Draft System Design and Maintenance

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Draft beer

You've moved from

to

But instead of

you've got

pics from mountainhomebrew.com, micromatic.com

You need to ask yourself . . .

- How cold do I like my beer?
- How carbonated do I like my beer?
- How am I going to serve my beer?
  - Direct draw (keezer, kegerator, converted fridge)
  - Long draw (kegs are in the basement, taps are in the kitchen)
- How many beers do I want to serve?
- How often will I be pouring beer?

How cold do you like it?

- Most bars serve beer between 34°F and 38°F

How carbonated do you like it?

- Usually varies by style
  - 2 volumes for porter
  - 2.5 volumes for IPA
  - 4 volumes for weizen

There are no rules, serve your beer the way you like it!

With the temp and volumes of CO_2 you can BALANCE your system.

B.A.L.A.N.C.E.

To balance your system, you want pressure to equal restriction

First:

- Determine the pressure:
  - Porter, 36°F, 2 volumes of CO_2

	Pressure (PSI)																													
(°F)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	(°F)
30	1.82	1.92	2.03	2.14	2.23	2.36	2.48	2.6	2.7	2.82	2.93	3.02	3.13	3.24	3.35	3.46	3.57	3.67	3.78	3.89	4	4.11	4.22	4.33	4.44	4.55	4.66	4.77	4.87	4.98	30
31	1.78	1.88	2	2.1	2.2	2.31	2.42	2.54	2.65	2.76	2.86	2.96	3.07	3.17	3.28	3.39	3.5	3.6	3.71	3.82	3.93	4.03	4.14	4.25	4.35	4.46	4.57	4.68	4.78	4.89	31
32	1.75	1.85	1.95	2.05	2.15	2.27	2.38	2.48	2.59	2.7	2.8	2.9	3	3.11	3.21	3.31	3.42	3.52	3.63	3.73	3.84	3.94	4.04	4.15	4.25	4.36	4.46	4.57	4.67	4.77	32
33	1.71	1.81	1.91	2.01	2.1	2.23	2.33	2.43	2.53	2.63	2.74	2.84	2.96	3.06	3.15	3.25	3.35	3.46	3.56	3.66	3.76	3.87	3.97	4.07	4.18	4.28	4.38	4.48	4.59	4.69	33
34	1.68	1.78	1.86	1.97	2.06	2.18	2.28	2.38	2.48	2.58	2.69	2.79	2.9	3	3.09	3.19	3.29	3.39	3.49	3.59	3.69	3.79	3.9	4	4.1	4.2	4.3	4.4	4.5	4.6	34
35	1.63	1.73	1.83	1.93	2.02	2.14	2.24	2.34	2.43	2.52	2.63	2.73	2.83	2.93	3.02	3.12	3.22	3.32	3.42	3.52	3.62	3.72	3.82	3.92	4.01	4.11	4.21	4.31	4.41	4.51	35
36	1.6	1.69	1.79	1.88	1.98	2.09	2.19	2.29	2.38	2.47	2.57	2.67	2.77	2.86	2.96	3.05	3.15	3.24	3.34	3.43	3.53	3.63	3.72	3.82	3.92	4.01	4.11	4.21	4.3	4.4	36
37	1.55	1.65	1.74	1.84	1.94	2.04	2.14	2.24	2.33	2.42	2.52	2.62	2.71	2.8	2.9	3	3.09	3.18	3.27	3.37	3.46	3.56	3.65	3.75	3.84	3.94	4.03	4.13	4.22	4.32	37
38	1.52	1.61	1.71	1.8	1.9	2	2.1	2.2	2.29	2.38	2.48	2.57	2.66	2.75	2.85	2.94	3.03	3.12	3.21	3.3	3.4	3.49	3.59	3.68	3.77	3.87	3.96	4.06	4.15	4.24	38
39	1.49	1.58	1.67	1.77	1.86	1.96	2.06	2.15	2.25	2.34	2.43	2.52	2.61	2.7	2.8	2.89	2.98	3.07	3.16	3.25	3.34	3.44	3.53	3.62	3.71	3.81	3.9	3.99	4.08	4.18	39
40	1.47	1.56	1.65	1.74	1.83	1.92	2.01	2.1	2.2	2.3	2.39	2.47	2.56	2.65	2.75	2.84	2.93	3.01	3.1	3.19	3.28	3.37	3.46	3.55	3.64	3.73	3.82	3.91	4.01	4.1	40
41	1.43	1.52	1.61	1.7	1.79	1.88	1.97	2.06	2.16	2.25	2.34	2.43	2.52	2.6	2.7	2.79	2.88	2.96	3.05	3.14	3.23	3.32	3.41	3.5	3.59	3.68	3.77	3.86	3.95	4.04	41
42	1.39	1.48	1.57	1.66	1.75	1.85	1.94	2.02	2.12	2.21	2.3	2.39	2.48	2.56	2.65	2.74	2.83	2.91	3	3.09	3.18	3.26	3.35	3.44	3.53	3.62	3.7	3.79	3.88	3.97	42
43	1.37	1.46	1.54	1.63	1.72	1.81	1.9	1.99	2.08	2.17	2.26	2.34	2.43	2.52	2.61	2.69	2.78	2.86	2.95	3.04	3.13	3.21	3.3	3.39	3.47	3.56	3.65	3.74	3.82	3.91	43
44	1.35	1.43	1.52	1.6	1.69	1.78	1.87	1.95	2.04	2.13	2.22	2.3	2.39	2.47	2.56	2.64	2.73	2.81	2.9	2.99	3.07	3.1	3.24	3.33	3.41	3.5	3.58	3.67	3.76	3.84	44
45	1.32	1.41	1.49	1.58	1.66	1.75	1.84	1.91	2	2.08	2.17	2.26	2.34	2.42	2.51	2.6	2.69	2.77	2.86	2.94	3.02	3.11	3.19	3.28	3.36	3.45	3.53	3.62	3.7	3.79	45
46	1.28	1.37	1.45	1.54	1.62	1.71	1.8	1.88	1.96	2.04	2.13	2.22	2.3	2.38	2.47	2.55	2.64	2.72	2.81	2.89	2.98	3.06	3.15	3.23	3.31	3.4	3.48	3.57	3.65	3.74	46
47	1.26	1.34	1.42	1.51	1.59	1.68	1.76	1.84	1.92	2	2.09	2.18	2.26	2.34	2.42	2.5	2.59	2.67	2.76	2.84	2.93	3.02	3.09	3.18	3.26	3.35	3.43	3.51	3.6	3.68	47
48	1.23	1.31	1.39	1.48	1.56	1.65	1.73	1.81	1.89	1.96	2.05	2.14	2.22	2.3	2.38	2.46	2.54	2.62	2.71	2.79	2.88	2.96	3.04	3.13	3.21	3.3	3.38	3.46	3.54	3.63	48
49	1.21	1.29	1.37	1.45	1.53	1.62	1.7	1.79	1.86	1.93	2.01	2.1	2.18	2.25	2.34	2.42	2.5	2.58	2.67	2.75	2.83	2.91	3	3.07	3.15	3.23	3.31	3.39	3.47	3.56	49
50	1.18	1.26	1.34	1.42	1.5	1.59	1.66	1.74	1.82	1.9	1.98	2.06	2.14	2.21	2.3	2.38	2.46	2.54	2.62	2.7	2.78	2.86	2.94	3.02	3.1	3.17	3.25	3.33	3.41	3.49	50

