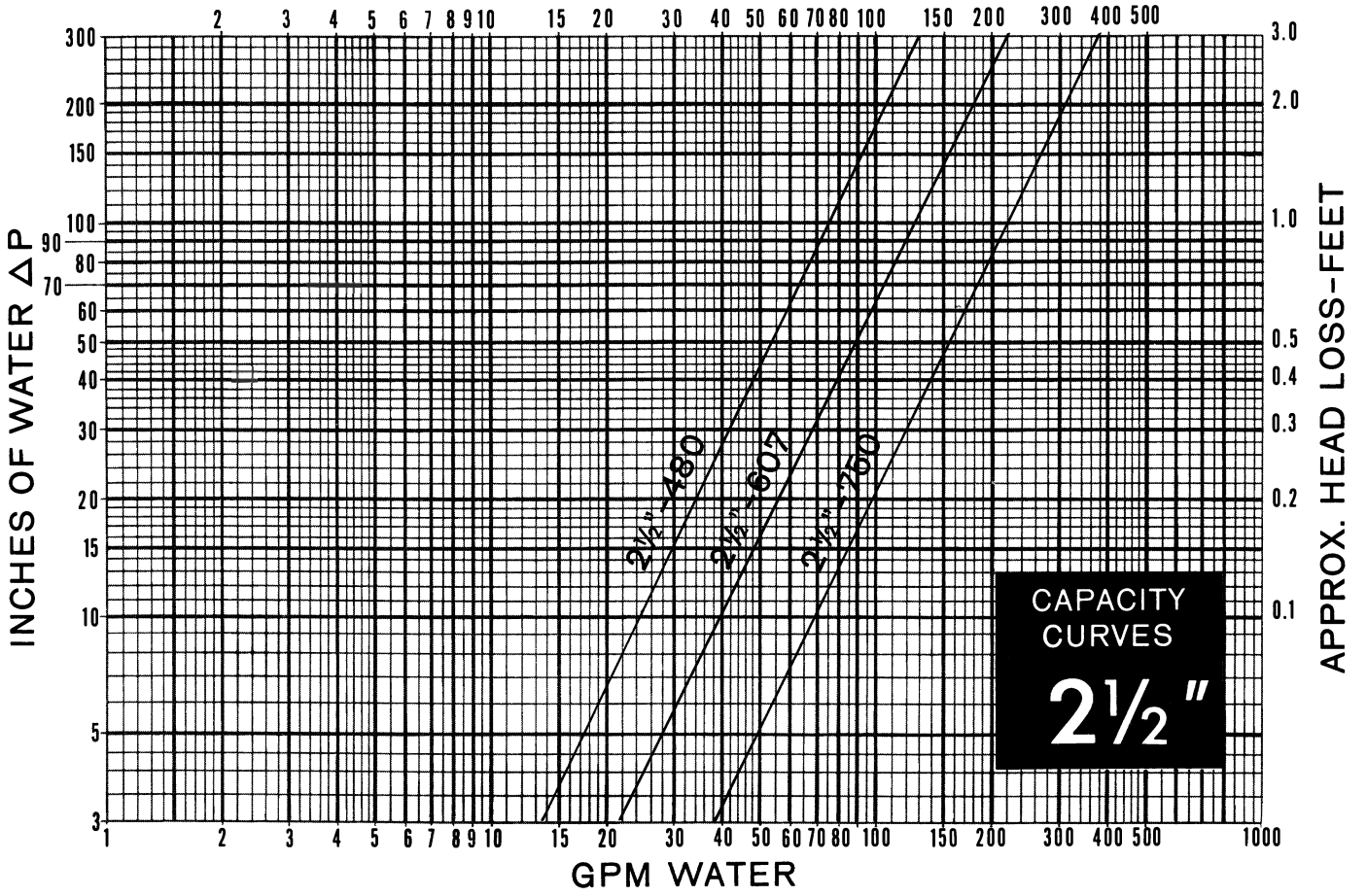
4. Specify proper part number for each venturi station. Detailed part numbers and dimensional information on all **HYSPAN** Venturis, along with temperature and pressure

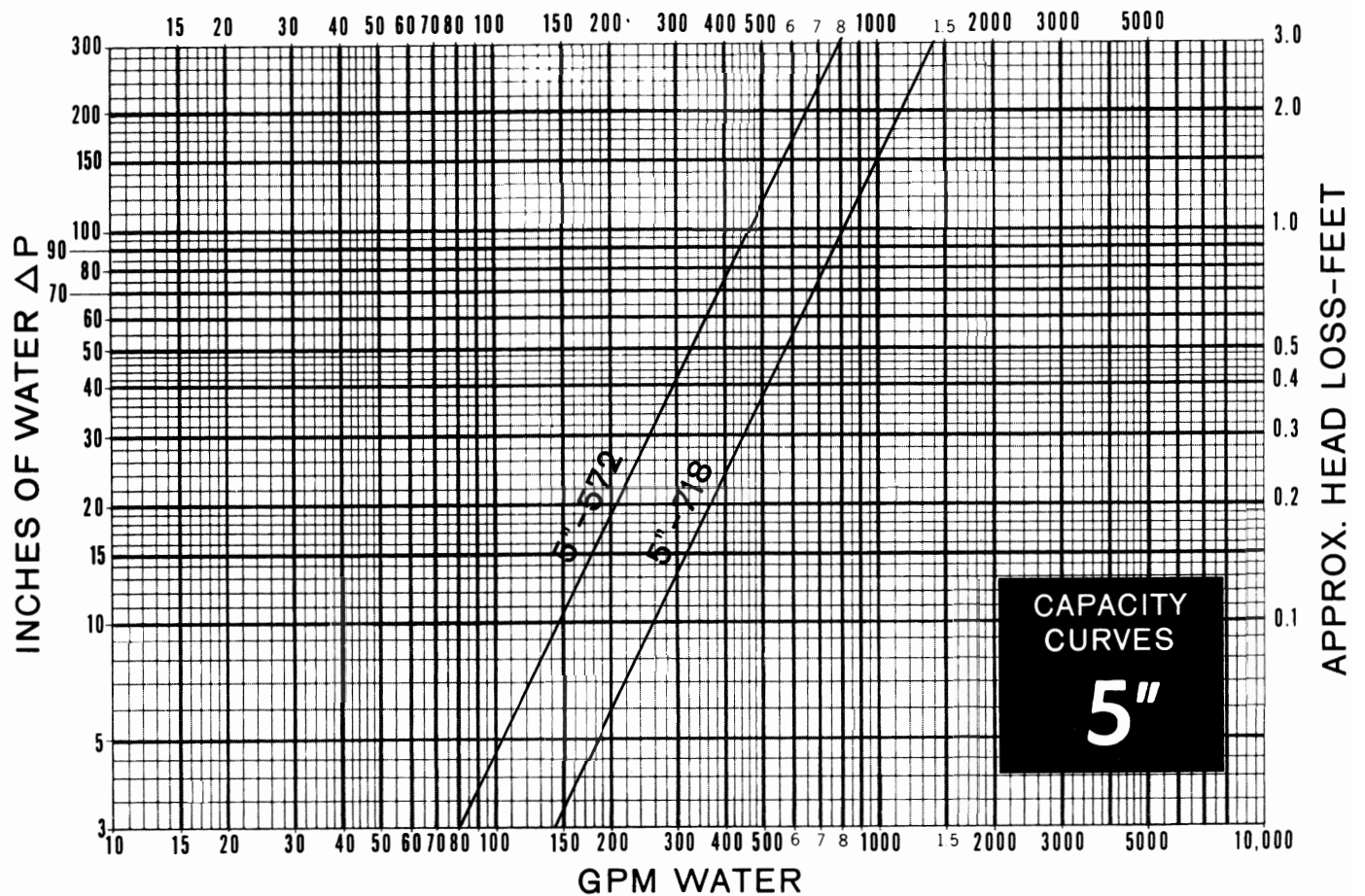
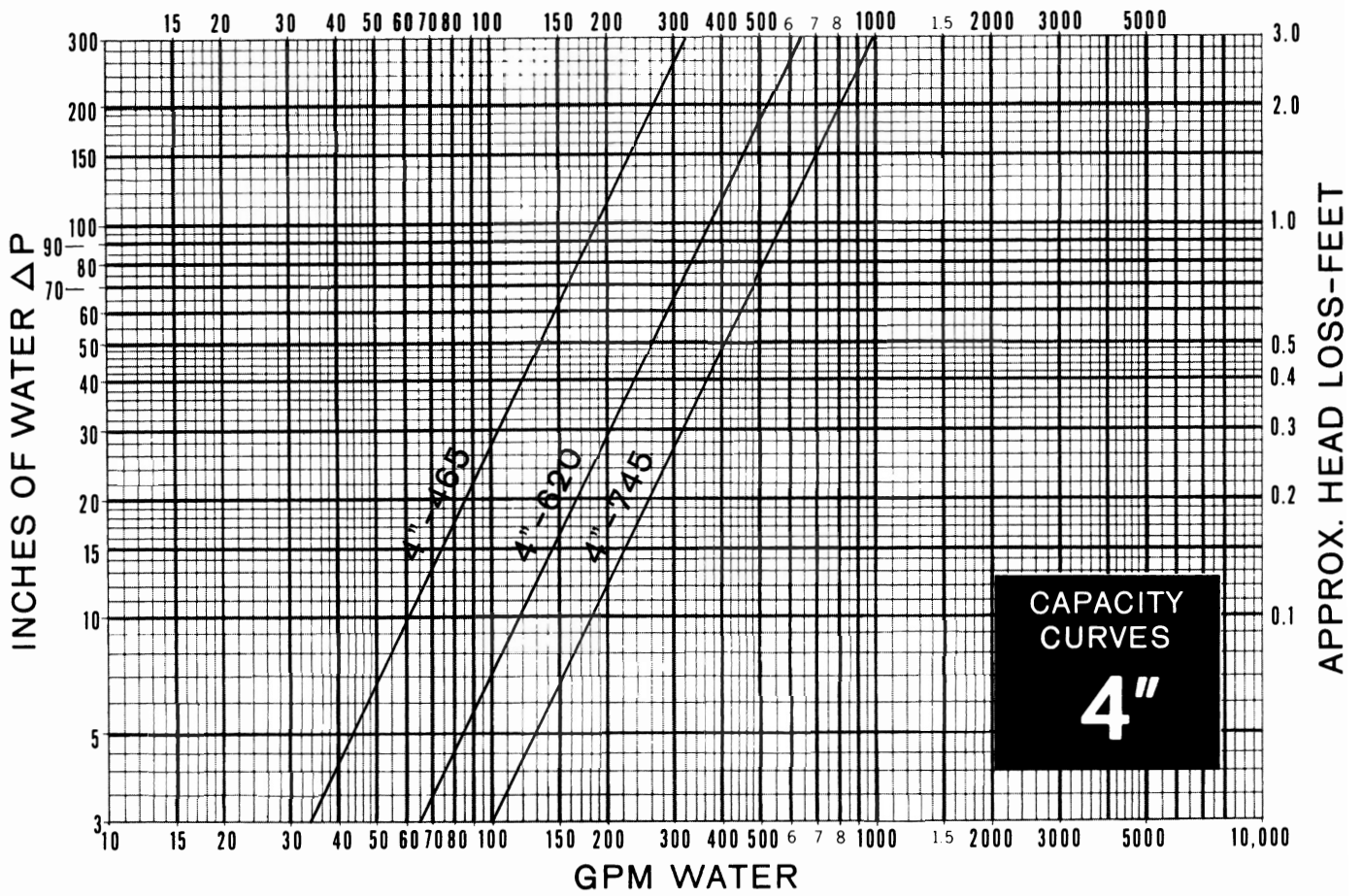
ratings and How to Order information are found on pages 18 thru 23.

