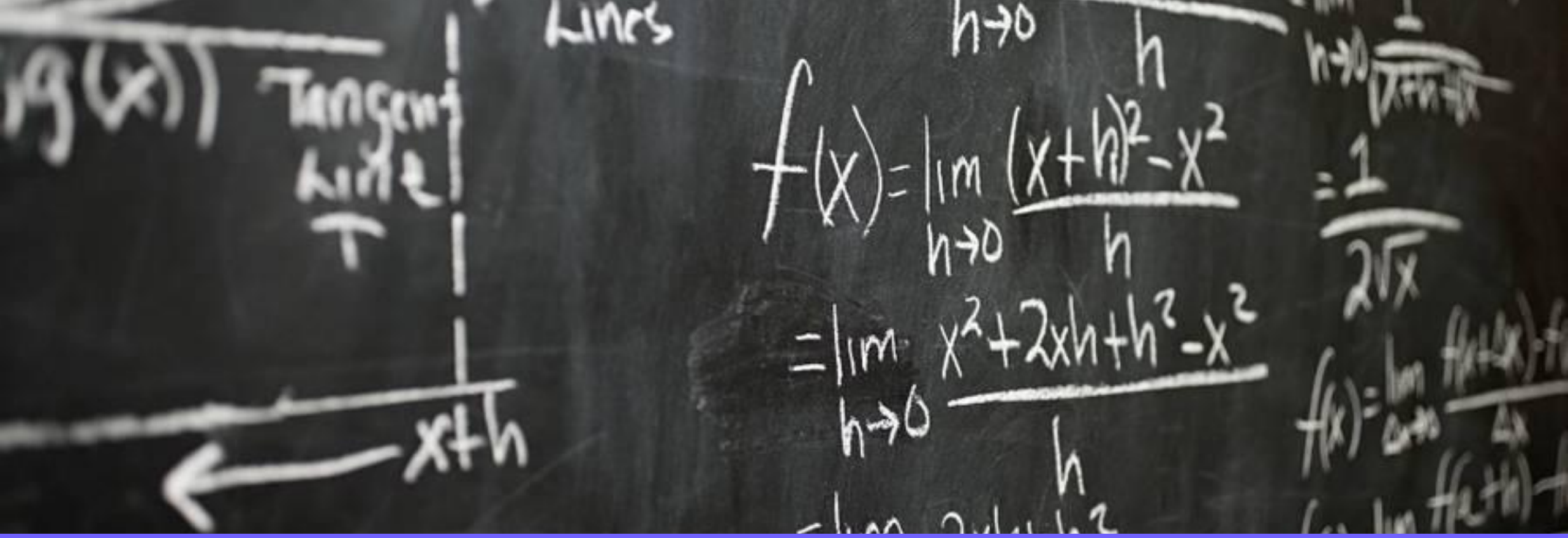
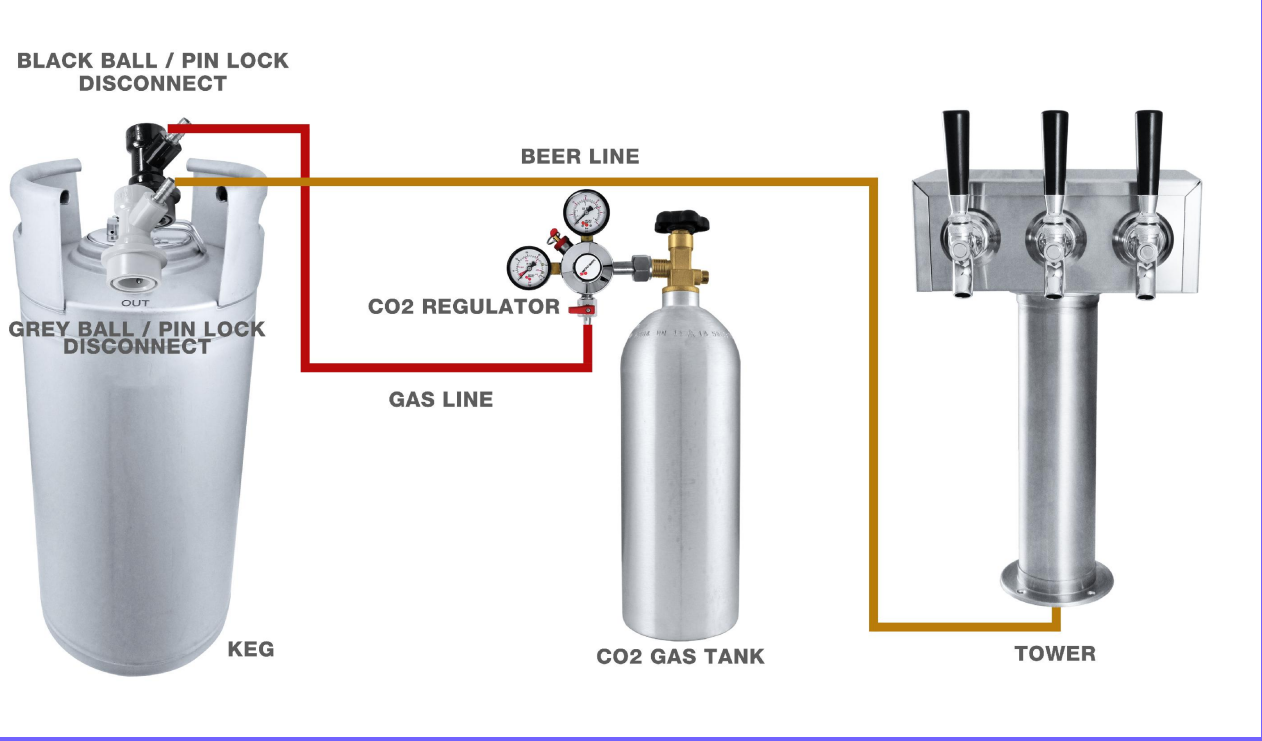