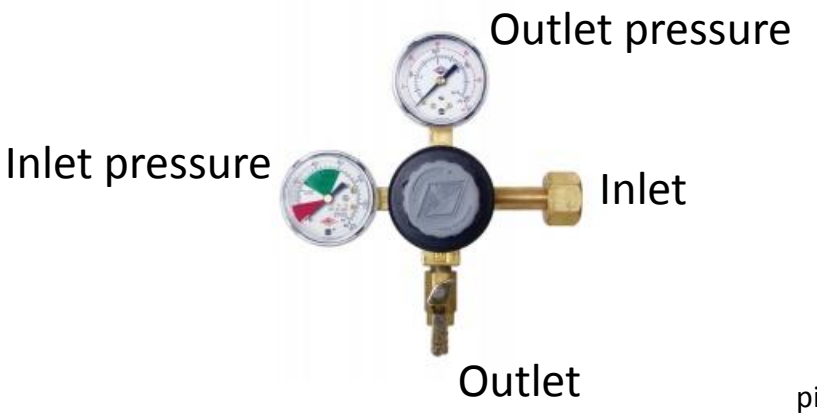
First:

- Determine the pressure:
  - IPA, 36°F, 2.5 volumes of CO_2

	Pressure (PSI)																													
(°F)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	(°F)
30	1.82	1.92	2.03	2.14	2.23	2.36	2.48	2.6	2.7	2.82	2.93	3.02	3.13	3.24	3.35	3.46	3.57	3.67	3.78	3.89	4	4.11	4.22	4.33	4.44	4.55	4.66	4.77	4.87	4.98	30
31	1.78	1.88	2	2.1	2.2	2.31	2.42	2.54	2.65	2.76	2.86	2.96	3.07	3.17	3.28	3.39	3.5	3.6	3.71	3.82	3.93	4.03	4.14	4.25	4.35	4.46	4.57	4.68	4.78	4.89	31
32	1.75	1.85	1.95	2.05	2.15	2.27	2.38	2.48	2.59	2.7	2.8	2.9	3	3.11	3.21	3.31	3.42	3.52	3.63	3.73	3.84	3.94	4.04	4.15	4.25	4.36	4.46	4.57	4.67	4.77	32
33	1.71	1.81	1.91	2.01	2.1	2.23	2.33	2.43	2.53	2.63	2.74	2.84	2.96	3.06	3.15	3.25	3.35	3.46	3.56	3.66	3.76	3.87	3.97	4.07	4.18	4.28	4.38	4.48	4.59	4.69	33
34	1.68	1.78	1.86	1.97	2.06	2.18	2.28	2.38	2.48	2.58	2.69	2.79	2.9	3	3.09	3.19	3.29	3.39	3.49	3.59	3.69	3.79	3.9	4	4.1	4.2	4.3	4.4	4.5	4.6	34
35	1.63	1.73	1.83	1.93	2.02	2.14	2.24	2.34	2.43	2.52	2.63	2.73	2.83	2.93	3.02	3.12	3.22	3.32	3.42	3.52	3.62	3.72	3.82	3.92	4.01	4.11	4.21	4.31	4.41	4.51	35
36	1.6	1.69	1.79	1.88	1.98	2.09	2.19	2.29	2.38	2.47	2.57	2.67	2.77	2.86	2.96	3.05	3.15	3.24	3.34	3.43	3.53	3.63	3.72	3.82	3.92	4.01	4.11	4.21	4.3	4.4	36
37	1.55	1.65	1.74	1.84	1.94	2.04	2.14	2.24	2.33	2.42	2.52	2.62	2.71	2.8	2.9	3	3.09	3.18	3.27	3.37	3.46	3.56	3.65	3.75	3.84	3.94	4.03	4.13	4.22	4.32	37
38	1.52	1.61	1.71	1.8	1.9	2	2.1	2.2	2.29	2.38	2.48	2.57	2.66	2.75	2.85	2.94	3.03	3.12	3.21	3.3	3.4	3.49	3.59	3.68	3.77	3.87	3.96	4.06	4.15	4.24	38
39	1.49	1.58	1.67	1.77	1.86	1.96	2.06	2.15	2.25	2.34	2.43	2.52	2.61	2.7	2.8	2.89	2.98	3.07	3.16	3.25	3.34	3.44	3.53	3.62	3.71	3.81	3.9	3.99	4.08	4.18	39
40	1.47	1.56	1.65	1.74	1.83	1.92	2.01	2.1	2.2	2.3	2.39	2.47	2.56	2.65	2.75	2.84	2.93	3.01	3.1	3.19	3.28	3.37	3.46	3.55	3.64	3.73	3.82	3.91	4.01	4.1	40