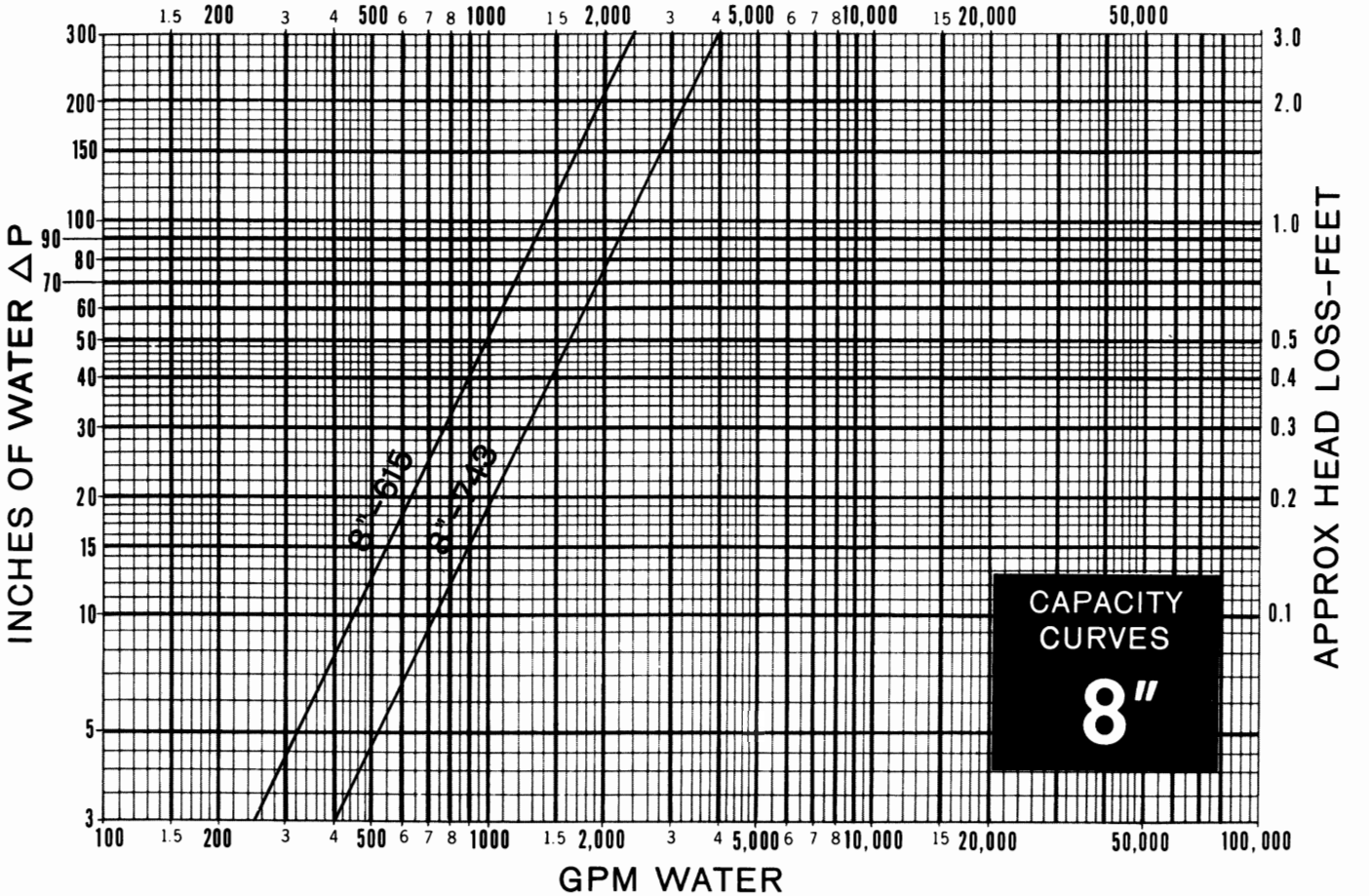
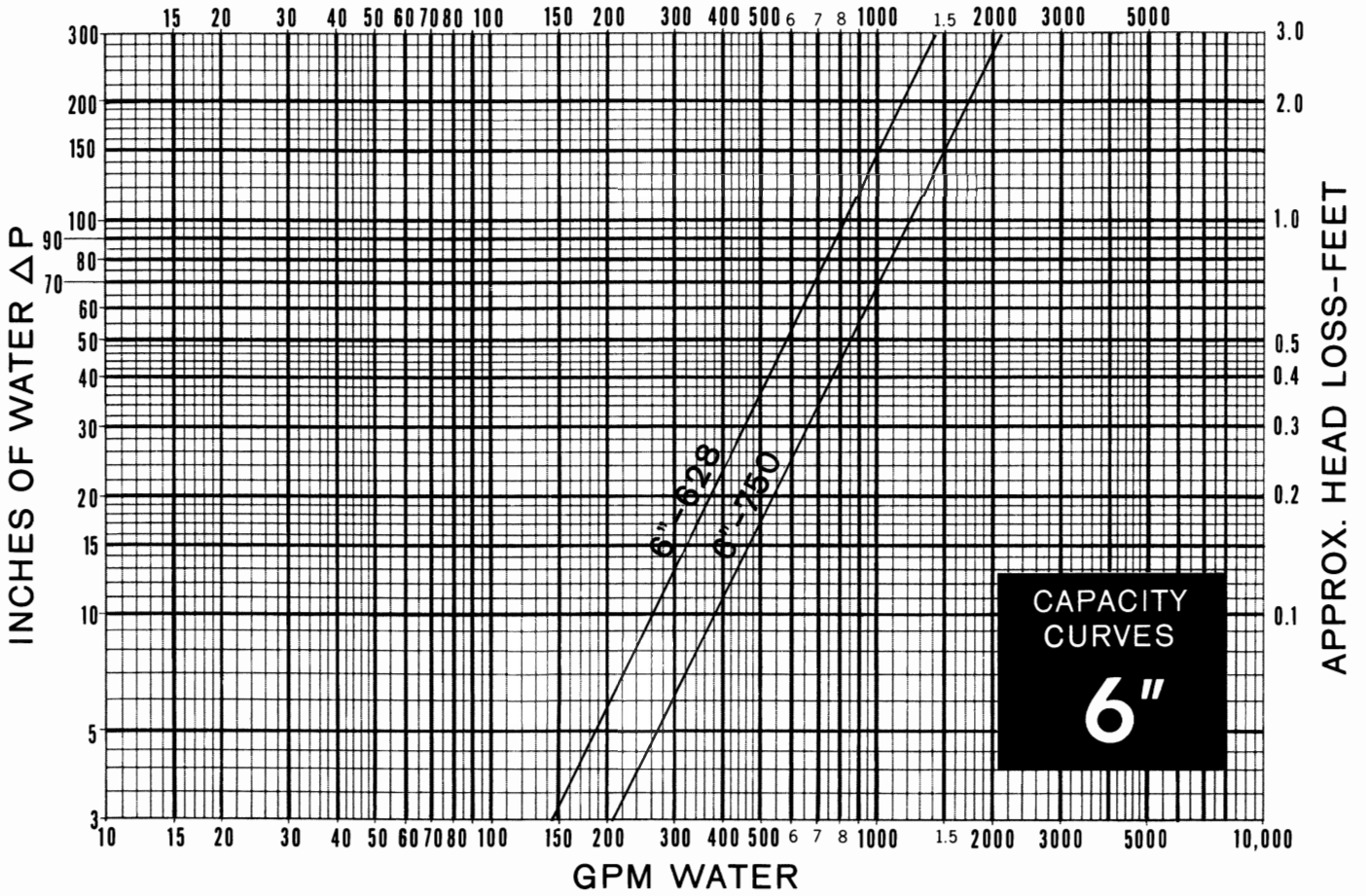


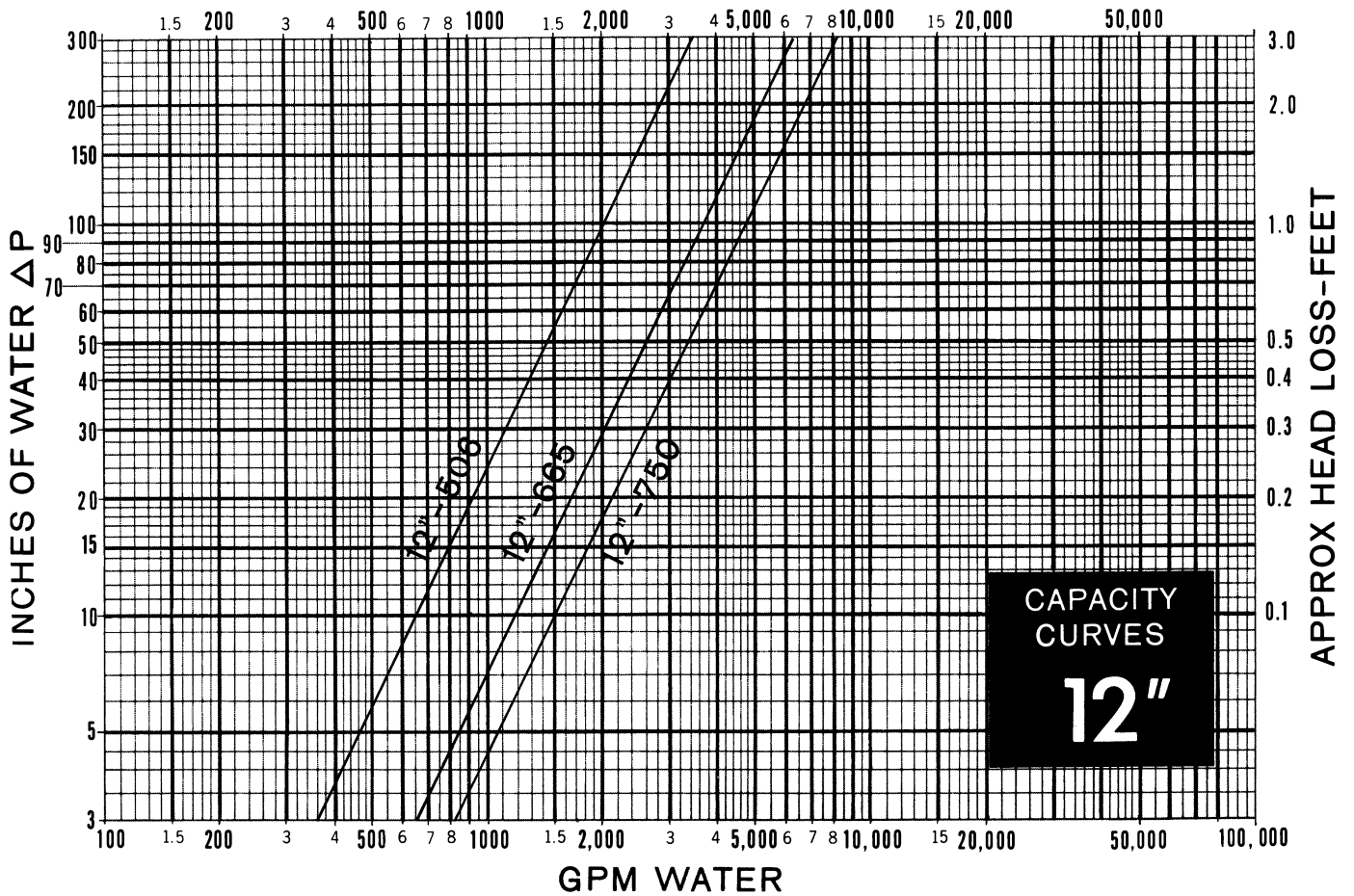
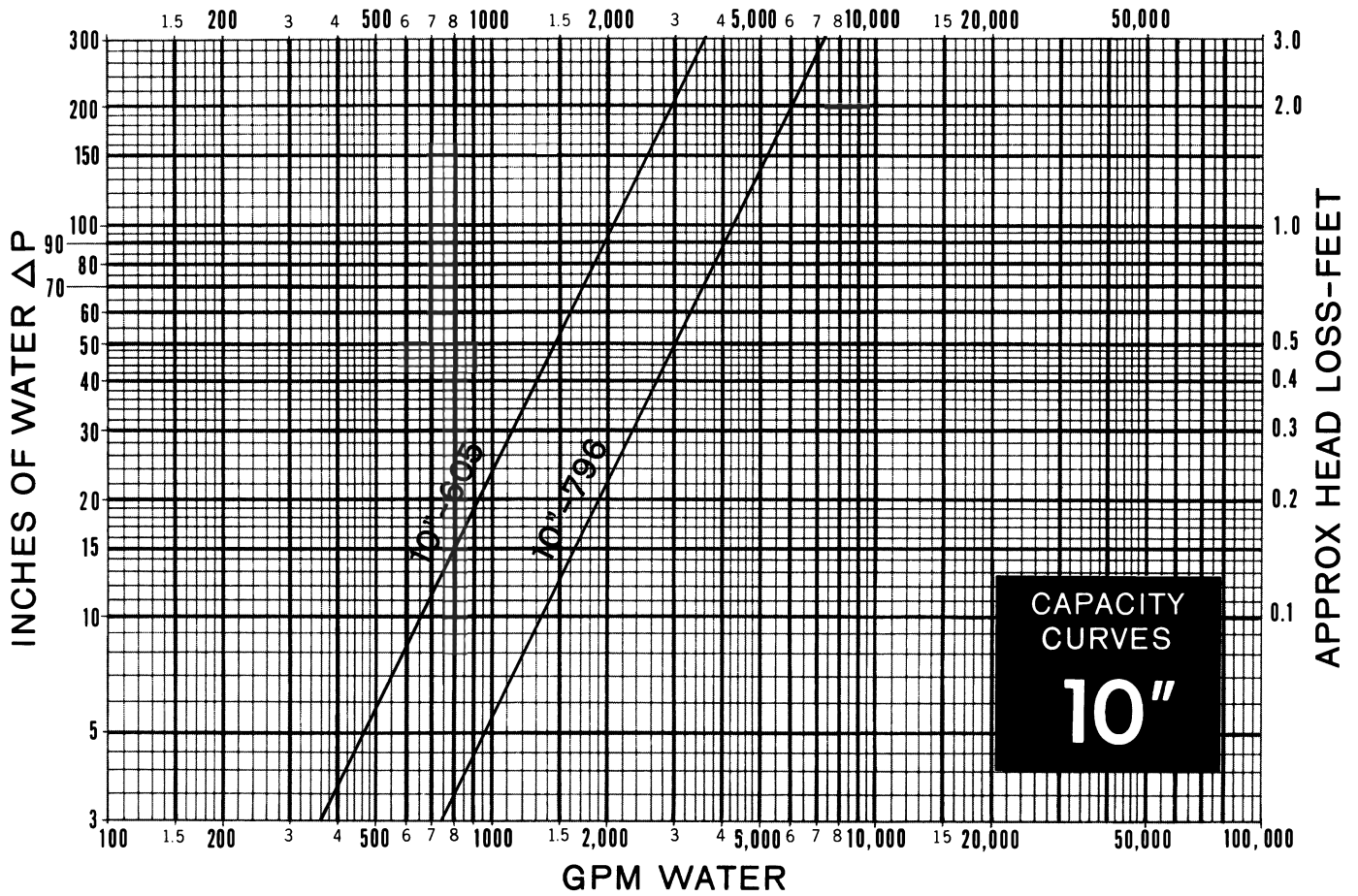