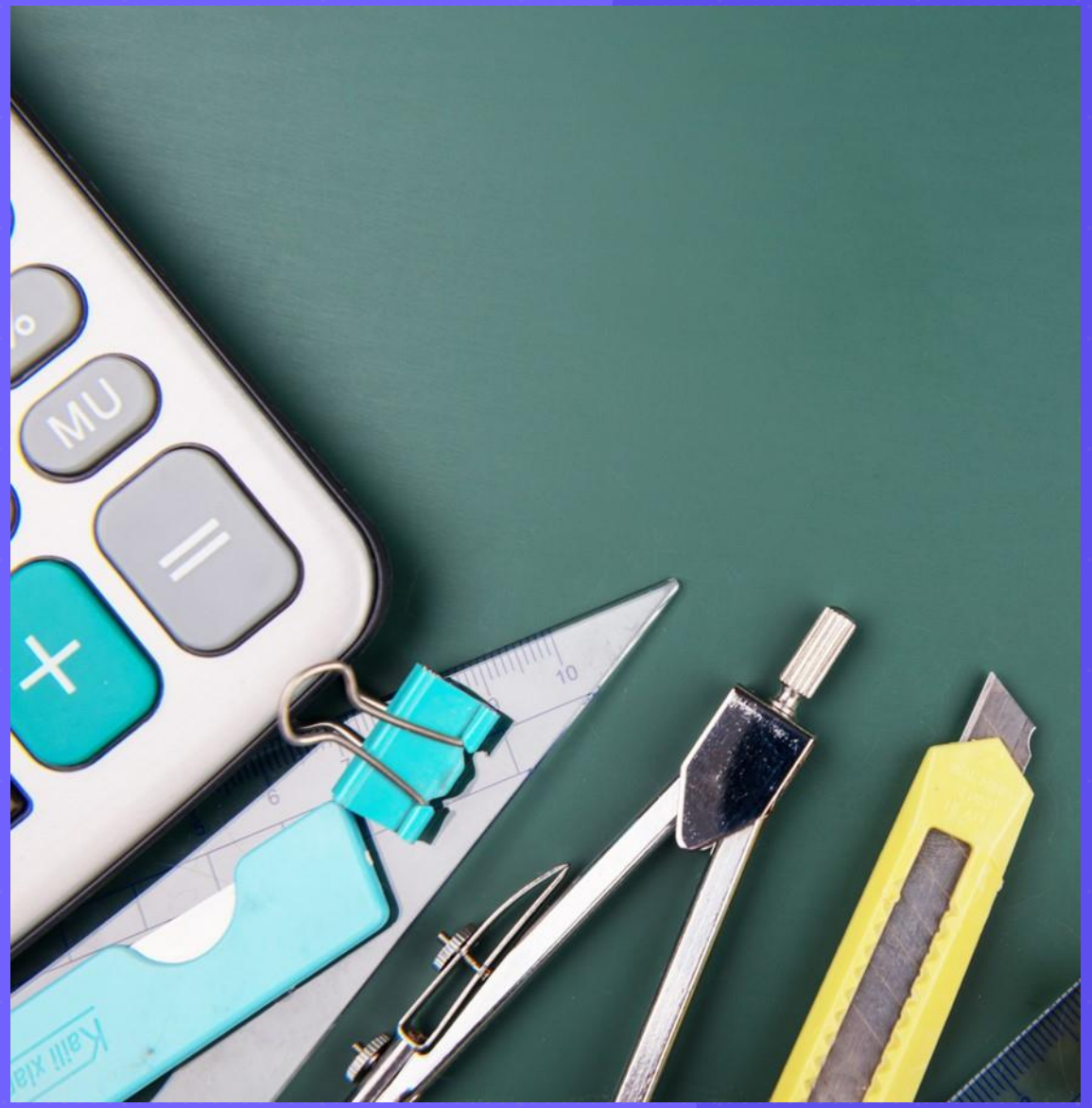
Beer Draft Systems

Colin Crowley

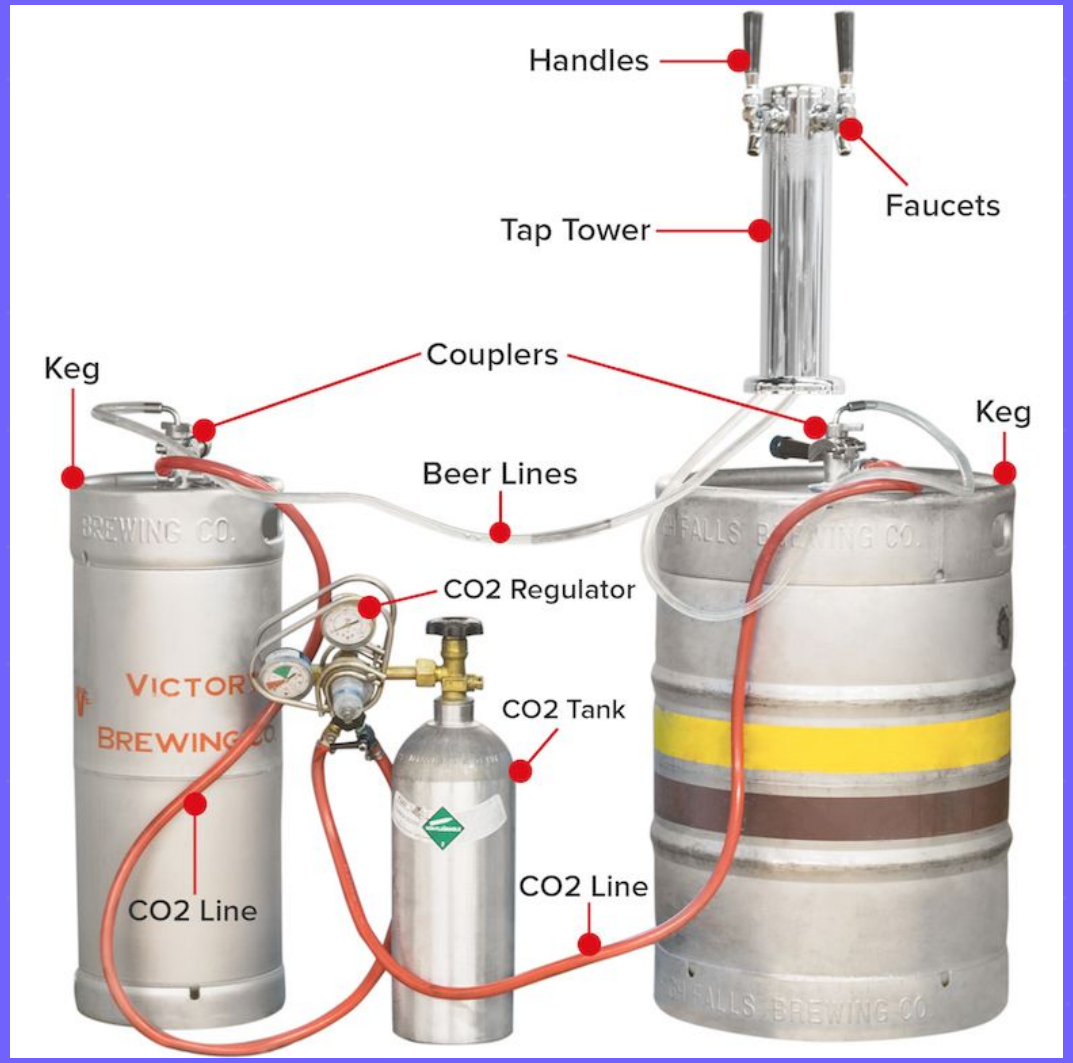
Basic Principles