41	1.43	1.52	1.61	1.7	1.79	1.88	1.97	2.06	2.16	2.25	2.34	2.43	2.52	2.6	2.7	2.79	2.88	2.96	3.05	3.14	3.23	3.32	3.41	3.5	3.59	3.68	3.77	3.86	3.95	4.04	41
42	1.39	1.48	1.57	1.66	1.75	1.85	1.94	2.02	2.12	2.21	2.3	2.39	2.48	2.56	2.65	2.74	2.83	2.91	3	3.09	3.18	3.26	3.35	3.44	3.53	3.62	3.7	3.79	3.88	3.97	42
43	1.37	1.46	1.54	1.63	1.72	1.81	1.9	1.99	2.08	2.17	2.26	2.34	2.43	2.52	2.61	2.69	2.78	2.86	2.95	3.04	3.13	3.21	3.3	3.39	3.47	3.56	3.65	3.74	3.82	3.91	43
44	1.35	1.43	1.52	1.6	1.69	1.78	1.87	1.95	2.04	2.13	2.22	2.3	2.39	2.47	2.56	2.64	2.73	2.81	2.9	2.99	3.07	3.1	3.24	3.33	3.41	3.5	3.58	3.67	3.76	3.84	44
45	1.32	1.41	1.49	1.58	1.66	1.75	1.84	1.91	2	2.08	2.17	2.26	2.34	2.42	2.51	2.6	2.69	2.77	2.86	2.94	3.02	3.11	3.19	3.28	3.36	3.45	3.53	3.62	3.7	3.79	45
46	1.28	1.37	1.45	1.54	1.62	1.71	1.8	1.88	1.96	2.04	2.13	2.22	2.3	2.38	2.47	2.55	2.64	2.72	2.81	2.89	2.98	3.06	3.15	3.23	3.31	3.4	3.48	3.57	3.65	3.74	46
47	1.26	1.34	1.42	1.51	1.59	1.68	1.76	1.84	1.92	2	2.09	2.18	2.26	2.34	2.42	2.5	2.59	2.67	2.76	2.84	2.93	3.02	3.09	3.18	3.26	3.35	3.43	3.51	3.6	3.68	47
48	1.23	1.31	1.39	1.48	1.56	1.65	1.73	1.81	1.89	1.96	2.05	2.14	2.22	2.3	2.38	2.46	2.54	2.62	2.71	2.79	2.88	2.96	3.04	3.13	3.21	3.3	3.38	3.46	3.54	3.63	48
49	1.21	1.29	1.37	1.45	1.53	1.62	1.7	1.79	1.86	1.93	2.01	2.1	2.18	2.25	2.34	2.42	2.5	2.58	2.67	2.75	2.83	2.91	3	3.07	3.15	3.23	3.31	3.39	3.47	3.56	49
50	1.18	1.26	1.34	1.42	1.5	1.59	1.66	1.74	1.82	1.9	1.98	2.06	2.14	2.21	2.3	2.38	2.46	2.54	2.62	2.7	2.78	2.86	2.94	3.02	3.1	3.17	3.25	3.33	3.41	3.49	50

Secondary regulators

- You need one for every different serving pressure you want
  - Can I carb to different levels and serve at the same pressure?
  - Can I serve my beer at different temperatures?
  - Does splitting the gas line affect the pressure?
  - Does the length of the gas line matter?
  - Does the length of the beer line matter?



pics from morebeer.com

How long should my beer line be?