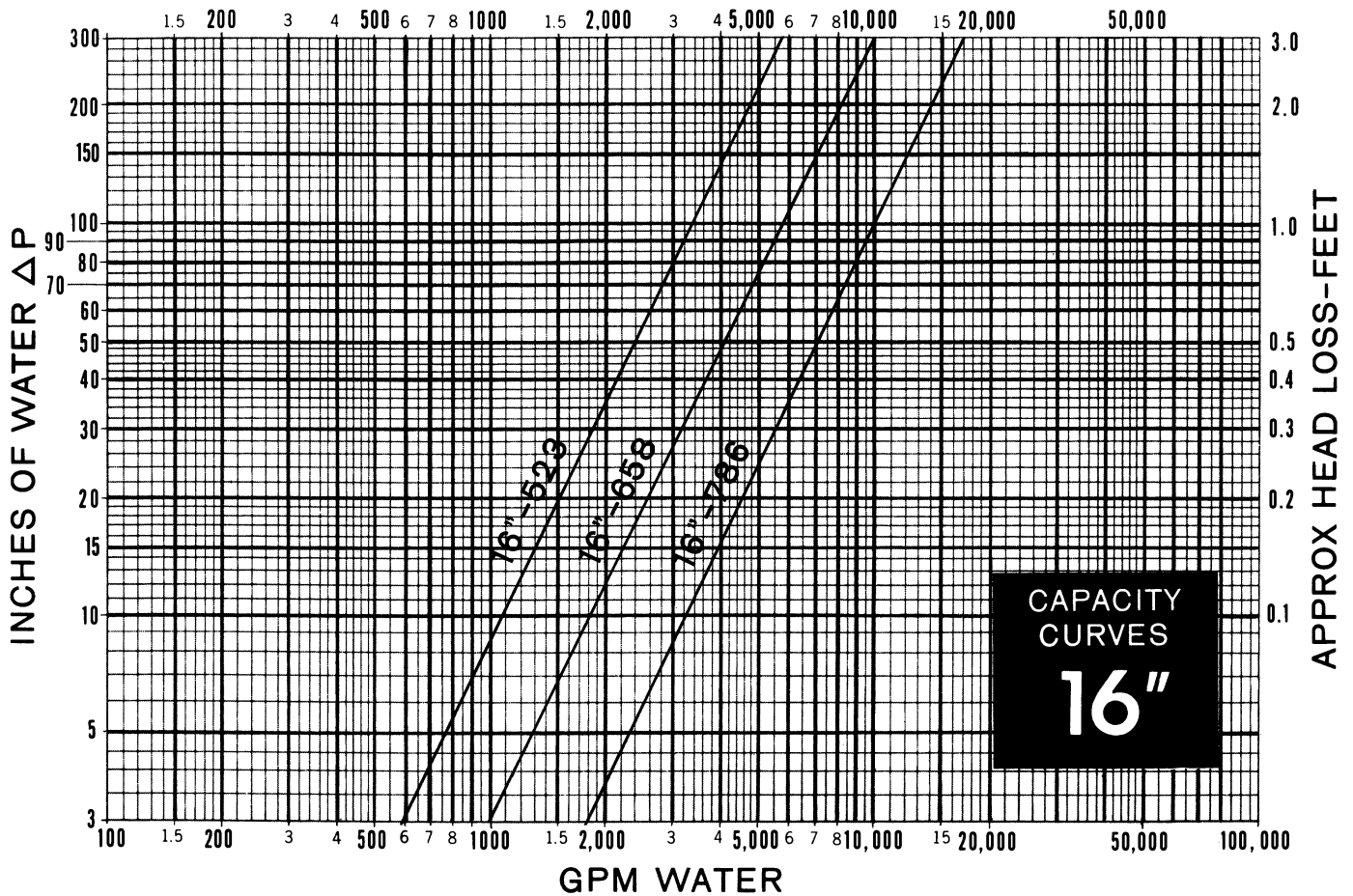
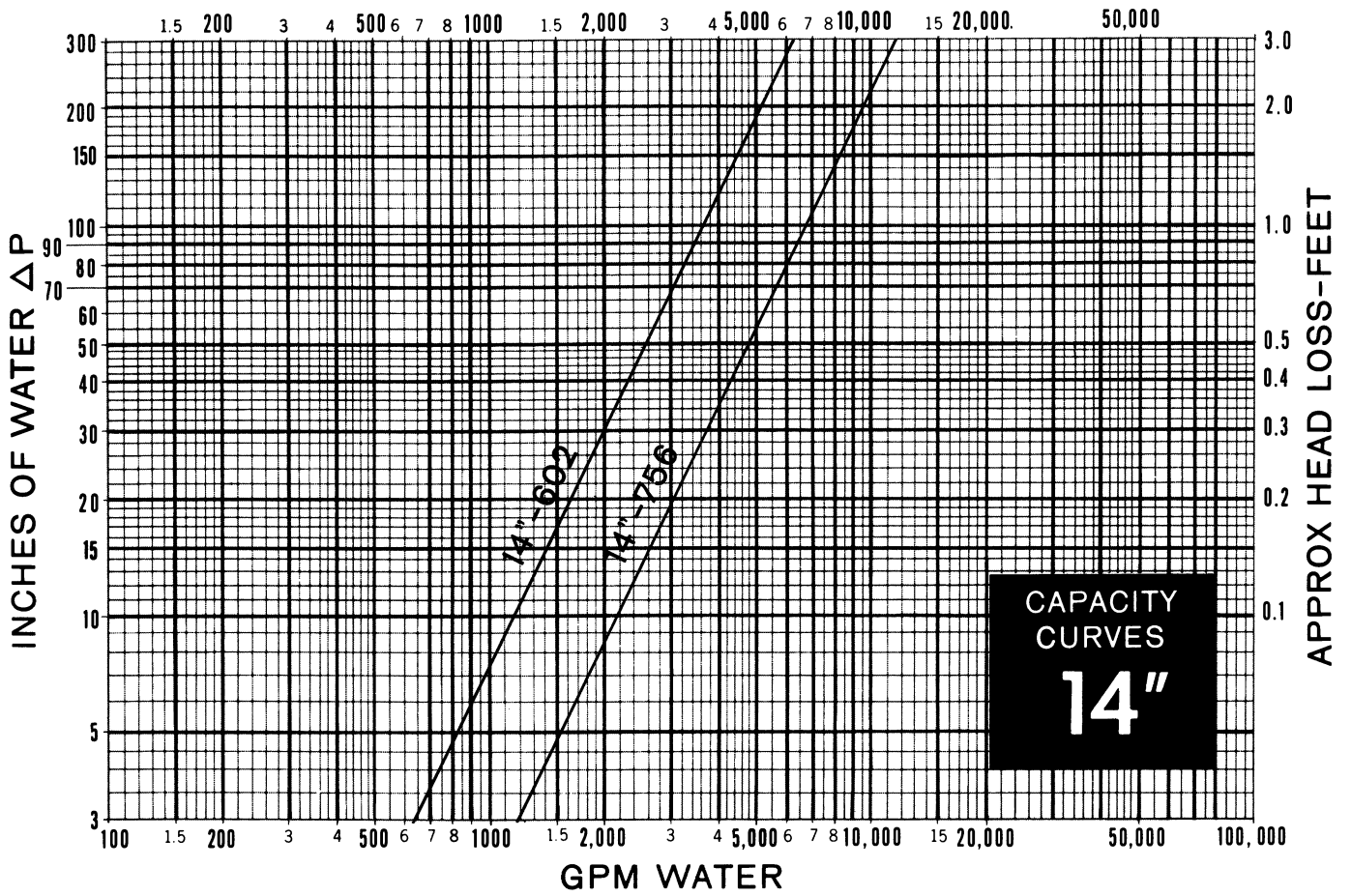