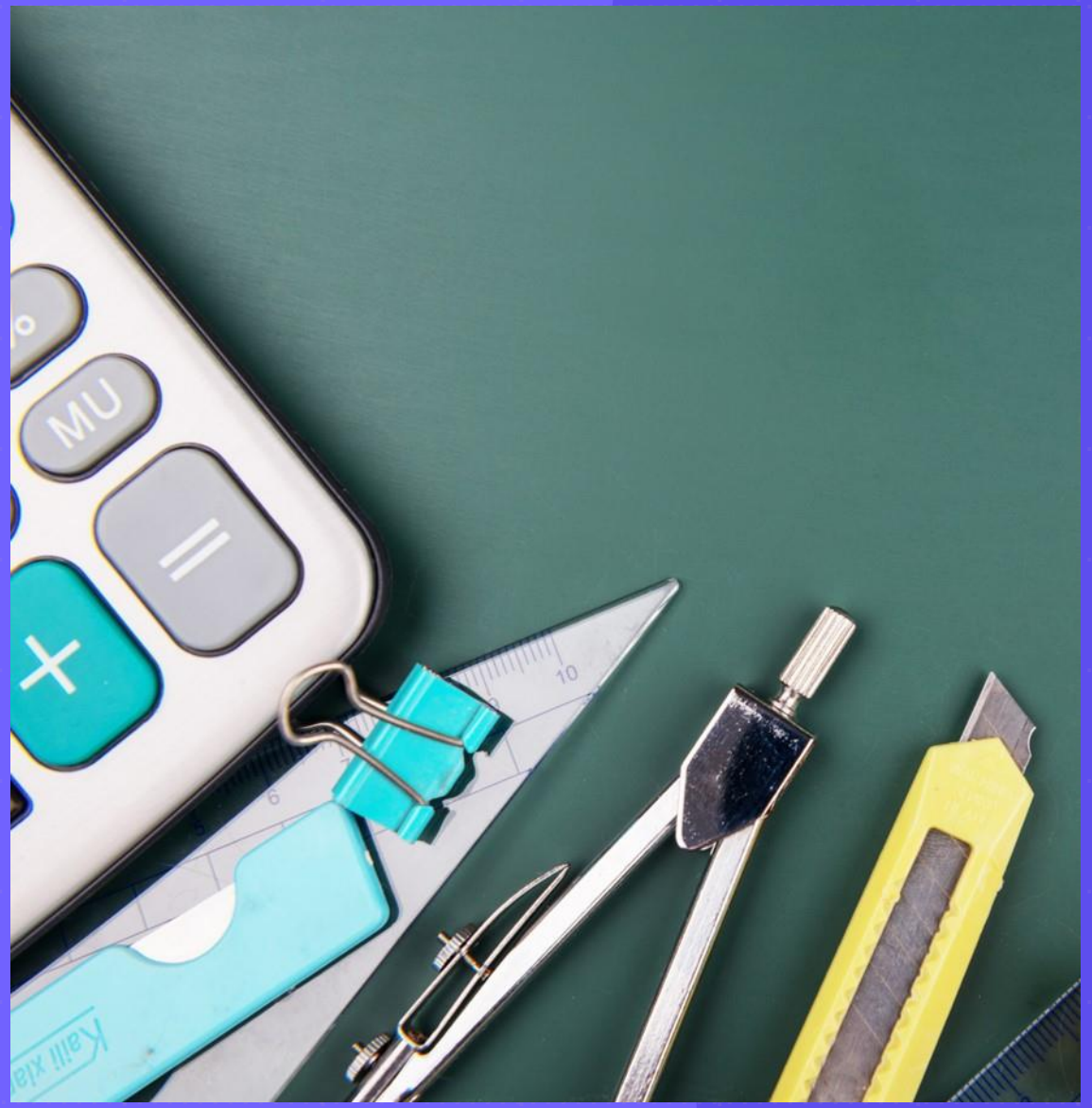


- CO_2 Gas displaces liquid in keg to beer line
- Flow is always from high pressure to low pressure