What is the inner diameter of the line?

These numbers are not set in stone, the restriction varies by material and manufacturer.

BEER TUBING			
Type	Size	Restriction	Volume
Vinyl	3/16" ID	3.00 lbs/ft	1/6 oz/ft
Vinyl	1/4" ID	0.85 lbs/ft	1/3 oz/ft
Vinyl	5/16" ID	0.40 lbs/ft	1/2 oz/ft
Vinyl	3/8" ID	0.20 lbs/ft	3/4 oz/ft
Vinyl	1/2" ID	0.025 lbs/ft	1-1/3 oz/ft
Barrier	1/4" ID	0.30 lbs/ft	1/3 oz/ft
Barrier	5/16" ID	0.10 lbs/ft	1/2 oz/ft
Barrier	3/8" ID	0.06 lbs/ft	3/4 oz/ft
Stainless	1/4" OD	1.20 lbs/ft	1/6 oz/ft
Stainless	5/16" OD	0.30 lbs/ft	1/3 oz/ft
Stainless	3/8" OD	0.12 lbs/ft	1/2 oz/ft

Other sources of resistance

- Gravity:
  - For every foot of height change between the keg and the tap, you have to allow ½ psi of static resistance. Measure from the center of the keg.
- Couplers, fittings, shanks, faucets, bends
  - How much restriction from each piece?
    - Shank and faucet about 5 psi, but there are a lot of variables
  - Does it matter? Do you need to account for each piece?

- Subtract 5 psi, calculate hose length, and shoot for 1 gpm flow rate.

How long should my beer line be?

Porter and 1/4” ID vinyl:

7 psi on the beer, 0.85 psi/ft

(7-5) / 0.85 = 2.35 * 2 = 4.7 ft

IPA and 3/16” ID vinyl:

10 psi on the beer, 3.0 psi/ft

(10-5) / 3.0 = 1.67 * 2 = 3.3 ft

Cut your lines long – it is easier to cut off more than to add length!

BEER TUBING			
Type	Size	Restriction	Volume
Vinyl	3/16” ID	3.00 lbs/ft	1/6 oz/ft
Vinyl	1/4” ID	0.85 lbs/ft	1/3 oz/ft
Vinyl	5/16” ID	0.40 lbs/ft	1/2 oz/ft
Vinyl	3/8” ID	0.20 lbs/ft	3/4 oz/ft
Vinyl	1/2” ID	0.025 lbs/ft	1-1/3 oz/ft
Barrier	1/4” ID	0.30 lbs/ft	1/3 oz/ft
Barrier	5/16” ID	0.10 lbs/ft	1/2 oz/ft
Barrier	3/8” ID	0.06 lbs/ft	3/4 oz/ft
Stainless	1/4” OD	1.20 lbs/ft	1/6 oz/ft
Stainless	5/16” OD	0.30 lbs/ft	1/3 oz/ft
Stainless	3/8” OD	0.12 lbs/ft	1/2 oz/ft

B.A.L.A.N.C.E.

- What happens if something changes?