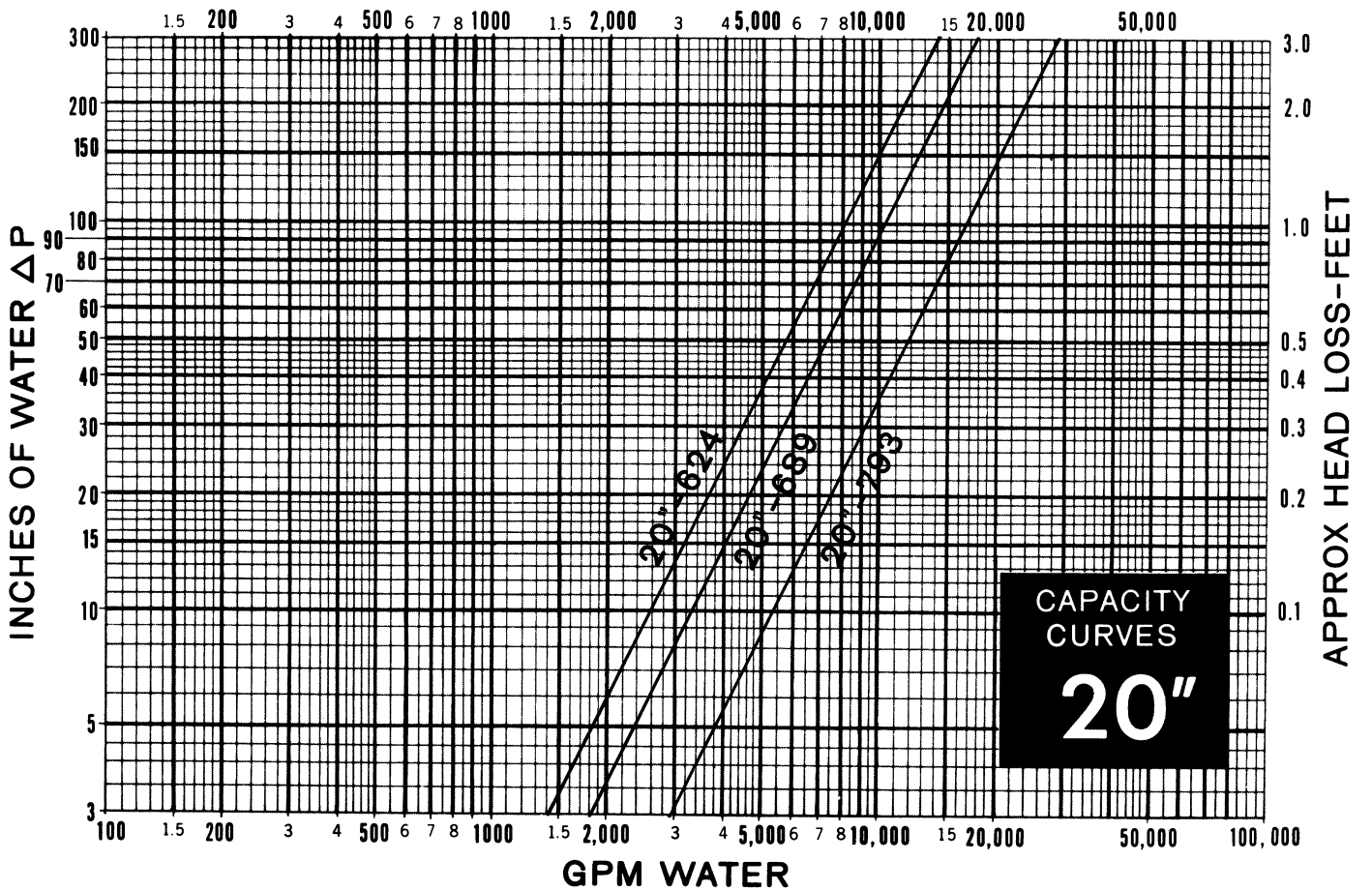
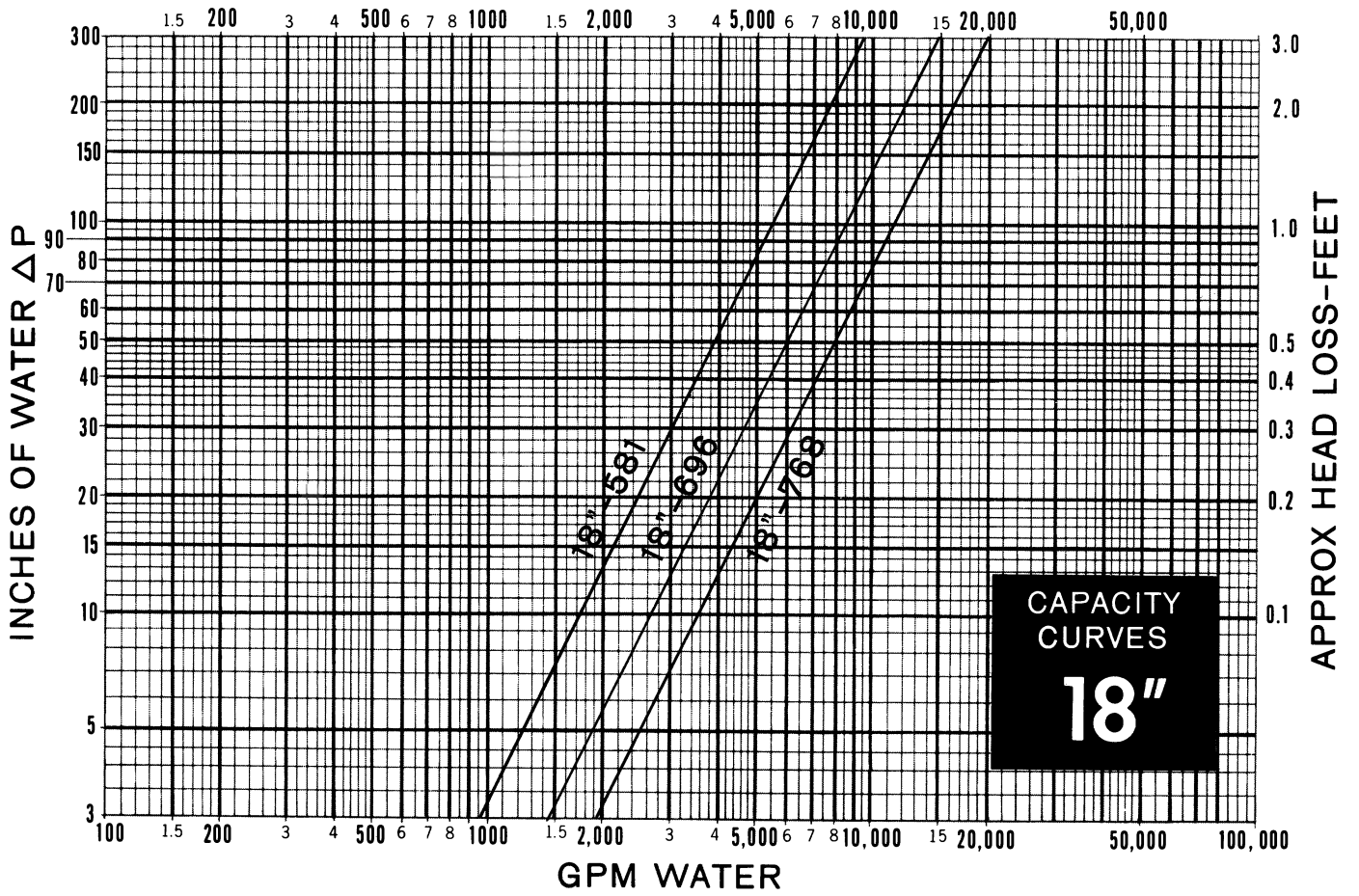


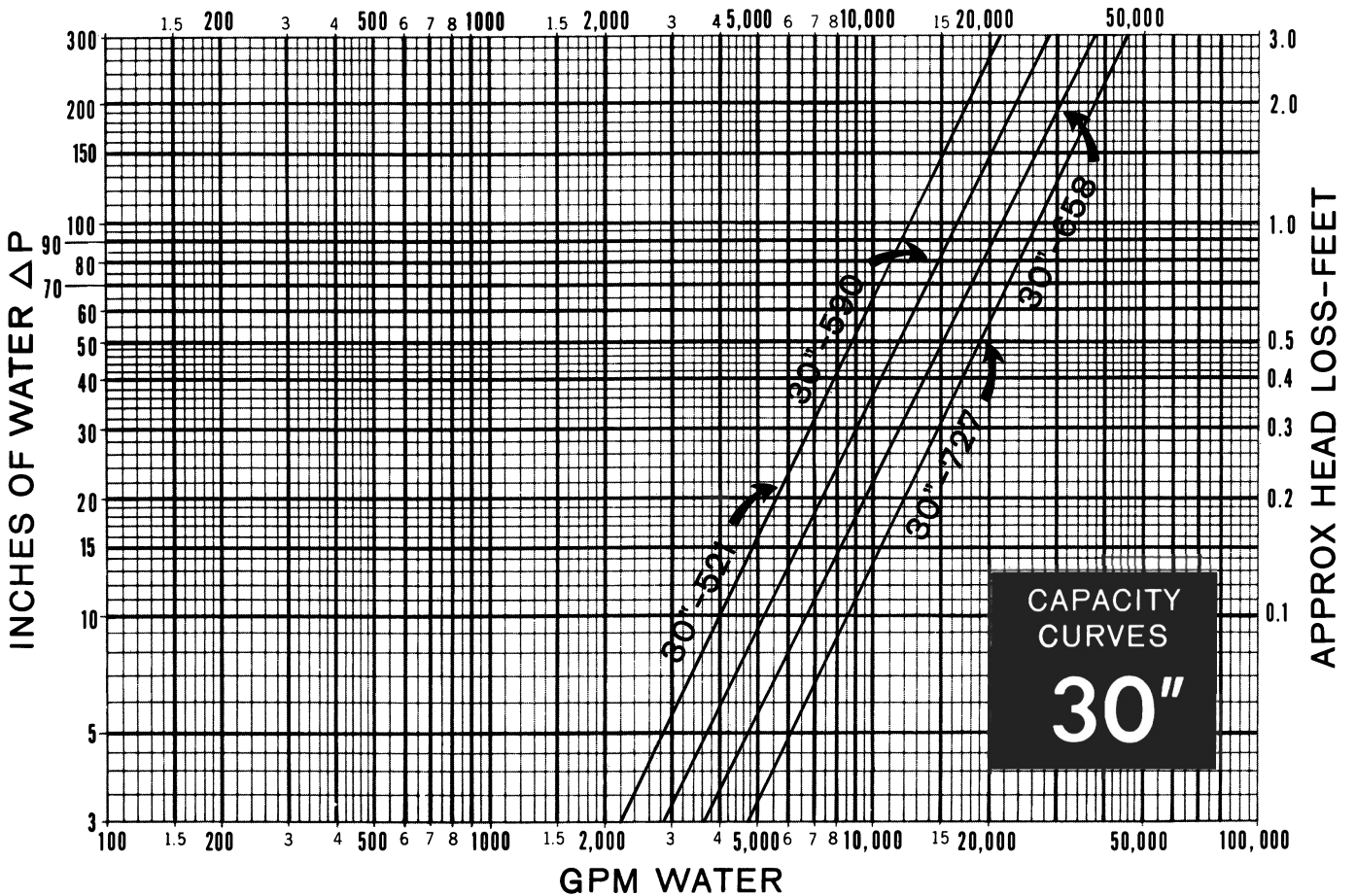
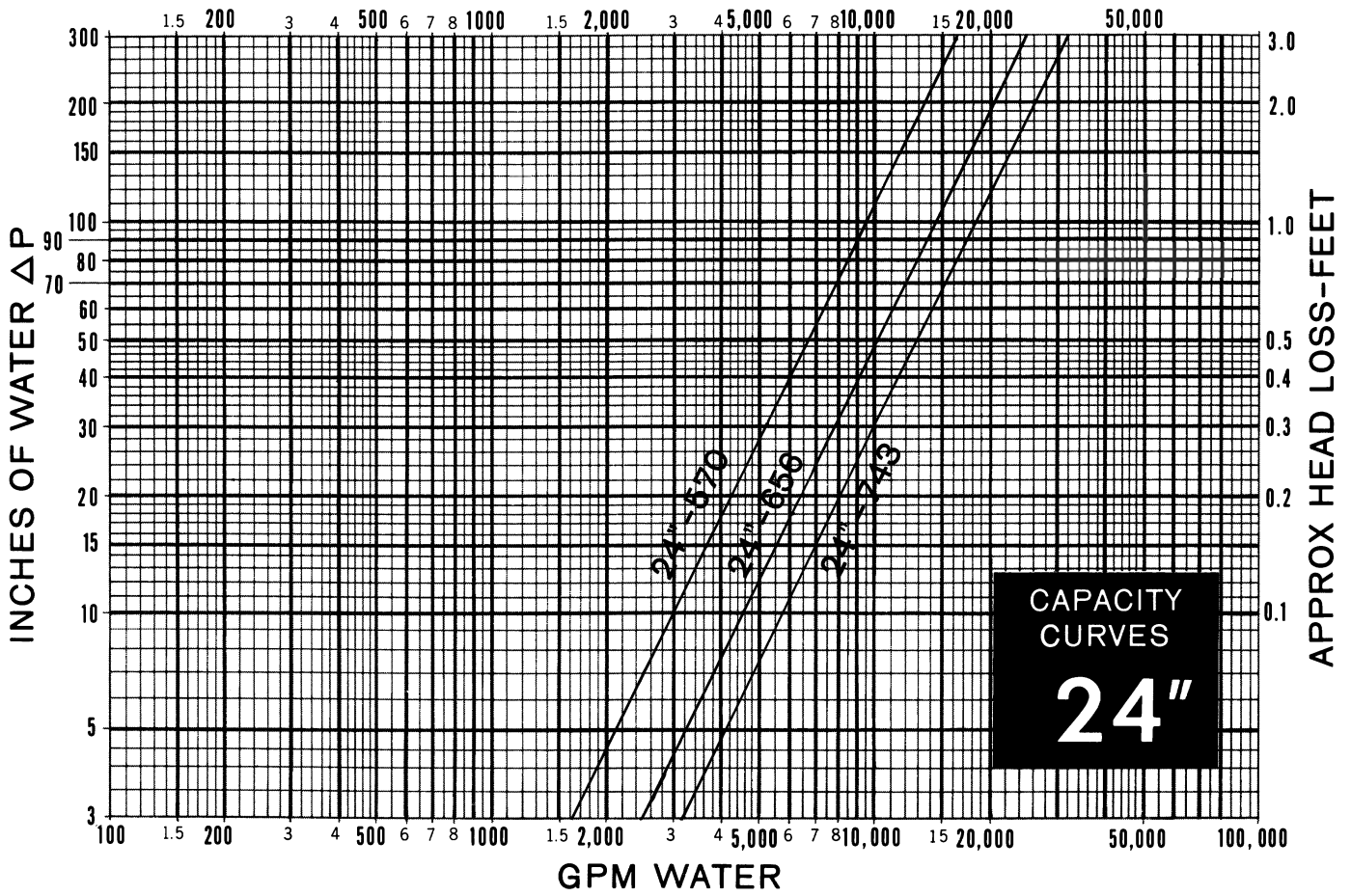




