

Sizing Spring Loaded Regulators – Questions to Ask

1. What **Type of Gas**? (Natural or Propane)?
2. What is **Inlet Pressure**? (Min and Max if it varies)
3. What is **Outlet Pressure**? (set point and or range)
4. What is **Connected Load**? (in BTU or CuFt)
5. Is Regulator **Located Inside or Outside**?
6. If Inside, do you want it “ventless”?
7. What is Line Size?
8. Is Connected Load a Single Appliance or Multiple & are any high efficiency?
9. If Inlet Pressure is above 2 PSIG do you need an overpressure protection device (OPD)?

Note: If you get items 1-5 we can make a selection, the other items help refine the selection for the application.

Sizing Spring Loaded Regulators – Rules of Thumb

1. Use MINIMUM inlet pressure expected and MAXIMUM flow required when considering capacity needs
2. If inlet is 2 PSIG or less select the largest orifice. Above 2 PSIG choose the orifice that can meet or exceed the capacity requirement AND meets the safety requirements for safety (see relief/build up). Above 10 PSIG inlet, select the smallest orifice that meets the capacity and safety requirements
3. Use maximum WORST CASE inlet pressure expected when considering relief performance.
4. Choose the LIGHTEST spring available that can meet outlet pressure requirements (i.e. choose set point at upper end of spring range but don't max it out.)

Sizing Spring Loaded Regulators – Procedure

Step 1: Size orifice to meet capacity requirements based on the lowest potential inlet pressure

Step 2: Check Maximum inlet pressure rating for the orifice to make sure it meets MAOP of the system

Step 3: Check relief build-up pressure using relief curves – based on highest potential inlet pressure.

Step 4: Choose the correct adjustment spring

Exceptions to the “Rules”

When sizing for 2 PSIG inlet and 7-14” w.c. out, we generally use as large an orifice as the regulator will accommodate. This is because a “2 PSIG System” will actually often have only 1-1.5 PSIG at the inlet of the regulator. In addition, code generally does not require any form of over-pressure protection, so there is no safety issue associated with a large orifice selection.

Example 1:

1. **Type of Gas** (Natural or Propane): Natural
2. **Inlet Pressure:** 2 PSIG
3. **Outlet Pressure:** 7" w.c.
4. **Connected Load:** 400 CFH
5. **Located Inside or Outside:** Outside

B42 SERIES COMMERCIAL REGULATOR, MODELS N, R

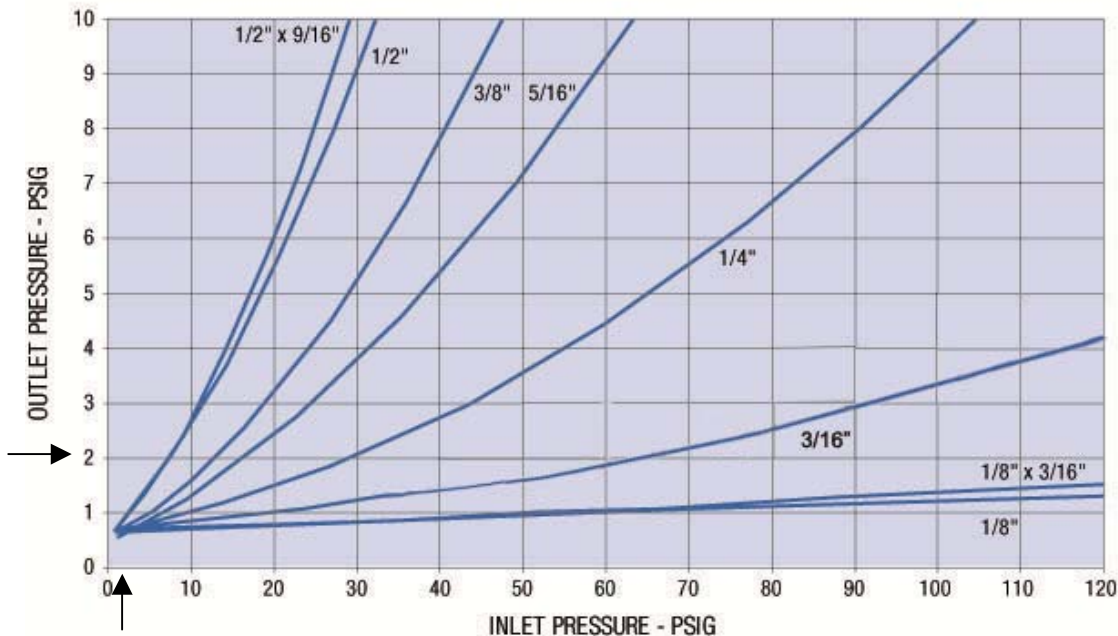
7" w.c. (17.5 mbar) Capacity Table (1" w.c. Droop*)