	Pressure (PSI)																													
(°F)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	(°F)
30	1.82	1.92	2.03	2.14	2.23	2.36	2.48	2.6	2.7	2.82	2.93	3.02	3.13	3.24	3.35	3.46	3.57	3.67	3.78	3.89	4	4.11	4.22	4.33	4.44	4.55	4.66	4.77	4.87	4.98	30
31	1.78	1.88	2	2.1	2.2	2.31	2.42	2.54	2.65	2.76	2.86	2.96	3.07	3.17	3.28	3.39	3.5	3.6	3.71	3.82	3.93	4.03	4.14	4.25	4.35	4.46	4.57	4.68	4.78	4.89	31
32	1.75	1.85	1.95	2.05	2.15	2.27	2.38	2.48	2.59	2.7	2.8	2.9	3	3.11	3.21	3.31	3.42	3.52	3.63	3.73	3.84	3.94	4.04	4.15	4.25	4.36	4.46	4.57	4.67	4.77	32
33	1.71	1.81	1.91	2.01	2.1	2.23	2.33	2.43	2.53	2.63	2.74	2.84	2.96	3.06	3.15	3.25	3.35	3.46	3.56	3.66	3.76	3.87	3.97	4.07	4.18	4.28	4.38	4.48	4.59	4.69	33
34	1.68	1.78	1.86	1.97	2.06	2.18	2.28	2.38	2.48	2.58	2.69	2.79	2.9	3	3.09	3.19	3.29	3.39	3.49	3.59	3.69	3.79	3.9	4	4.1	4.2	4.3	4.4	4.5	4.6	34
35	1.63	1.73	1.83	1.93	2.02	2.14	2.24	2.34	2.43	2.52	2.63	2.73	2.83	2.93	3.02	3.12	3.22	3.32	3.42	3.52	3.62	3.72	3.82	3.92	4.01	4.11	4.21	4.31	4.41	4.51	35
36	1.6	1.69	1.79	1.88	1.98	2.09	2.19	2.29	2.38	2.47	2.57	2.67	2.77	2.86	2.96	3.05	3.15	3.24	3.34	3.43	3.53	3.63	3.72	3.82	3.92	4.01	4.11	4.21	4.3	4.4	36
37	1.55	1.65	1.74	1.84	1.94	2.04	2.14	2.24	2.33	2.42	2.52	2.62	2.71	2.8	2.9	3	3.09	3.18	3.27	3.37	3.46	3.56	3.65	3.75	3.84	3.94	4.03	4.13	4.22	4.32	37
38	1.52	1.61	1.71	1.8	1.9	2	2.1	2.2	2.29	2.38	2.48	2.57	2.66	2.75	2.85	2.94	3.03	3.12	3.21	3.3	3.4	3.49	3.59	3.68	3.77	3.87	3.96	4.06	4.15	4.24	38
39	1.49	1.58	1.67	1.77	1.86	1.96	2.06	2.15	2.25	2.34	2.43	2.52	2.61	2.7	2.8	2.89	2.98	3.07	3.16	3.25	3.34	3.44	3.53	3.62	3.71	3.81	3.9	3.99	4.08	4.18	39
40	1.47	1.56	1.65	1.74	1.83	1.92	2.01	2.1	2.2	2.3	2.39	2.47	2.56	2.65	2.75	2.84	2.93	3.01	3.1	3.19	3.28	3.37	3.46	3.55	3.64	3.73	3.82	3.91	4.01	4.1	40
41	1.43	1.52	1.61	1.7	1.79	1.88	1.97	2.06	2.16	2.25	2.34	2.43	2.52	2.6	2.7	2.79	2.88	2.96	3.05	3.14	3.23	3.32	3.41	3.5	3.59	3.68	3.77	3.86	3.95	4.04	41
42	1.39	1.48	1.57	1.66	1.75	1.85	1.94	2.02	2.12	2.21	2.3	2.39	2.48	2.56	2.65	2.74	2.83	2.91	3	3.09	3.18	3.26	3.35	3.44	3.53	3.62	3.7	3.79	3.88	3.97	42
43	1.37	1.46	1.54	1.63	1.72	1.81	1.9	1.99	2.08	2.17	2.26	2.34	2.43	2.52	2.61	2.69	2.78	2.86	2.95	3.04	3.13	3.21	3.3	3.39	3.47	3.56	3.65	3.74	3.82	3.91	43
44	1.35	1.43	1.52	1.6	1.69	1.78	1.87	1.95	2.04	2.13	2.22	2.3	2.39	2.47	2.56	2.64	2.73	2.81	2.9	2.99	3.07	3.1	3.24	3.33	3.41	3.5	3.58	3.67	3.76	3.84	44
45	1.32	1.41	1.49	1.58	1.66	1.75	1.84	1.91	2	2.08	2.17	2.26	2.34	2.42	2.51	2.6	2.69	2.77	2.86	2.94	3.02	3.11	3.19	3.28	3.36	3.45	3.53	3.62	3.7	3.79	45
46	1.28	1.37	1.45	1.54	1.62	1.71	1.8	1.88	1.96	2.04	2.13	2.22	2.3	2.38	2.47	2.55	2.64	2.72	2.81	2.89	2.98	3.06	3.15	3.23	3.31	3.4	3.48	3.57	3.65	3.74	46
47	1.26	1.34	1.42	1.51	1.59	1.68	1.76	1.84	1.92	2	2.09	2.18	2.26	2.34	2.42	2.5	2.59	2.67	2.76	2.84	2.93	3.02	3.09	3.18	3.26	3.35	3.43	3.51	3.6	3.68	47
48	1.23	1.31	1.39	1.48	1.56	1.65	1.73	1.81	1.89	1.96	2.05	2.14	2.22	2.3	2.38	2.46	2.54	2.62	2.71	2.79	2.88	2.96	3.04	3.13	3.21	3.3	3.38	3.46	3.54	3.63	48
49	1.21	1.29	1.37	1.45	1.53	1.62	1.7	1.79	1.86	1.93	2.01	2.1	2.18	2.25	2.34	2.42	2.5	2.58	2.67	2.75	2.83	2.91	3	3.07	3.15	3.23	3.31	3.39	3.47	3.56	49
50	1.18	1.26	1.34	1.42	1.5	1.59	1.66	1.74	1.82	1.9	1.98	2.06	2.14	2.21	2.3	2.38	2.46	2.54	2.62	2.7	2.78	2.86	2.94	3.02	3.1	3.17	3.25	3.33	3.41	3.49	50

Where are you storing your beer?

Keezer at the Hudecek Compound

Things to consider with your build

- Shanks that stick further into the cold space chill the beer better
  - They also get in the way
- CO_2 tank inside or out?
  - Minimal waste of gas
  - Gauges may not react as well as when they are warmer
- Keezers are hard to lift kegs in and out of, but the builds look better
- Upright fridges dump cold air when they are opened, but they are better non-direct draw systems

Short draw systems

- Example, kegs in basement, taps in kitchen:
  - 8 feet of elevation gain
  - 16 feet minimum distance
  - Beer at 40°F, 2.5 volumes
  - 12 psi to carbonate the beer
  - Allow 8*0.5 = 4 psi for elevation
  - 8 psi for restriction
  - Using 1/4“ ID barrier tubing

    x = (8-5) / 0.3 = 10 ft of tubing

  No fudge factor?