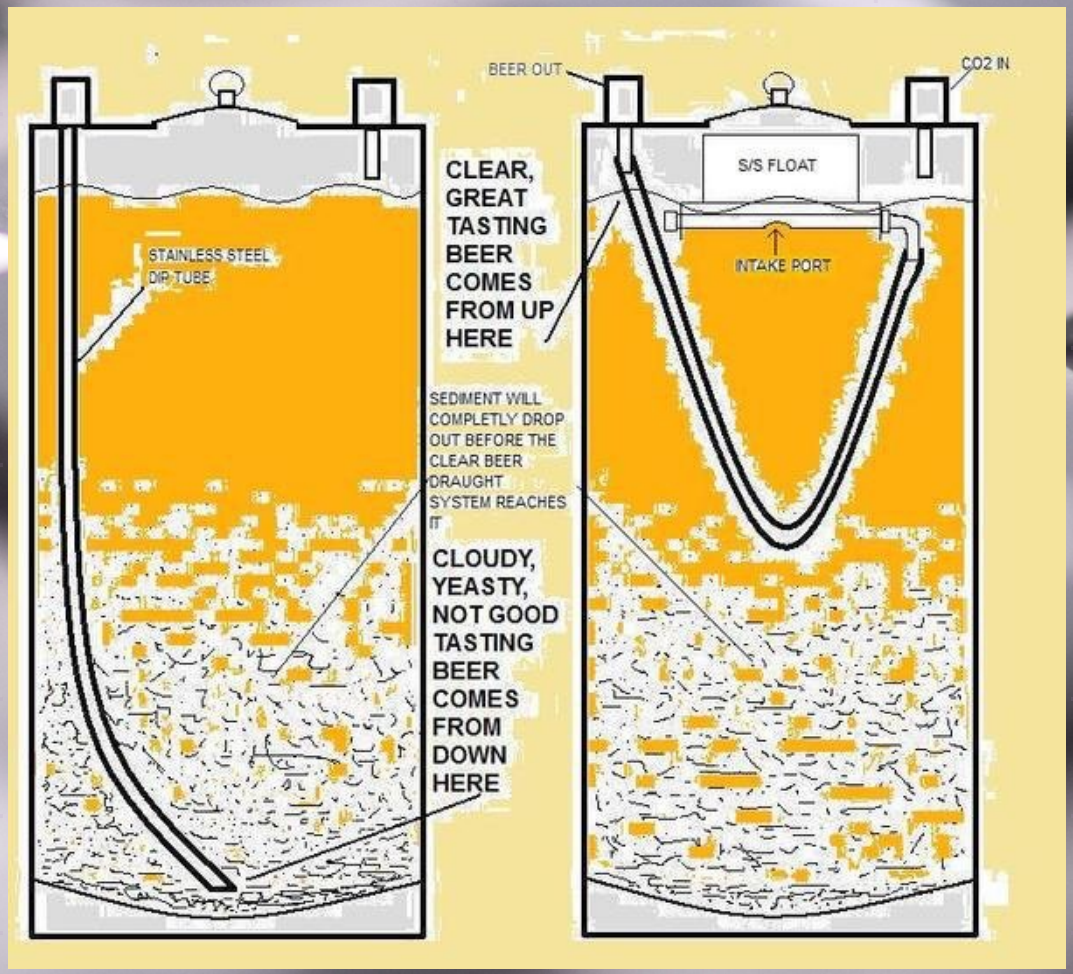


Introduction





Kegs



GAS GOES IN, LIQUID COMES OUT

TRUB WILL SETTLE - DISPOSE OF FIRST COUPLE OF PINTS

Couplers

Ball Lock (Pepsi)

Sanke

Pin Lock (Coke)

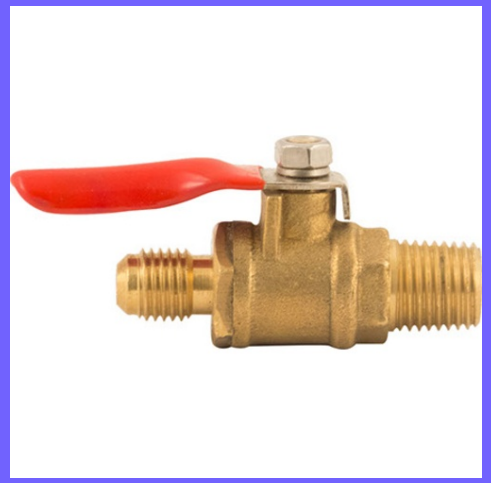
REMEMBER GRAY= GAS; GAS BALL FIT ON LIQUID BALL BUT NOT VICE VERSA
CHOOSE FLARE FITTINGS – EASIER TO REPAIR, MOVE AROUND AND CLEAN