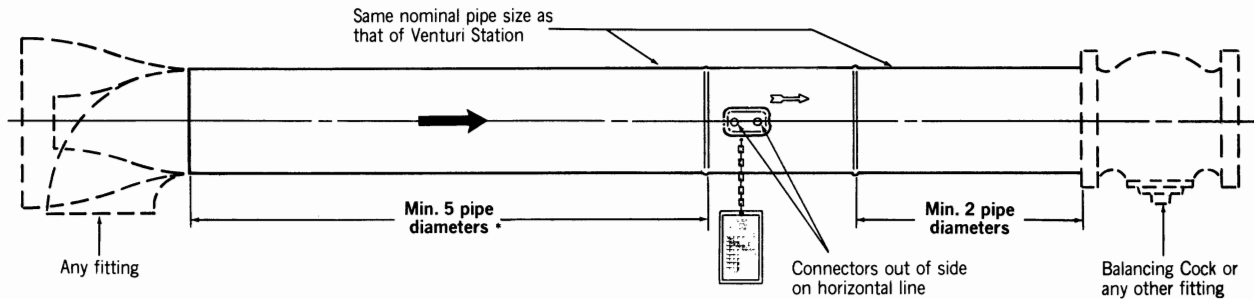








FLOW MEASUREMENT SYSTEM / INSTALLATION INSTRUCTIONS



*Consult factory for recommendations when space is limited.

1. **Note the directional arrow on the venturi and make sure the flow is in the direction of the arrow.**
2. **Position the venturi so that the taps are not pointing straight up, or straight down, but preferably in a horizontal direction.**
3. **Red quick connect assembly should be installed on red, or upstream, tap.**
4. **Green quick connect assembly should be installed on green, or downstream, tap.**
5. **Tag should hang through the insulation, if present, to have station information readily available.**
6. **Venturis can be installed in horizontal, vertical, or inclined pipe lines.**

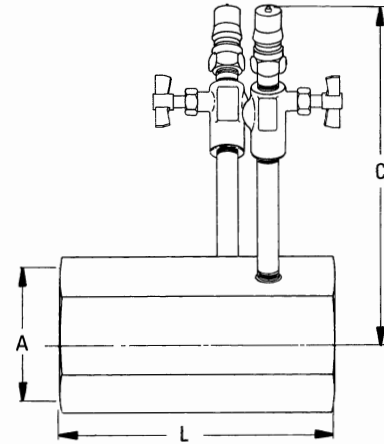
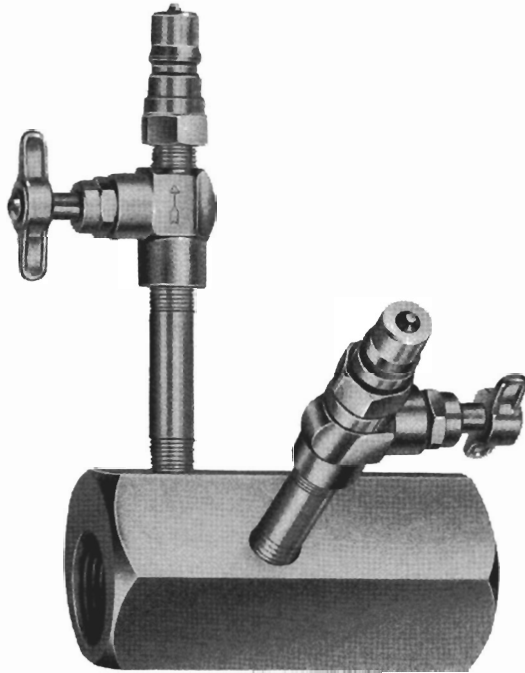
Photo at right shows a reading with flow meter on an insulated water line.

Far right photo shows a reading with the flow meter on an uninsulated portion of another water line.



Hyspan VENTURI

FLOW MEASUREMENT SYSTEM / SERIES V1(BRASS & BRONZE)



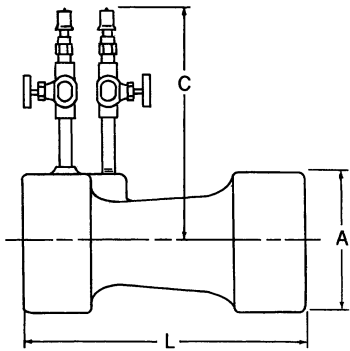
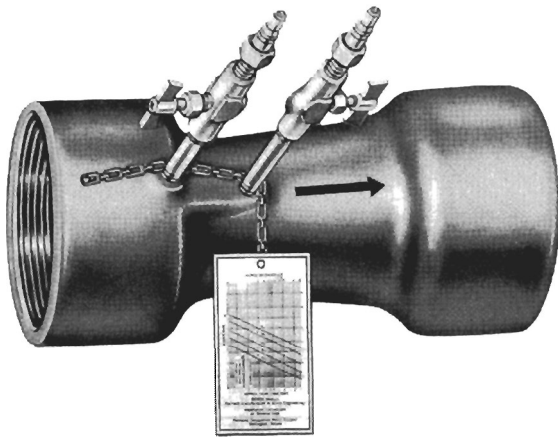
The Series V1 Brass Venturi in sizes 1/2" to 1" is shown above. It is rated to handle pressures to 250 psig and temperatures to +250°F. Each brass venturi is precision made to assure accuracy. Shipped with identification tags and fitting kit (brass nipples, brass valves and color-coded quick connect couplings) attached.

All **HYPAN** Venturis are shipped with a permanently attached tag which shows the correct capacity curve for converting meter readings to gpm.

All dimensions in inches. **BRASS 1/2" TO 1"**

* For pressure rating of fittings, see page 25.

Pipe Size	Beta Ratio	Size Code	End Code	COMPLETE PART NUMBER	A Diam.	C	L	End Connection	Weight each (lbs.)	Rating PSI at +250°F.*
1/2	251	08	31	BR12251-08-31	1.50	5.13	3.40	1/2" NPT	2.0	250
	323	08	31	BR12323-08-31	1.50	5.13	3.40	1/2" NPT	2.0	250
	402	08	31	BR12402-08-31	1.50	5.13	3.40	1/2" NPT	2.0	250
3/4	220	12	31	BR12220-12-31	1.75	5.26	3.40	3/4" NPT	2.5	250
	290	12	31	BR12290-12-31	1.75	5.26	3.40	3/4" NPT	2.5	250
	390	12	31	BR12390-12-31	1.75	5.26	3.40	3/4" NPT	2.5	250
	425	12	31	BR12425-12-31	1.75	5.26	3.40	3/4" NPT	2.5	250
	550	12	31	BR12550-12-31	1.75	5.26	3.40	3/4" NPT	2.5	250
1	298	16	31	BR12298-16-31	2.00	5.38	4.12	1" NPT	3.0	250
	358	16	31	BR12358-16-31	2.00	5.38	4.12	1" NPT	3.0	250
	448	16	31	BR12448-16-31	2.00	5.38	4.12	1" NPT	3.0	250
	567	16	31	BR12567-16-31	2.00	5.38	4.12	1" NPT	3.0	250
	705	16	31	BR12705-16-31	2.00	5.38	4.12	1" NPT	3.0	250



HOW TO ORDER

To order a **HYSpan** Venturi, state the complete part number, as shown in color below. The part number consists of the following elements: first, a basic assembly number which designates the type of venturi; second, the beta ratio; third, the size; and fourth, the end code. Below is a typical example.

End Code

31 = NPT

Complete Part Number

BR12374-20-31

Basic Assembly Number

Beta Ratio

Size Code

End Code

The Series V1 Bronze Venturi in sizes 1¼" to 3" is shown above. It is rated to handle pressures to 250 psig and temperatures to +250°F. Each bronze venturi is precision made to assure accuracy. Shipped with identification tags and fitting kit (brass nipples, brass valves and color-coded quick connect couplings) attached.

All dimensions in inches.

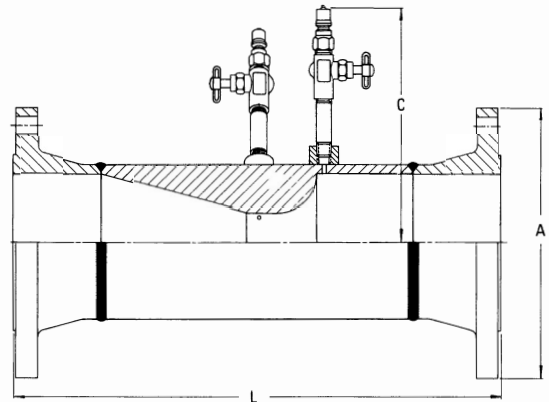
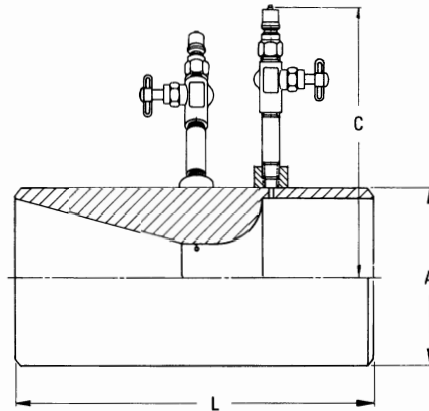
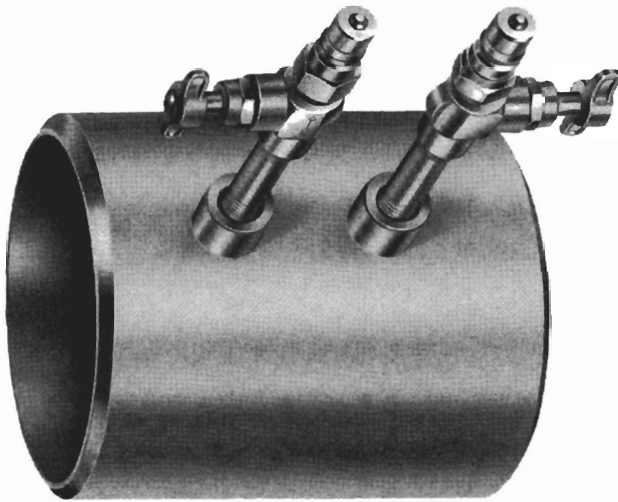
BRONZE 1¼" TO 3"

* For pressure rating of fittings, see page 25.