(°F)	1	2	3	4	5	6	7	8	9	10	11	12	13
30	1.82	1.92	2.03	2.14	2.23	2.36	2.48	2.6	2.7	2.82	2.93	3.02	3.13
31	1.78	1.88	2	2.1	2.2	2.31	2.42	2.54	2.65	2.76	2.86	2.96	3.07
32	1.75	1.85	1.95	2.05	2.15	2.27	2.38	2.48	2.59	2.7	2.8	2.9	3
33	1.71	1.81	1.91	2.01	2.1	2.23	2.33	2.43	2.53	2.63	2.74	2.84	2.96
34	1.68	1.78	1.86	1.97	2.06	2.18	2.28	2.38	2.48	2.58	2.69	2.79	2.9
35	1.63	1.73	1.83	1.93	2.02	2.14	2.24	2.34	2.43	2.52	2.63	2.73	2.83
36	1.6	1.69	1.79	1.88	1.98	2.09	2.19	2.29	2.38	2.47	2.57	2.67	2.77
37	1.55	1.65	1.74	1.84	1.94	2.04	2.14	2.24	2.33	2.42	2.52	2.62	2.71
38	1.52	1.61	1.71	1.8	1.9	2	2.1	2.2	2.29	2.38	2.48	2.57	2.66
39	1.49	1.58	1.67	1.77	1.86	1.96	2.06	2.15	2.25	2.34	2.43	2.52	2.61
40	1.47	1.56	1.65	1.74	1.83	1.92	2.01	2.1	2.2	2.3	2.39	2.47	2.56

BEER TUBING			
Type	Size	Restriction	Volume
Vinyl	3/16” ID	3.00 lbs/ft	1/6 oz/ft
Vinyl	1/4” ID	0.85 lbs/ft	1/3 oz/ft
Vinyl	5/16” ID	0.40 lbs/ft	1/2 oz/ft
Vinyl	3/8” ID	0.20 lbs/ft	3/4 oz/ft
Vinyl	1/2” ID	0.025 lbs/ft	1-1/3 oz/ft
Barrier	1/4” ID	0.30 lbs/ft	1/3 oz/ft
Barrier	5/16” ID	0.10 lbs/ft	1/2 oz/ft

Short draw systems

- Example, kegs in basement, taps in kitchen:
  - 8 feet of elevation gain
  - 16 feet minimum distance
  - Beer at 40°F, 2.5 volumes
  - 12 psi to carbonate the beer
  - Allow 8*0.5 = 4 psi for elevation
  - 8 psi for restriction
  - Using 5/16” ID barrier tubing

    x = (8-5) / 0.1 = 30 ft of tubing

  Choker line

(°F)	1	2	3	4	5	6	7	8	9	10	11	12	13
30	1.82	1.92	2.03	2.14	2.23	2.36	2.48	2.6	2.7	2.82	2.93	3.02	3.13
31	1.78	1.88	2	2.1	2.2	2.31	2.42	2.54	2.65	2.76	2.86	2.96	3.07
32	1.75	1.85	1.95	2.05	2.15	2.27	2.38	2.48	2.59	2.7	2.8	2.9	3
33	1.71	1.81	1.91	2.01	2.1	2.23	2.33	2.43	2.53	2.63	2.74	2.84	2.96
34	1.68	1.78	1.86	1.97	2.06	2.18	2.28	2.38	2.48	2.58	2.69	2.79	2.9
35	1.63	1.73	1.83	1.93	2.02	2.14	2.24	2.34	2.43	2.52	2.63	2.73	2.83
36	1.6	1.69	1.79	1.88	1.98	2.09	2.19	2.29	2.38	2.47	2.57	2.67	2.77
37	1.55	1.65	1.74	1.84	1.94	2.04	2.14	2.24	2.33	2.42	2.52	2.62	2.71
38	1.52	1.61	1.71	1.8	1.9	2	2.1	2.2	2.29	2.38	2.48	2.57	2.66
39	1.49	1.58	1.67	1.77	1.86	1.96	2.06	2.15	2.25	2.34	2.43	2.52	2.61
40	1.47	1.56	1.65	1.74	1.83	1.92	2.01	2.1	2.2	2.3	2.39	2.47	2.56

BEER TUBING			
Type	Size	Restriction	Volume
Vinyl	3/16” ID	3.00 lbs/ft	1/6 oz/ft
Vinyl	1/4” ID	0.85 lbs/ft	1/3 oz/ft
Vinyl	5/16” ID	0.40 lbs/ft	1/2 oz/ft
Vinyl	3/8” ID	0.20 lbs/ft	3/4 oz/ft
Vinyl	1/2” ID	0.025 lbs/ft	1-1/3 oz/ft
Barrier	1/4” ID	0.30 lbs/ft	1/3 oz/ft
Barrier	5/16” ID	0.10 lbs/ft	1/2 oz/ft

Mixed gas

- Used for nitro pours and sometimes for long draw systems
- Comes in various mixes, 75% N_2 / 25% CO_2 is common
- For nitro beers, carbonate normally to low volumes
- Push with nitro mix at ~30 psi
- If you are using a 75/25 mix, you have 7.5 psi of CO_2 pressure