Gas Line Components

Regulator

HIGH PRESSURE GAUGE IS NOT ACCURATE MEASURE OF HOW MUCH CO2 IS IN TANK – WEIGHT IS

GAS WASHER/ISOLATION VALVES



CHECK VALVES

ARROW IN DIRECTION OF GAS FLOW

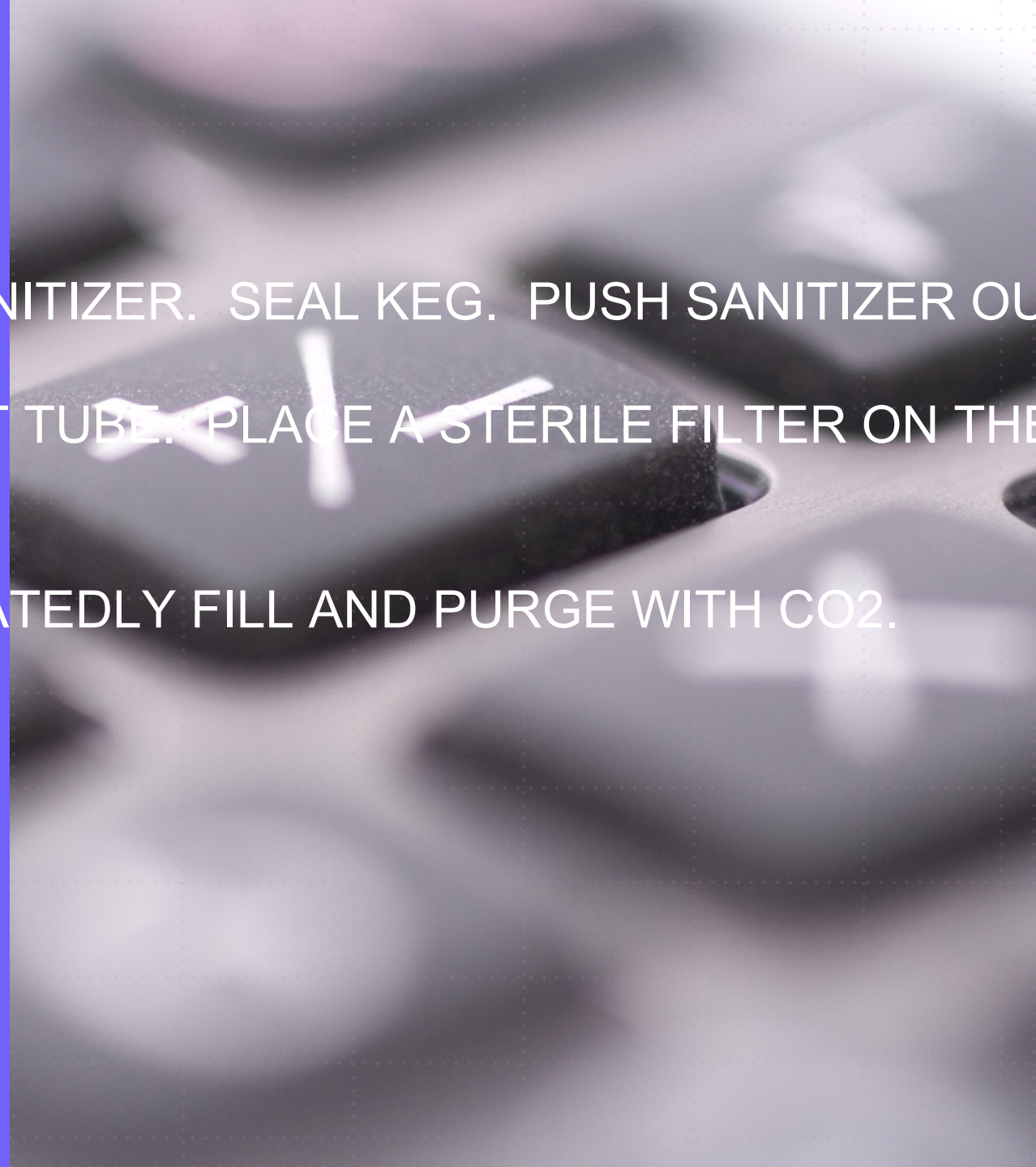
Beer Gas

- Beer Gas is a mixture of 75% N2/25% CO2
  - Gas is compressed at much higher pressure than CO2 tanks
  - Requires different regulator than CO2
  - Works in conjunction with restrictor plate or stout faucet to generate small N2 bubbles on dispensing creating creamy head
  - Kegging pressure is much higher (~4X due to gas being ¼ CO2)
  - Recommend serving at 1.8-1.9 volumes CO2 (30-40 psi)

Keg Preparation

- FILL EMPTY KEG TO TOP WITH SANITIZER. SEAL KEG. PUSH SANITIZER OU
  WITH CARBON DIOXIDE.
- RACK BEER IN THROUGH THE OUT TUBE. PLACE A STERILE FILTER ON THE
  IN TUBE.

- ALTERNATE METHOD IS TO REPEATEDLY FILL AND PURGE WITH CO2.



CARBONATION

- CHOOSE CARBONATION LEVEL BASED UPON STYLE AND SERVING TEMPERATURE

Beer Styles, CO_2 Volumes & Keg Pressure Ranges

Beer Style	CO_2 Volumes	Ideal CO_2 Gauge Pressure
Stouts	1.2 — 2.1 CO_2 Vol	35 — 38 psi (beer gas)
Ales	2.1 — 2.6 CO_2 Vol	7 — 13 psi
Lagers	2.4 — 2.6 CO_2 Vol	10 — 14 psi
Continental & Light Pilsners	2.5 — 2.8 CO_2 Vol	11 — 16 psi
Wheat Beers, Belgian Ales, & American Sours	2.8 + CO_2 Vol	15 — 20 + psi