Capacities in SCFH (m3/hr) of 0.6 S.G. gas; base conditions of 14.7 PSIA and 60° F.

Inlet Pressure		Orifice Size							
PSIG	BAR	1/8"	1/8 x 3/16"	3/16"	1/4"	5/16"	3/8"	1/2"	1/2 x 9/16"
0.5	0.038	65 (1.8)	70 (2.0)	90 (2.5)	140 (3.9)	175 (4.9)	210 (5.9)	270 (7.6)	280 (7.9)
1	0.069	80 (2.3)	110 (3.1)	140 (3.9)	200 (5.7)	275 (7.8)	300 (8.5)	400 (11.3)	450 (12.7)
2	0.1	100 (2.8)	180 (5.1)	225 (6.4)	250 (7.1)	375 (10.6)	425 (12.0)	600 (17.0)	700 (19.8)
3	0.2	170 (4.8)	225 (6.4)	310 (8.8)	350 (9.9)	500 (14.2)	575 (16.3)	800 (22.7)	910 (25.8)
5	0.3	215 (6.1)	280 (7.9)	400 (11.3)	500 (14.2)	725 (20.5)	825 (23.4)	1100 (31.1)	1230 (34.8)
10	0.7	340 (9.6)	390 (11.0)	625 (17.7)	850 (24.1)	1100 (31.1)	1300 (36.8)	1550 (43.9)	1720 (48.7)

Note: In this instance a 3/8" orifice would technically meet the requirement, but we go up an orifice size, to 1/2", to give us some cushion and protect us should the inlet pressure drop. A larger orifice is also less likely to freeze or be blocked by small debris.

B42R Relief Curves, Blocked Open, 7" w.c. Set Point, Nat Gas



Code requires an OPD (Over-pressure Protection Device) for inlet pressures above 2 PSIG. Since this application is equal to or less than 2 PSIG no OPD is actually required. From the curve above you can see that at 2 PSIG the relief valve would keep build up pressure below 1 PSIG with any size orifice installed.

Example 2:

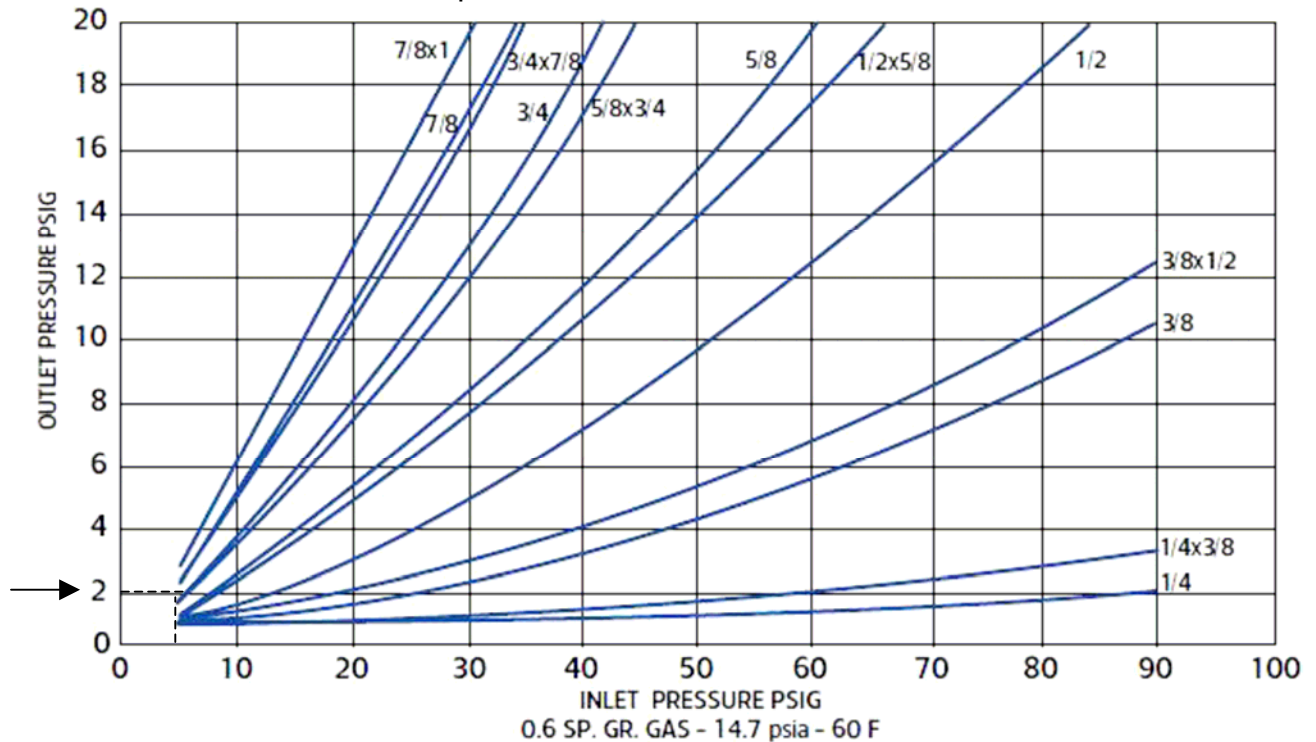
1. **Type of Gas** (Natural or Propane): Natural
2. **Inlet Pressure:** 5 PSIG
3. **Outlet Pressure:** 7" w.c.
4. **Connected Load:** 3,000 CFH
5. **Located Inside or Outside:** Outside

B34 SERIES COMMERCIAL REGULATOR, MODELS N, R, M, AND D

7" w.c. (17.5 mbar) Capacity Table (1" w.c. Droop*) for Nat Gas (0.6 S.G.)

Inlet Pressure		Orifice Size							
PSIG	Bar	1/2" x 5/8"	5/8"	5/8" x 3/4"	3/4"	3/4" x 7/8"	7/8"	7/8" x 1"	
8" w.c.	0.020	400 (11.2)	500 (14.0)	635 (17.8)	675 (18.9)	725 (20.3)	850 (23.8)	900 (25.2)	
10" w.c.	0.025	650 (18.2)	750 (21.0)	850 (23.8)	900 (25.2)	1050 (29.4)	1150 (32.2)	1225 (34.3)	
12" w.c.	0.030	800 (22.4)	800 (22.4)	950 (26.6)	1050 (29.4)	1100 (30.8)	1250 (35.0)	1425 (39.9)	
14" w.c.	0.035	900 (25.2)	1175 (32.9)	1200 (33.6)	1250 (35.0)	1525 (42.7)	1700 (47.6)	1900 (53.2)	
16" w.c.	0.040	1050 (29.4)	1175 (32.9)	1350 (37.8)	1550 (43.4)	1700 (47.6)	1950 (54.6)	2050 (57.4)	
18" w.c.	0.045	1150 (32.2)	1275 (35.7)	1575 (44.1)	1750 (49.0)	1825 (51.1)	2050 (57.4)	2350 (65.8)	
21" w.c.	0.052	1350 (37.8)	1500 (42.5)	1750 (49.0)	1800 (50.4)	2100 (58.8)	2350 (65.8)	2700 (75.6)	
24" w.c.	0.060	1450 (40.6)	1700 (47.6)	1950 (54.6)	2100 (58.8)	2250 (63.0)	2700 (75.6)	3000 (84.0)	
1	0.069	1500 (42.0)	2200 (61.6)	2200 (61.6)	2300 (64.4)	2400 (67.2)	2700 (75.6)	3200 (89.6)	
2	0.138	2000 (56.0)	3000 (84.0)	3300 (92.4)	3700 (103.6)	4000 (112.0)	4500 (126.0)	4700 (131.6)	
3	0.207	2700 (75.6)	4000 (112.0)	4200 (117.6)	4400 (123.3)	4600 (128.8)	5200 (145.6)	6000 (168.0)	
5	0.345	4000 (112.0)	5100 (142.8)	5700 (159.6)	6800 (190.4)	7000 (196.0)	7500 (210.0)	8000 (224.0)	
10	0.69	5700 (159.6)	8500 (238.0)	9000 (252.0)	10000 (280.0)	10000 (280.0)	10000 (280.0)	10000 (280.0)	