(°F)	1	2	3	4	5	6	7	8	9	10	11	12	13
30	1.82	1.92	2.03	2.14	2.23	2.36	2.48	2.6	2.7	2.82	2.93	3.02	3.13
31	1.78	1.88	2	2.1	2.2	2.31	2.42	2.54	2.65	2.76	2.86	2.96	3.07
32	1.75	1.85	1.95	2.05	2.15	2.27	2.38	2.48	2.59	2.7	2.8	2.9	3
33	1.71	1.81	1.91	2.01	2.1	2.23	2.33	2.43	2.53	2.63	2.74	2.84	2.96
34	1.68	1.78	1.86	1.97	2.06	2.18	2.28	2.38	2.48	2.58	2.69	2.79	2.9
35	1.63	1.73	1.83	1.93	2.02	2.14	2.24	2.34	2.43	2.52	2.63	2.73	2.83
36	1.6	1.69	1.79	1.88	1.98	2.09	2.19	2.29	2.38	2.47	2.57	2.67	2.77
37	1.55	1.65	1.74	1.84	1.94	2.04	2.14	2.24	2.33	2.42	2.52	2.62	2.71
38	1.52	1.61	1.71	1.8	1.9	2	2.1	2.2	2.29	2.38	2.48	2.57	2.66
39	1.49	1.58	1.67	1.77	1.86	1.96	2.06	2.15	2.25	2.34	2.43	2.52	2.61
40	1.47	1.56	1.65	1.74	1.83	1.92	2.01	2.1	2.2	2.3	2.39	2.47	2.56

Other beverages

- Better grade of stainless (304) for other beverages
  - Sours, wine, mead, cider, even spirits
- What if you want to dispense a still beverage?
  - Push with an inert gas, argon is typical for wine

Avoiding leaks – use the right parts and tools

- Use
  - Stepless clamps

  - Clamp crimper
  - The right sized barb for the type and size of hose you are using
    - A 3/16” barb is good for 3/16” vinyl but 1/4” barrier line
    - Vinyl is flexible and can be forced onto a larger barb, barrier line can not
  - Teflon tape on threaded connectors
  - Keg lube
- Do not use
  - Worm clamps
  - Pliers

CO_2 safety

- Basements = bad
- Long term exposure to >5000 ppm = bad
- Immediate exposure to >40,000 ppm = bad
- 20 lb tank in a 4000 cuft room (20x25x8) = > 40,000 ppm = bad
- 400 ppm = normal outside
- <1000 ppm = normal inside
- CO monitor = good but not useful
- CO_2 monitor = good

Leak detection - micromatic

Single In-Line Leak Detector

New!

Price: $121.50

Availability: In Stock

Part #: MV039

Add to Cart

Beer Check W/Leak Sensor Wand

Price: $1,289.25

Availability: In Stock

Part #: MV022

Add to Cart

Leak detection - morebeer

Sanitizing Spray Bottle

★★★★☆

12 Reviews

$2.99

Item #: CE96

Shipping: **Eligible for Free Shipping Program**

Weight: **0.25LBS**

Availability: California - In Stock

Pennsylvania - In Stock

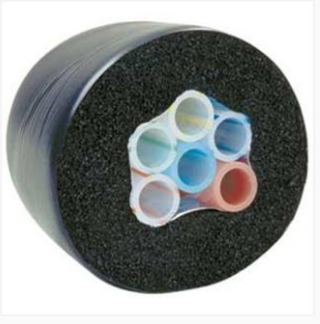
1 ADD TO CART

Tracking down a leak

- Spray all connections and look for bubbles
- Make sure all gaskets and o-rings are in place and in good shape
- Check tightness of threaded connections
- Re-tape and tighten threaded connectors
- Isolate parts of the system
- Check your corny fittings!!!

Cheap and easy glycol systems

- Easiest if you are using a refrigerator freezer for your kegs
- For long draws using trunk line
  - Run trunk line through refrigerator door to the taps
- Bucket of glycol in the freezer
  - Submersible pump in bucket
  - Vinyl lines from bucket, out through the freezer door, in through refrigerator door, connect to trunk line glycol lines
  - Insulate the exterior vinyl lines
- Connect the ends of the glycol lines with a U



Cheap and easy glycol design considerations

- Most freezers are preset with a thermostat range of -20°F to 20°F
- You want your freezer to be at least 10°F warmer than the freezing point of your glycol/water mixture
- The submersible pump will heat the glycol
- Keep air out of the glycol line

PROPYLENE GLYCOL - WATER SOLUTION SPECIFIC GRAVITY, CONCENTRATION AND FREEZING POINT CHART								
Specific Gravity – SG 60°F		1.000	1.008	1.017	1.026	1.034	1.041	1.046
Propylene Glycol Solution %	by mass	0	10	20	30	40	50	60
	by volume	0	10	19	29	40	50	60
Freezing Point	°F	32	26	18	7	-8	-29	-55
Temperature	°C	0	-3	-8	-14	-22	-34	-48

How cheap is it?