FORCE CARBONATION CHART

	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
30°F	1.82	1.92	2.03	2.14	2.23	2.36	2.48	2.60	2.70	2.82	2.93	3.02	3.13	3.24	3.35	3.46	3.57	3.67	3.78	3.89	4.00	4.11	4.22	4.33	4.44	4.66	4.77	4.87	4.98	4.98
31°F	1.78	1.88	2.00	2.10	2.20	2.31	2.42	2.54	2.65	2.76	2.86	2.96	3.07	3.17	3.28	3.39	3.50	3.60	3.71	3.82	3.93	4.03	4.14	4.25	4.35	4.46	4.57	4.68	4.78	4.89
32°F	1.75	1.85	1.95	2.05	2.15	2.27	2.38	2.48	2.59	2.70	2.80	2.90	3.00	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
33°F	1.71	1.81	1.91	2.01	2.10	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	3.86	3.97	4.07	4.18	4.28	4.38	4.48	4.59	4.69
34°F	1.68	1.78	1.86	1.97	2.06	2.18	2.28	2.38	2.48	2.58	2.69	2.79	2.90	3.00	3.09	3.19	3.29	3.39	3.49	3.59	3.69	3.79	3.90	4.00	4.10	4.20	4.30	4.40	4.50	4.60
35°F	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
36°F	1.60	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	4.30	4.40
37°F	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	2.80	2.90	3.00	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
38°F	1.52	1.61	1.71	1.80	1.90	2.00	2.10	2.20	2.29	2.38	2.48	2.57	2.66	2.75	2.85	2.94	3.03	3.12	3.21	3.30	3.40	3.49	3.59	3.68	3.77	3.87	3.96	4.06	4.15	4.24
39°F	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	2.70	2.80	2.89	2.98	3.07	3.16	3.25	3.34	3.44	3.53	3.62	3.71	3.81	3.90	3.99	4.08	4.18
40°F	1.47	1.56	1.65	1.74	1.83	1.92	2.01	2.10	2.20	2.30	2.39	2.47	2.56	2.65	2.75	2.84	2.93	3.01	3.10	3.19	3.28	3.37	3.46	3.55	3.64	3.73	3.82	3.91	4.01	4.10
41°F	1.43	1.52	1.61	1.70	1.79	1.88	1.97	2.06	2.16	2.25	2.34	2.43	2.52	2.60	2.70	2.79	2.88	2.96	3.05	3.14	3.23	3.32	3.41	3.50	3.59	3.68	3.77	3.86	3.95	4.04
42°F	1.39	1.48	1.57	1.66	1.75	1.85	1.94	2.02	2.12	2.21	2.30	2.39	2.48	2.56	2.65	2.74	2.83	2.91	3.00	3.09	3.18	3.26	3.35	3.44	3.53	3.62	3.70	3.79	3.88	3.97
43°F	1.37	1.46	1.54	1.63	1.72	1.81	1.90	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	3.30	3.39	3.47	3.56	3.65	3.74	3.82	3.91
44°F	1.35	1.43	1.52	1.60	1.69	1.78	1.87	1.95	2.04	2.13	2.22	2.30	2.39	2.47	2.56	2.64	2.73	2.81	2.90	2.99	3.07	3.10	3.24	3.33	3.41	3.50	3.58	3.67	3.76	3.84
45°F	1.32	1.41	1.49	1.58	1.66	1.75	1.84	1.91	2.00	2.08	2.17	2.26	2.34	2.42	2.51	2.60	2.69	2.77	2.86	2.94	3.02	3.11	3.19	3.28	3.36	3.45	3.53	3.62	3.70	3.79
46°F	1.28	1.37	1.45	1.54	1.62	1.71	1.80	1.88	1.96	2.04	2.13	2.22	2.30	2.38	2.47	2.55	2.64	2.72	2.81	2.89	2.98	3.06	3.15	3.23	3.31	3.40	3.48	3.57	3.65	3.74
47°F	1.26	1.34	1.42	1.51	1.59	1.68	1.76	1.84	1.92	2.00	2.09	2.18	2.26	2.34	2.42	2.50	2.59	2.67	2.76	2.84	2.93	3.02	3.09	3.18	3.26	3.35	3.43	3.51	3.60	3.68
48°F	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	2.30	2.38	2.46	2.54	2.62	2.71	2.79	2.88	2.96	3.04	3.13	3.21	3.30	3.38	3.46	3.54	3.63