Pipe Size	Beta Ratio	Size Code	End Code	COMPLETE PART NUMBER	A Diam.	C	L	End Connection	Weight each (lbs.)	Rating PSI at +250°F.*
1¼	374	20	31	BR12374-20-31	2.09	5.50	6.10	1¼" NPT	4.0	250
	498	20	31	BR12498-20-31	2.09	5.50	6.10	1¼" NPT	4.0	250
	588	20	31	BR12588-20-31	2.09	5.50	6.10	1¼" NPT	4.0	250
	725	20	31	BR12725-20-31	2.09	5.50	6.10	1¼" NPT	4.0	250
1½	427	24	31	BR12427-24-31	2.34	5.63	6.60	1½" NPT	5.0	250
	563	24	31	BR12563-24-31	2.34	5.63	6.60	1½" NPT	5.0	250
	698	24	31	BR12698-24-31	2.34	5.63	6.60	1½" NPT	5.0	250
2	393	32	31	BR12393-32-31	2.94	5.88	7.83	2" NPT	6.0	250
	483	32	31	BR12483-32-31	2.94	5.88	7.83	2" NPT	6.0	250
	636	32	31	BR12636-32-31	2.94	5.88	7.83	2" NPT	6.0	250
2½	480	40	31	BR12480-40-31	3.55	6.17	8.22	2½" NPT	9.0	250
	607	40	31	BR12607-40-31	3.55	6.17	8.22	2½" NPT	9.0	250
	750	40	31	BR12750-40-31	3.55	6.17	8.22	2½" NPT	9.0	250
3	478	48	31	BR12478-48-31	4.27	6.49	8.31	3" NPT	12.0	250
	610	48	31	BR12610-48-31	4.27	6.49	8.31	3" NPT	12.0	250
	750	48	31	BR12750-48-31	4.27	6.49	8.31	3" NPT	12.0	250

Hyspan VENTURI

FLOW MEASUREMENT SYSTEM / SERIES V5 STEEL



Series V5 Steel Venturis are available in sizes from 2 1/2" thru 10", with flanged or weld ends. Shipped with identification tags and fitting kit (brass nipples, brass valves and color-coded quick connect couplings) attached.

All **HYSpan** Venturis are shipped with a permanently attached tag which shows the correct capacity curve for converting meter readings to gpm.

Other materials, schedule weld ends, flanges, etc., are available on request.

All dimensions in inches.

Pipe Size	Beta Ratio	Size Code	End Code	COMPLETE PART NUMBER	A Diam.	C	L	End Connection	Weight each (lbs.)	Rating PSI at +250°F.*
2 1/2	480	40	41	BR29480-40-41	7.00	6.26	11.25	150# Flange	25.0	225**
	480	40	61	BR29480-40-61	3.10	6.26	5.50	Sch. 40 .203 Wall	5.5	500†
	607	40	41	BR29607-40-41	7.00	6.26	10.50	150# Flange	23.5	225**
	607	40	61	BR29607-40-61	3.10	6.26	4.75	Sch. 40 .203 Wall	5.0	500†
	750	40	41	BR29750-40-41	7.00	6.26	9.75	150# Flange	22.0	225**
	750	40	61	BR29750-40-61	3.10	6.26	4.00	Sch. 40 .203 Wall	4.0	500†
3	478	48	41	BR29478-48-41	7.50	6.56	11.75	150# Flange	34.0	225**
	478	48	61	BR29478-48-61	3.79	6.56	6.00	Sch. 40 .216 Wall	8.0	500†
	610	48	41	BR29610-48-41	7.50	6.56	11.00	150# Flange	32.0	225**
	610	48	61	BR29610-48-61	3.79	6.56	5.25	Sch. 40 .216 Wall	7.0	500†
	750	48	41	BR29750-48-41	7.50	6.56	10.25	150# Flange	30.0	225**
	750	48	61	BR29750-48-61	3.79	6.56	4.50	Sch. 40 .216 Wall	6.0	500†

HOW TO ORDER

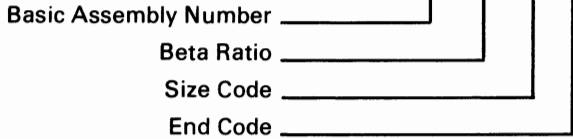
To order a **HYPAN** Venturi, state the complete part number, as shown in color below. The part number consists of the following elements: first, a basic assembly number which designates the type of venturi; second, the beta ratio; third, the size; and fourth, the end code. Below is a typical example.

End Codes

41 = 150 lb. Flange 61 = Weld End 81 = Grooved End

Complete Part Number

BR29465-64-41



* For pressure rating of fittings, see page 25.

** When flanges are used, venturi body without fitting kit is rated at the flange pressure rating, i.e., ANSI 150 lb., ANSI 300 lb., or ANSI 600 lb. (2", 2½" and 3" only).

† Pressure rating of venturi body without fitting kit for 2", 2½", 3" and 4" is designed to meet ANSI 600 lb. ratings, i.e., 1440 psig up to +100°F., 1100 psig up to +600°F.

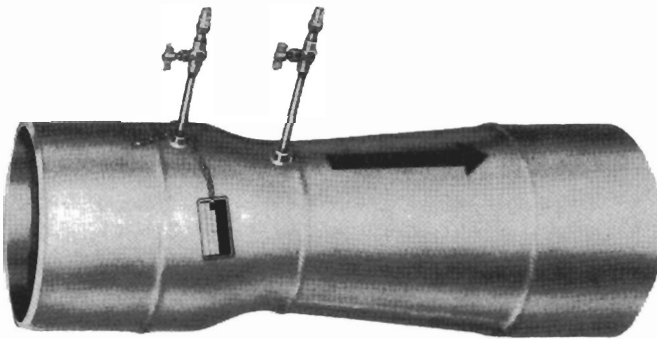
‡ Pressure rating of venturi body without fitting kit for 5", 6", 8", and 10" is designed to meet ANSI 300 lb. ratings, i.e., 720 psig up to +100°F., 550 psig up to +600°F.

All dimensions in inches.

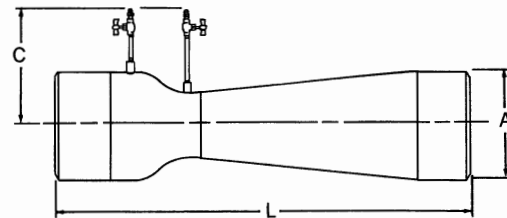
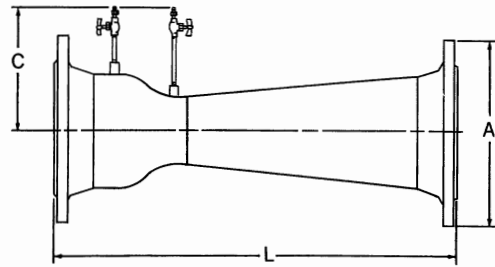
Pipe Size	Beta Ratio	Size Code	End Code	COMPLETE PART NUMBER	A Diam.	C	L	End Connection	Weight each (lbs.)	Rating PSI at +250°F.*
4	465	64	41	BR29465-64-41	9.00	7.04	13.75	150# Flange	47.0	225**
	465	64	61	BR29465-64-61	4.89	7.04	7.50	Sch. 40 .237 Wall	17.0	500†
	620	64	41	BR29620-64-41	9.00	7.04	12.50	150# Flange	42.0	225**
	620	64	61	BR29620-64-61	4.89	7.04	6.25	Sch. 40 .237 Wall	14.0	500†
	745	64	41	BR29745-64-41	9.00	7.04	11.50	150# Flange	40.0	225**
	745	64	61	BR29745-64-61	4.89	7.04	5.25	Sch. 40 .237 Wall	12.0	500†
5	572	65	41	BR29572-65-41	10.00	7.61	14.75	150# Flange	58.0	225**
	572	65	61	BR29572-65-61	5.91	7.61	7.50	Sch. 40 .258 Wall	21.0	500†
	718	65	41	BR29718-65-41	10.00	7.61	12.75	150# Flange	51.0	225**
	718	65	61	BR29718-65-61	5.91	7.61	5.50	Sch. 40 .258 Wall	15.0	500†
6	628	66	41	BR29628-66-41	11.00	8.12	15.25	150# Flange	74.0	225**
	628	66	61	BR29628-66-61	6.92	8.12	8.00	Sch. 40 .280 Wall	29.0	500‡
	750	66	41	BR29750-66-41	11.00	8.12	13.25	150# Flange	64.0	225**
	750	66	61	BR29750-66-61	6.92	8.12	6.00	Sch. 40 .280 Wall	21.0	500‡
8	615	68	41	BR29615-68-41	13.50	9.12	18.25	150# Flange	123.0	225**
	615	68	61	BR29615-68-61	8.96	9.12	10.00	Sch. 40 .322 Wall	49.0	500‡
	743	68	41	BR29743-68-41	13.50	9.12	16.25	150# Flange	110.0	225**
	743	68	61	BR29743-68-61	8.96	9.12	8.00	Sch. 40 .322 Wall	39.0	500‡
10	605	70	41	BR29605-70-41	16.00	10.12	21.00	150# Flange	154	225**
	605	70	61	BR29605-70-61	10.75	10.12	13.00	Sch. 40 .365 Wall	62	500
	796	70	41	BR29796-70-41	16.00	10.12	17.00	150# Flange	138	225**
	796	70	61	BR29796-70-61	10.75	10.12	9.00	Sch. 40 .365 Wall	50	500

Hyspan VENTURI

FLOW MEASUREMENT SYSTEM / SERIES V3 (FABRICATED STEEL)



Sizes: 12" thru 16"



Series V3 Fabricated Steel Venturi is available with flanged or weld ends in sizes from 12" to 30". Design pressure ratings of Series V3 venturi body (without fitting kit) is limited to pressure ratings as indicated on this page and the next. Shipped with identification tags and fitting kit (brass nipples, brass valves and color-coded quick connect couplings) attached.

Other materials, schedule weld ends, flanges, etc., are available on request.

All dimensions in inches.

Pipe Size	Beta Ratio	Size Code	End Code	COMPLETE PART NUMBER	A Diam.	C	L	End Connection	Weight each (lbs.)	Rating PSI at +250°F.*
12	506	72	41	BR24506-72-41	19.00	13.89	42.00	150# Flange	300	225**
	506	72	61	BR24506-72-61	12.75	13.82	45.00	Std. Sch. .375 Wall	175	500
	665	72	41	BR24665-72-41	19.00	13.89	34.00	150# Flange	225	225**
	665	72	61	BR24665-72-61	12.75	13.82	37.00	Std. Sch. .375 Wall	150	500
	750	72	41	BR24750-72-41	19.00	14.31	36.50	150# Flange	240	225**
	750	72	61	BR24750-72-61	12.75	14.31	39.50	Std. Sch. .375 Wall	130	500
14	602	74	41	BR24602-74-41	21.00	14.75	45.00	150# Flange	375	225**
	602	74	61	BR24602-74-61	14.00	14.75	47.00	Sch. 30 .375 Wall	225	450
	756	74	41	BR24756-74-41	21.00	14.82	37.00	150# Flange	350	225**
	756	74	61	BR24756-74-61	14.00	14.82	39.00	Sch. 30 .375 Wall	200	450
16	523	76	41	BR24523-76-41	23.50	15.75	54.00	150# Flange	500	225**
	523	76	61	BR24523-76-61	16.00	15.75	56.00	Sch. 30 .375 Wall	275	400
	658	76	41	BR24658-76-41	23.50	15.82	46.00	150# Flange	475	225**
	658	76	61	BR24658-76-61	16.00	15.44	48.00	Sch. 30 .375 Wall	250	400
	786	76	41	BR24786-76-41	23.50	15.82	39.00	150# Flange	450	225**
	786	76	61	BR24786-76-61	16.00	15.82	41.00	Sch. 30 .375 Wall	225	400

HOW TO ORDER

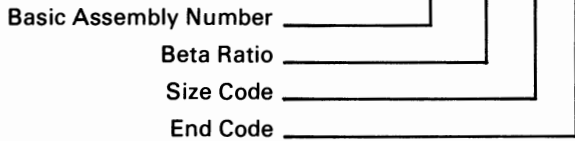
To order a **HYSPAN** Venturi, state the complete part number, as shown in color below. The part number consists of the following elements: first, a basic assembly number which designates the type of venturi; second, the beta ratio; third, the size; and fourth, the end code. Below is a typical example.