- 1 gallon of glycol, $40
  - This is concentrate, you will dilute it
- 1 submersible pump, <$30
  - Hydroponic pump, comes with hose barbs
- Vinyl hose, free
  - Because you bought 100’ of it to begin with and still have some left over
- 2 straight splicers and a U splicer, $10
- 4 clamps, $2
- Trunk line, varies
  - Depends on number of beer lines and length, $10-$25 per foot

Cleaning your system – why?

- Dirty lines affect a beer's flavor and aroma, even if it's not "off"
- Clean lines increase beer sales, dirty lines decrease beer sales

How to clean your system

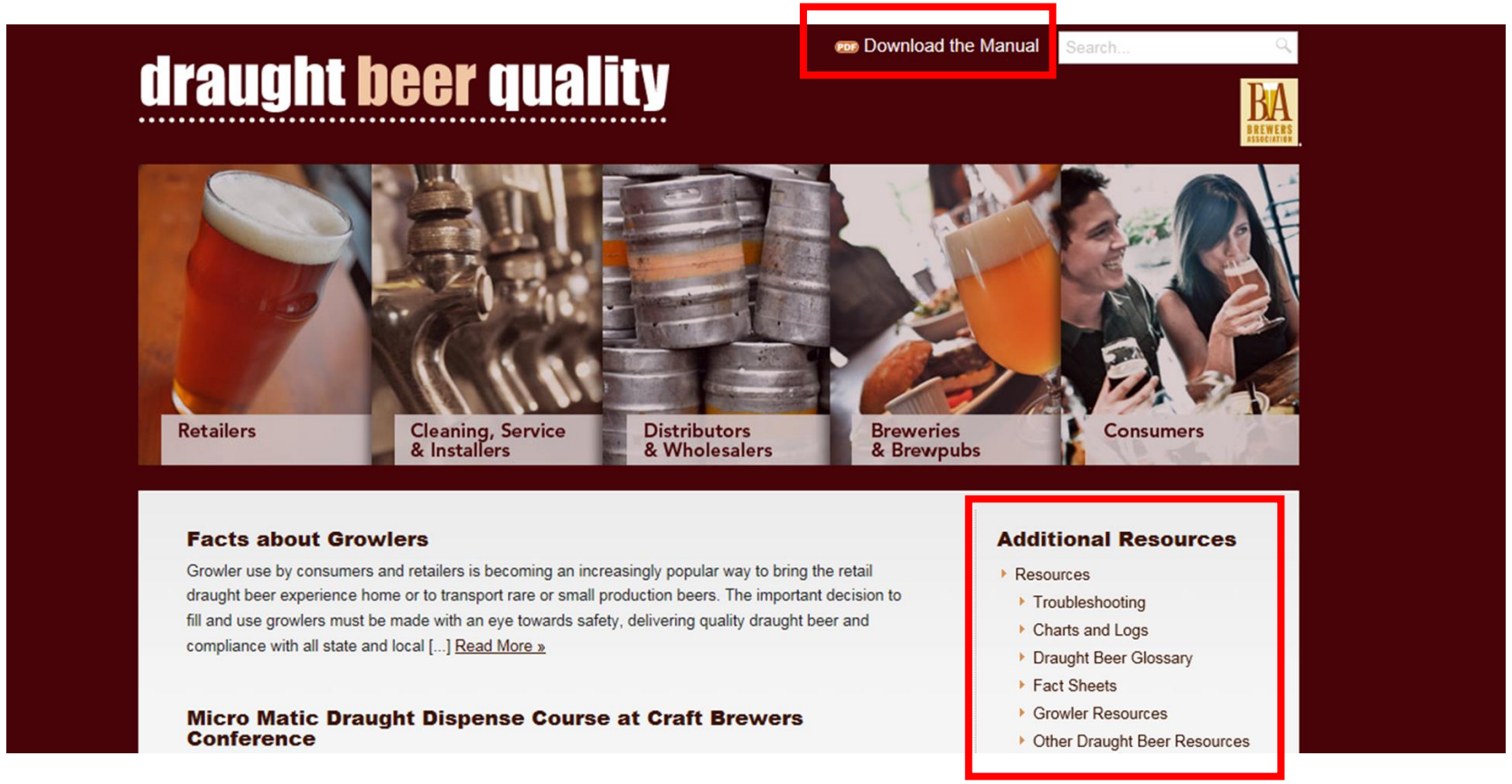
- Breweries and restaurants (ideally)
  - Recirculating caustic for 15 minutes every 2 weeks
  - Disassemble and hand clean faucets and couplers
  - Recirculating acid every 3 months time to remove scale
  - Replace vinyl yearly
- Homebrewers (reality)
  - Beer line cleaner pushed from keg at random intervals
  - Disassemble and hand clean faucets and couplers sometimes
  - No acid except maybe starsan
  - Replace line when it looks dirty

What is better?

- Reverse flow of cleaning solution - $8 from micromatic
- Recirculate with a pump
  - You can gang all of your lines together and clean them at the same time
- Use proper cleaning solutions, follow instructions

Write this down:

- http://www.draughtquality.org/



Questions?

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Postdoc Brewing Company

Redmond WA, opening fall 2014