49°F	1.21	1.29	1.37	1.45	1.53	1.62	1.70	1.79	1.86	1.93	2.01	2.10	2.18	2.25	2.34	2.52	2.50	2.58	2.67	2.75	2.83	2.91	3.00	3.07	3.15	3.23	3.31	3.39	3.47	3.56
50°F	1.18	1.26	1.34	1.42	1.50	1.59	1.66	1.74	1.82	1.90	1.98	2.06	2.14	2.21	2.30	2.38	2.46	2.54	2.62	2.70	2.78	2.86	2.94	3.02	3.10	3.17	3.25	3.33	3.41	3.49
51°F	1.18	1.26	1.34	1.42	1.49	1.57	1.64	1.71	1.79	1.87	1.95	2.02	2.10	2.18	2.26	2.34	2.52	2.49	2.57	2.65	2.74	2.82	2.90	2.97	3.05	3.13	3.19	3.27	3.34	3.42
52°F	1.16	1.23	1.31	1.39	1.46	1.54	1.61	1.68	1.76	1.84	1.92	1.99	2.06	2.14	2.22	2.30	2.38	2.45	2.53	2.61	2.68	2.76	2.84	2.92	3.00	3.06	3.13	3.22	3.30	3.37
53°F	1.14	1.21	1.29	1.36	1.44	1.51	1.59	1.66	1.74	1.81	1.89	1.96	2.03	2.10	2.18	2.26	2.34	2.41	2.49	2.57	2.64	2.71	2.79	2.86	2.94	3.01	3.09	3.16	3.24	3.31
54°F	1.12	1.19	1.27	1.34	1.41	1.49	1.56	1.63	1.71	1.78	1.86	1.93	2.00	2.07	2.15	2.22	2.30	2.37	2.45	2.52	2.59	2.66	2.74	2.81	2.89	2.96	3.04	3.10	3.17	3.24
55°F	1.10	1.17	1.24	1.31	1.39	1.46	1.53	1.60	1.68	1.75	1.82	1.89	1.97	2.04	2.12	2.18	2.26	2.33	2.40	2.47	2.54	2.62	2.69	2.76	2.83	2.89	2.97	3.04	3.11	3.18
56°F	1.07	1.15	1.22	1.29	1.36	1.43	1.50	1.57	1.65	1.72	1.79	1.86	1.93	2.00	2.08	2.15	2.22	2.29	2.36	2.43	2.50	2.57	2.64	2.71	2.78	2.85	2.92	2.99	3.06	3.13
57°F	1.05	1.12	1.19	1.26	1.33	1.40	1.47	1.54	1.52	1.70	1.77	1.83	1.90	1.97	2.04	2.11	2.18	2.25	2.32	2.39	2.46	2.53	2.60	2.66	2.73	2.80	2.87	2.94	3.00	3.08
58°F	1.03	1.10	1.17	1.24	1.30	1.37	1.44	1.51	1.59	1.67	1.74	1.80	1.87	1.94	2.01	2.08	2.15	2.21	2.28	2.35	2.42	2.48	2.55	2.62	2.69	2.75	2.82	2.88	2.95	3.02
59°F	1.02	1.09	1.16	1.22	1.29	1.36	1.43	1.49	1.56	1.64	1.71	1.77	1.84	1.91	1.98	2.04	2.11	2.17	2.24	2.31	2.38	2.43	2.50	2.57	2.64	2.70	2.77	2.84	2.91	2.97
60°F	1.01	1.08	1.15	1.21	1.28	1.34	1.41	1.47	1.54	1.62	1.62	1.76	1.82	1.88	1.95	2.01	2.08	2.14	2.21	2.27	2.34	2.40	2.47	2.53	2.60	2.66	2.73	2.79	2.86	2.92
61°F	0.99	1.05	1.12	1.18	1.24	1.31	1.37	1.44	1.50	1.57	1.63	1.69	1.76	1.82	1.89	1.95	2.02	2.08	2.14	2.21	2.27	2.34	2.40	2.47	2.53	2.59	2.66	2.72	2.79	2.85
62°F	0.96	1.02	1.09	1.15	1.21	1.27	1.34	1.40	1.46	1.52	1.59	1.65	1.71	1.78	1.84	1.90	1.97	2.03	2.09	2.15	2.22	2.28	2.34	2.41	2.47	2.53	2.59	2.66	2.72	2.78
63°F	0.93	0.99	1.06	1.12	1.18	1.24	1.30	1.36	1.42	1.49	1.55	1.61	1.67	1.73	1.79	1.85	1.92	1.98	2.04	2.10	2.16	2.22	2.28	2.35	2.41	2.47	2.53	2.59	2.65	2.71
64°F	0.91	0.97	1.03	1.09	1.15	1.21	1.27	1.33	1.39	1.45	1.51	1.57	1.63	1.69	1.75	1.81	1.87	1.93	1.99	2.05	2.11	2.17	2.23	2.29	2.35	2.41	2.47	2.52	2.58	2.64
65°F	0.88	0.94	1.00	1.06	1.11	1.17	1.23	1.29	1.35	1.41	1.46	1.52	1.58	1.64	1.70	1.76	1.82	1.87	1.93	1.99	2.05	2.11	2.17	2.23	2.28	2.34	2.40	2.46	2.52	2.58