End Codes

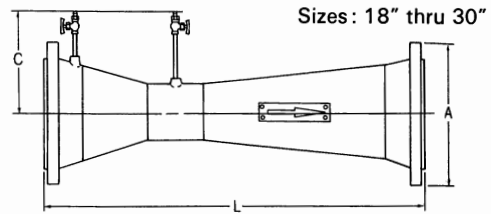
41 = 150 lb. Flange **61** = Weld End **81** = Grooved End

Complete Part Number

BR24605-70-41



All **HYSPAN** Venturis are shipped with a permanently attached tag which shows the correct capacity curve for converting meter readings to gpm.

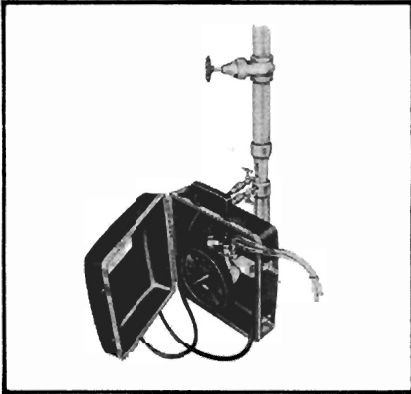


- * For pressure rating of fittings, see page 25.
- ** When flanges are used, venturi body without fitting kit is rated at the flange pressure rating for the 12" through 20" venturi, i.e., ANSI 150 lb.
- † Maximum pressure rating for 24" and 30" venturi is 250 psig, with or without 150 lb. flanges.

All dimensions in inches.

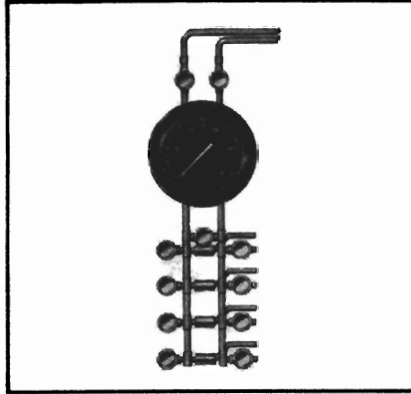
Pipe Size	Beta Ratio	Size Code	End Code	COMPLETE PART NUMBER	A Diam.	C	L	End Connection	Weight each (lbs.)	Rating PSI at +250°F.*
18	581	78	41	BR24581-78-41	25.00	16.82	67.00	150# Flange	600	225**
	581	78	61	BR24581-78-61	18.00	16.82	80.00	Std. Sch. .375 Wall	425	350
	696	78	41	BR24696-78-41	25.00	16.82	54.00	150# Flange	550	225**
	696	78	61	BR24696-78-61	18.00	16.82	67.00	Std. Sch. .375 Wall	375	350
	768	78	41	BR24768-78-41	25.00	16.51	46.00	150# Flange	500	225**
	768	78	61	BR24768-78-61	18.00	16.44	59.00	Std. Sch. .375 Wall	350	350
20	624	80	41	BR24624-80-41	27.50	17.51	67.38	150# Flange	700	225**
	624	80	61	BR24624-80-61	20.00	17.44	80.00	Sch. 20 .375 Wall	500	300
	689	80	41	BR24689-80-41	27.50	17.51	59.38	150# Flange	650	225**
	689	80	61	BR24689-80-61	20.00	17.44	72.00	Sch. 20 .375 Wall	450	300
	793	80	41	BR24793-80-41	27.50	17.51	46.38	150# Flange	600	225**
	793	80	61	BR24793-80-61	20.00	17.44	59.00	Sch. 20 .375 Wall	400	300
24	570	84	41	BR24570-84-41	32.00	19.51	87.00	150# Flange	900	225**
	570	84	61	BR24570-84-61	24.00	19.44	99.00	Sch. 20 .375 Wall	700	250†
	656	84	41	BR24656-84-41	32.00	19.51	73.00	150# Flange	850	225**
	656	84	61	BR24656-84-61	24.00	19.44	85.00	Sch. 20 .375 Wall	600	250†
	743	84	41	BR24743-84-41	32.00	19.51	61.00	150# Flange	800	225**
	743	84	61	BR24743-84-61	24.00	19.44	73.00	Sch. 20 .375 Wall	550	250†
30	521	90	41	BR24521-90-41	38.75	22.51	113.25	150# Flange	1600	225**
	521	90	61	BR24521-90-61	30.00	22.44	127.00	Std. Sch. .375 Wall	1050	250†
	590	90	41	BR24590-90-41	38.75	22.51	99.25	150# Flange	1500	225**
	590	90	61	BR24590-90-61	30.00	22.44	113.00	Std. Sch. .375 Wall	1000	250†
	658	90	41	BR24658-90-41	38.75	22.51	85.24	150# Flange	1400	225**
	658	90	61	BR24658-90-61	30.00	22.44	99.00	Std. Sch. .375 Wall	900	250†
	727	90	41	BR24727-90-41	38.75	22.51	71.25	150# Flange	1300	225**
	727	90	61	BR24727-90-61	30.00	22.44	85.00	Std. Sch. .375 Wall	800	250†

MOUNTING STYLES



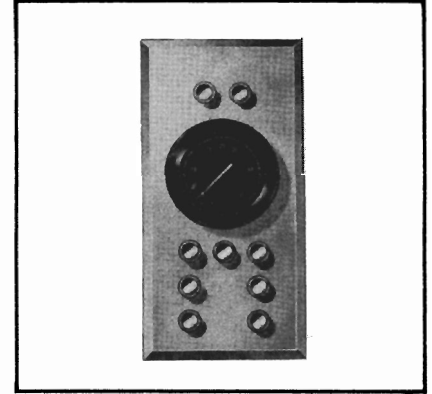
Portable Master Meter

This master meter is a high precision instrument for measuring pressure differential. Only one meter is usually required for measuring a number of stations in the same building, or complex. Weighing only 12 pounds, the meter is carried from station to station in a durable case. A complete operating manual fits into the cover. The meter itself is rugged and accurate, giving dependable precision readings. The standard dial has a range of 0 to 50 inches of water. Other dial ranges, such as 0–100", or direct reading gpm dials are available. Self-contained, the meter is supplied with two quick disconnect fittings and ten feet of hose for the upstream and throat connections. Shutoff valves for bleeding, balancing and shutoff are also included. The standard meter is suitable for +250°F. water at 250 psig. Special units for higher temperatures, pressures and other media are available.



Wall-Mounted

The wall-mounted meter is designed for fixed installation as shown in the illustration above. The meter is supplied with mounting brackets, appropriate valves, connectors and assembly piping. Various piping arrangements are available to adapt this meter configuration for single, or multiple station measurement. Specify number of stations to be measured.



Panel-Mounted

The panel-mounted meter is designed for fixed mounting in an instrument panel as shown in the illustration above. The valves for bleedoff and shutoff are normally furnished facing forward through a specified pattern to fit customer-furnished panel. Also available for mounting with valves facing backward for operation from rear. Various piping arrangements are available to adapt this meter configuration for single, or multiple station measurement. Specify number of stations to be measured.

Consult Operating and Installation Manual for meter usage and installation instructions.

RATINGS

Fitting Kits

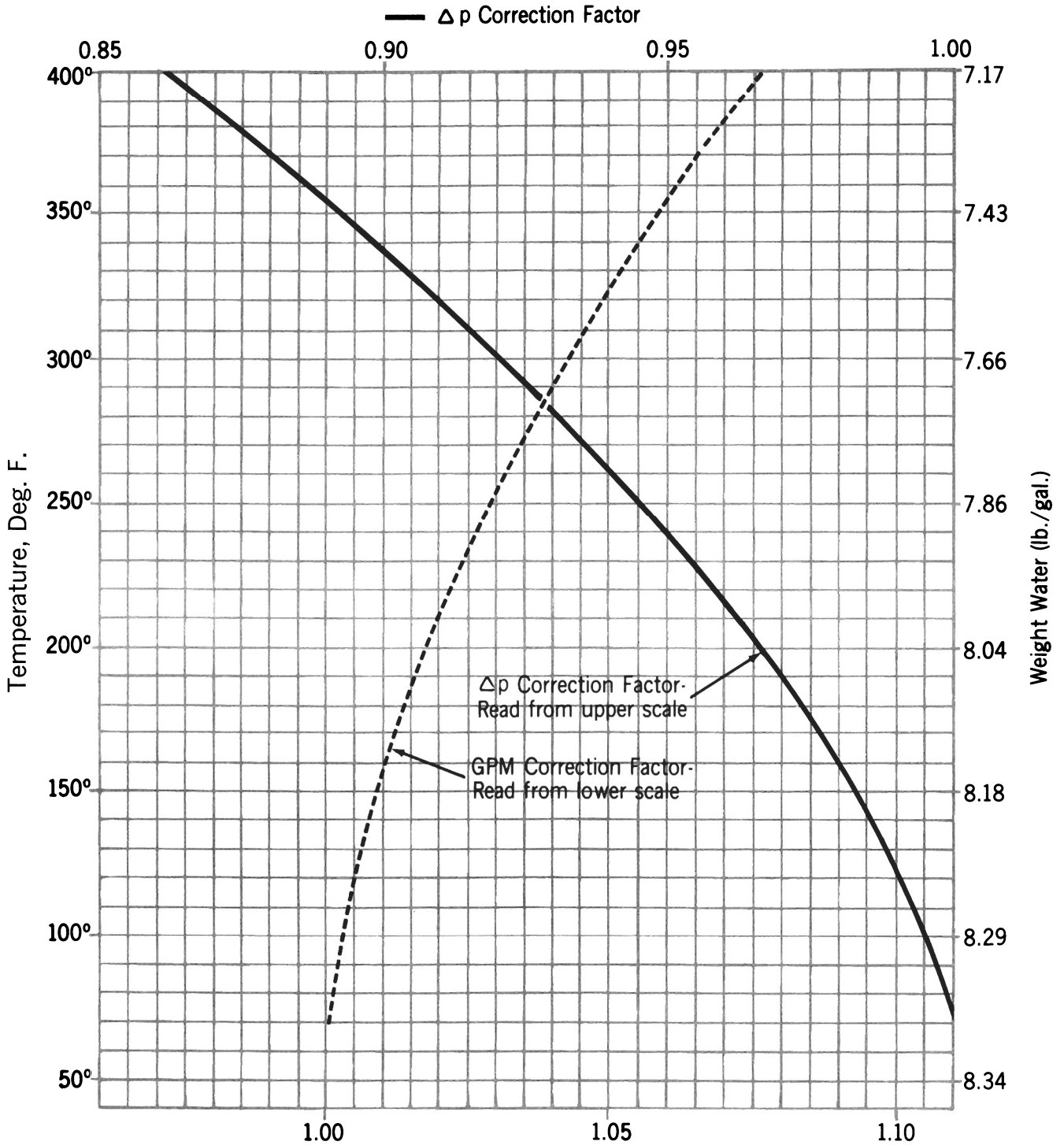
- 1) Standard Fitting Kit** (500 psig, +250°F.): P/N 30-10103-32-32
Nipples, brass: 2600 psig at +250°F.
Valve, brass: 500 psig at +250°F.
Quick connect coupling (male): 1000 psig at +250°F.
- 2) High Temperature Fitting Kit** (500 psig, +400°F.): P/N 30-10468-32-32
Nipples, stainless steel: 4500 psig at +400°F.
Valve, stainless steel (seals): 500 psig at +400°F.
Quick connect coupling (male): up to 1600 psig at +400°F.
- 3) High Pressure Fitting Kit:** available to 1500 psig. Consult factory.

Meter Fittings

- 1) High Pressure:** (500 psig, +250°F.
Meter body: 500 psig at +250°F.
Meter valves: 2500 psig at +250°F.
Meter Hose (portable meter only—Teflon hose with brass fittings): 500 psig at +250°F.
Quick connect coupling (female): 1000 psig at +250°F.
- 2) Standard Pressure:** (250 psig, +250°F.)
Meter body: 500 psig at +250°F.
Meter valves: 250 psig at +250°F.
Meter hose (portable meter only—rubber braided hose with brass fittings): 250 psig at +250°F.
Quick connect coupling (female): 1000 psig at +250°F.
- 3) Higher Pressure** (1500 psig): Consult factory for proper parts.