B34R Relief Curves, Blocked Open, 7" w.c. Set Point, Nat Gas.



Select a B34R with 1/2"x5/8" orifice (but no larger than 3/4"). Any orifice above this could potentially build up beyond the code limit of 2 PSIG. Black Spring (6.5

Example 3:

1. **Type of Gas** (Natural or Propane): Natural
2. **Inlet Pressure:** 2 PSIG
3. **Outlet Pressure:** 11" w.c.
4. **Connected Load:** 5000 CFH
5. **Located Inside or Outside:** Inside
6. If Inside, do you want it "ventless"? Yes
7. What is Line Size? 4"

Excerpts from Pietro Fiorentini Governor Extended Capacity Tables for Nat Gas (0.6 S.G.)
 Size at 50% to 75% of listed capacity to minimize high lock-up.

30154 1-1/2"	Outlet Pressure	Operating Inlet pressure											OPD vers
		4" w.c.	5" w.c.	6" w.c.	7" w.c.	11" w.c.	0.5 PSIG	0.75 PSIG	1 PSIG	1.5 PSIG	2 PSIG	3 PSIG	
30154-G	2" w.c.	1844	2260	2610	2918	3911	4481	5629	6572	8122	8186	8186	
30154-R	3" w.c.	1310	1852	2267	2616	3695	4297	5487	6454	8032	8196	8196	
30154-R	4" w.c.		1311	1854	2270	3462	4058	5354	6333	7939	8206	8206	
30154-B	7" w.c.					2629	3330	4842	5650	7650	8237	8237	
30154-B	10" w.c.					1321	2453	4303	5496	7343	8268	8268	
30154-B	11" w.c.						2227	4119	5372	7236	8278	8278	
30154-B	14" w.c.							3251	4952	6903	8309	8309	
30154-Y	18" w.c.							2214	4137	6420	8060	8060	
30154-V	1 PSIG									4997	7037	7037	
30154-V	2 PSIG											7264	

30155 2"	Outlet Pressure	Operating Inlet pressure											OPD vers
		4" w.c.	5" w.c.	6" w.c.	7" w.c.	11" w.c.	0.5 PSIG	0.75 PSIG	1 PSIG	1.5 PSIG	2 PSIG	3 PSIG	
30155-G	2" w.c.	3377	4138	4779	5342	7160	8205	10306	12033	14871	14988	14988	
30155-R	3" w.c.	2398	3390	4150	4791	6765	7867	10046	11817	14706	15007	15007	
30155-R	4" w.c.		2401	3394	4156	6338	7430	9804	11565	14537	15026	15026	
30155-B	7" w.c.					4814	6097	8866	10947	14006	15082	15082	
30155-B	10" w.c.					2419	4491	7878	10064	13445	15139	15139	
30155-B	11" w.c.						4078	7542	9836	13250	15158	15158	
30155-B	14" w.c.							5953	9068	12639	15214	15214	
30155-Y	18" w.c.							4055	7575	11755	14759	14759	
30155-V	1 PSIG									9149	12885	12885	
30155-V	2 PSIG											13301	

In this case a 1.5" 30154-B would technically meet the requirements. However, we tend to size this style of regulator less aggressively to minimize the risk of high lock-up.

As such, a 2" 30155-B would be better suited for the application. By going to a 2" we lessen the potential turbulence associated with the transition into a 4" pipe. We also give ourselves a cushion should the inlet pressure drop or should the customer ever add additional load.

Selection: 2" 30155-B-EVL, Black Spring (6-14"w.c.), EVL (External Vent Limiter)