ENGINEERING FACTORS

Multiply Δp specified for flow rate with 70° water by correction factor to obtain required Δp for specified GPM at other temperature



---- GPM Correction Factor
 Multiply GPM by correction factor to obtain actual GPM at temperature indicated.

MEDIA CONVERSION FACTORS

Capacity curves are for water at +70°F. For water at higher temperature, see page 26. Most other media can be converted to equivalent gpm water at +70°F. by the use of an appropriate formula with the following constants.

Constants:

1.0 gpm water at +70°F. is approximately equal to:

Air (C_a) = 3.8 SCFM AT 0 PSIG & +70°F.

Steam (C_s) = 12.25 PPH at 0 PSIG saturated (+212°F.)

Gas (C_g) = $\frac{3.8}{\sqrt{S_g}}$ SCFM at 0 PSIG & +70°F.

Legend:

Q₁ = given quantity of fluid.

Q₂ = sizing quantity equivalent gpm +70°F. water.

F_{pa} = pressure correction factor for air.

F_{ta} = temperature correction factor for air.

F_{ps} = pressure correction factor for steam.

SCFM = a cubic foot of air at 14.7 PSIA and +70°F.

PPH = pounds per hour.

S_g = specific gravity of gas relative to air.

1. Water

Read directly from capacity curves which are designed to read gpm water at +70°F. For other temperatures, see correction factors on page 26.

2. Air (use for sizing venturi)*

To find the equivalent gpm water at +70°F. use the following formula:

$$Q_2 = \frac{Q_1}{C_a} \times F_{pa} \times F_{ta}$$

Example: 500 SCFM Air at 100 psig and +150°F.

$$Q_2 = \frac{500}{3.8} \times .36 \times 1.07 = 51 \text{ gpm}$$

Solution: Use 2"-636 to read 25.5" ΔP

3. Saturated Steam (use for sizing venturi)*

Use the following formula:

$$Q_2 = \frac{Q_1}{C_s} \times F_{ps}$$

Example: 5000 PPH at 100 psig

$$Q_2 = \frac{5000}{12.25} \times .38 = 155 \text{ gpm}$$

Solution: Use 3"-750 to read 21" ΔP

4. Other Liquids

Use the following formula:

$$Q_2 = Q_1 \sqrt{S_g}$$

Example: 100 gpm, specific gravity 1.21, viscosity 1.0 centistokes

$$Q_2 = Q_1 \sqrt{S_g}$$

$$Q_2 = 100 \times 1.1 = 110 \text{ gpm}$$

Solution: 2½"-750 to read 25" ΔP

5. Gas (use for sizing venturi)*

Use the following formula:

$$Q_2 = \frac{Q_1}{C_g} \times F_{pa} \times F_{ta}$$

Example: 24,000 SCFM natural gas with specific gravity of 0.6 and measured at 15 psig and +70°F.

$$Q_2 = 24,000 \div \frac{3.8}{\sqrt{0.6}} \times .70 \times 1.0 = 3425 \text{ gpm}$$

Solution: Use 14"-756 to read 30.0" ΔP

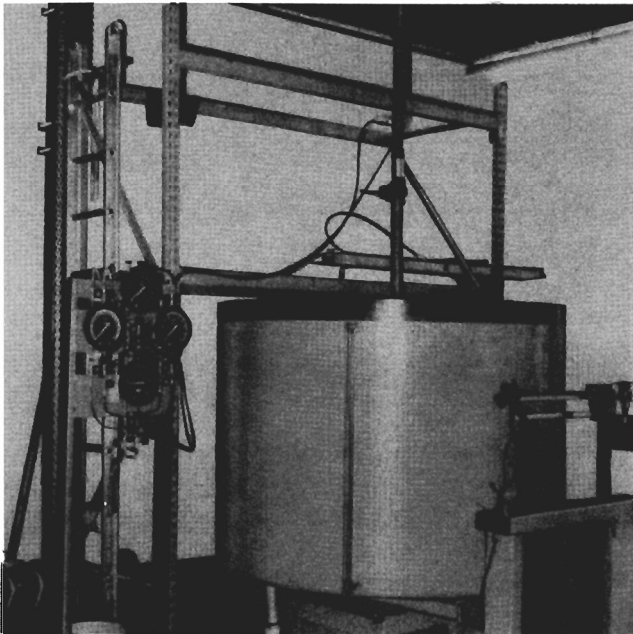
Temperature		Pressure		
Deg. F	Air/Gas Temp. F _{ta}	PSIG	Air/Gas Press. F _{pa}	Sat. Steam Press. F _{ps}
0	0.932	0	1.000	1.000
2	0.933	2	.938	.934
4	0.936	4	.886	.887
6	0.938	6	.843	.846
8	0.940	8	.805	.811
10	0.942	10	.771	.780
12	0.944	12	.742	.752
14	0.946	14	.716	.727
16	0.948	16	.692	.705
18	0.950	18	.670	.685
20	0.952	20	.651	.666
25	0.956	25	.608	.626
30	0.961	30	.573	.592
35	0.966	35	.544	.564
40	0.971	40	.518	.539
50	0.981	50	.477	.498
60	0.990	60	.443	.466
70	1.000	70	.416	.439
80	1.009	80	.394	.416
90	1.019	90	.375	.397
100	1.028	100	.358	.380
120	1.046	120	.330	.352
140	1.064	140	.308	.331
160	1.081	160	.290	.312
180	1.099	180	.275	.296
200	1.116	200	.261	.282
225	1.137	225	.247	.267
250	1.157	250	.235	.255
275	1.177	275	.225	.244
300	1.197	300	.216	.234
325	1.217	325	.208	.226
350	1.236	350	.201	.218
375	1.255	375	.194	.211
400	1.274	400	.188	.204
425	1.292	425	.183	.198
450	1.310	450	.178	.193
475	1.328	475	.173	.188
500	1.346	500	.169	.183

The accuracy of venturis is well-known throughout the industry. Independent of the size, or beta ratio, stock **HYSpan** Venturi Systems thru 8" in size are guaranteed to be accurate to within $\pm 2\%$ of the true value, regardless of the flow.

There are, however, some flow monitoring situations where even greater accuracy than $\pm 2\%$ is required. No flow measuring device can achieve greater long term accuracy than a properly calibrated venturi. **HYSpan** therefore, offers as a customer option, individual calibration of any

venturi. This individual calibration can result in an assurance of accuracy to $\pm \frac{1}{4}$ of 1%. This accuracy is achieved by plotting the actual flow through the specific venturi under laboratory conditions. When converted, these actual flow points form capacity curves that are peculiar to the individual venturi involved.

The following paragraphs explain several systems **HYSpan** uses to calibrate specific venturis. Additional information can be obtained by contacting the factory.



ARL ALDEN RESEARCH LABORATORIES / FOXBORO LABORATORIES

Venturis above 4" sizes are calibrated at selected independent test laboratories. Alden Research Laboratories and Foxboro Company have calibrated a number of these larger size venturis. The apparatus used at Alden Labs is a weighing tank facility utilizing a weigh tank mounted on scales with a crystal reference timer and a backup timer, along with a mercury thermometer.

Water is pumped by means of centrifugal pumps arranged to operate in parallel. The flow element to be calibrated is installed in the test line and water is introduced while air is bled from the test line and monometer lines. The zero of

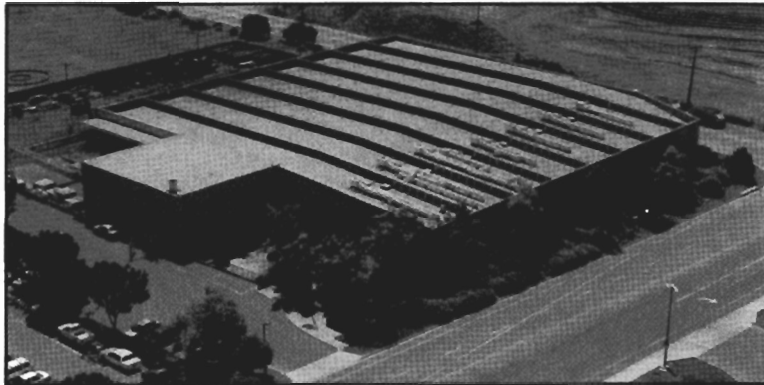
each monometer is set and checked; and the control valve at the downstream end of the test line is set to give the desired flow, with the discharge flowing to waste. The scale indicator and electric timer are zeroed and the water is then diverted into the weighing tank while the electric timer starts at the instant of diversion. At least 20 readings of pressure differential are taken and averaged. Flow is then adjusted to the desired flow rate and the procedure repeated. The accuracy of the test permits the average flow rate for each run to be within $\frac{1}{4}$ of 1% of the true value.

TYPICAL SPECIFICATIONS

- 1.0 Furnish and install where shown on drawings, complete **Hyspan** Venturi Flow Measurement System as manufactured by **Hyspan**. This shall be a coordinated system, including individual Venturi Flow Stations and Portable (or permanently mounted) Master Meter, supplied by one manufacturer.
- 2.0 Each primary flow element shall be a **Hyspan** Venturi selected from manufacturers' engineering data to permit prescribed flow at a minimum of head loss. For maximum accuracy and minimal turbulence in recovery area and thus low pressure loss, the beta ratio shall be selected to allow for a differential pressure compatible with the meter as specified herein and insure a proper system accuracy throughout the entire range. This accuracy must be obtained with as little as five (5) pipe diameters of straight pipe upstream and two (2) diameters downstream from the venturi. Each venturi shall be furnished with two (2) accurately located built-in sensing taps, nipples, shutoff valves and quick connect couplings. Venturis shall be complete with an identification tag on chain giving pipe size, venturi series, station identification and meter reading at specified flow rate, flow vs differential curves and installation instructions.
- 3.0 Venturi stations shall be one-piece brass or bronze threaded 1/2" through 3". Sizes 2 1/2" through 10" shall consist of one-piece steel, with weld or flanged ends. Sizes 12" and larger shall be fabricated steel, with weld or flanged ends.
- 4.0 Venturi sizes and beta ratios shall be selected so that design flow rates shall read between 20% and the full scale range on a linear meter (e.g. between 10" and 50" on a 0-50" meter), with permanent pressure loss of not more than 25% of indicated flow rate differential pressure.
- 5.0 The indicating meter shall be portable (or permanently mounted) type with 6" round dial, 270° indication. It shall be the dual rupture-proof liquid filled bellows type with integral temperature compensation. The meter shall have over-range protection in either direction equal to the working pressure equivalent of the instrument housing (250 psig @ +250°F). The accuracy of the meter shall be no less than 0.75% full scale. The meter case shall be waterproof. It shall have external zero and range adjusting screws and lifelong lubrication. Scale shall be calibrated uniformly either in differential pressure (0-5", 0-100"); percent of flow; or directly in gpm.
- 5.1 Portable Master Meters shall be mounted in a durable metal reinforced plastic carrying case with the following accessories:
 - a) Two (2) 10" lengths of connecting hose, each with color-coded quick connect couplings compatible with the venturi couplings.
 - b) Two (2) brass blow-down valves with Buna-N seals.
 - c) Blow-down hoses.
 - d) Instruction book with flow vs differential curves.Portable Master Meter shall (shall not) become the property of owner.
- 5.2 Stationary, or permanently mounted meters shall be furnished with wall or panel mounting brackets, bleedoff and shutoff valves, connectors, fittings and assembly piping for single, or multiple stations. Piping connections from venturi to meter shall be furnished by the contractor.

NOTE: The above is a suggested wording for a typical specification of a Flow Measurement System—since service conditions and other factors will vary on different projects the exact wording may need revision to fit different specific situations.

HYSpan BARCO BALL JOINTS



Chula Vista, California headquarters and manufacturing plant completed in 1983. Total area 54,000 square feet. Office staff performs all company design and production engineering, sales and marketing, accounting and administration. Manufacturing includes ASME code and custom expansion joints, and tooling and equipment fabrication. Expansion joints have been manufactured up to 31'0" diameter.



Tulsa, Oklahoma manufacturing plant completed in 1989. Total area 41,200 square feet. Manufactures and inventories wire braid, bellows pump connectors, packed slip expansion joints, expansion compensators, and pipe guides. The facility also includes the seal fabrication for ball joints.



Hyspan

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