Blue = Under-Carbonated, 0 - 1.40 volumes CO2

Gray = Stouts and porters, 1.50 - 2.20 volumes CO2

Green = Lagers, Ales, Ambers, most beers, 2.20 - 2.60 volumes CO2

Yellow = Highly carbonated ales, Lambics, Wheat beers 2.60 - 4.0 volumes CO2

Red = Over-carbonated (except for certain specialty ales) 4.1+ volumes CO2

BREWCABIN

QUICK CARBONATION

- USE CARBONATION STONE OR QUICK CARB

- USE BURST CARBONATION METHOD + ROCKING AND ROLLING

BURST CARBONATION CHART

CO2 Pressure	LOW/MODERATE	HIGH
<15 PSI	Use Carbonation Chart	Use Carbonation Chart
30 PSI	16 Hours	48 Hours
35 PSI	14 Hours	34 Hours
40 PSI	12 Hours	30 Hours
45 PSI	10 Hours	26 Hours
50 PSI	8 Hours	24 Hours

BREWCABIN

DISPENSING PRESSURE

- CO_2 IS USED TO PUSH BEER LINE
- PRESSURE SHOULD BE SET TO MATCH PRESSURE LOSSES IN THE SYSTEM
- IF PRESSURE IS HIGHER, FOAM WILL RESULT
- IF PRESSURE IS LOWER, NO OR LOW FLOW WILL RESULT
- BEST STRATEGY IS TO START LOW AND RAISE PRESSURE

CALCULATING LINE PRESSURE

- SUM UP PRESSURE LOSSES DUE TO TUBING, COILS, RESTRICTIONS AND HEIGHT
- TUBING/COIL LOSSES (MULTIPLE LENGTH BY MATERIAL/SIZE FACTOR)
- HEIGHT (0.5 psi/ft HEIGHT)
- SET PRESSURE WITHIN 1 PSI OF TOTAL
- EXAMPLE (KEG 2 FT BELOW TAP, 6’ of 3/16” HDPE)

Pressure Drop (psi/ft)				
I.D. (“)	Vinyl	Polyethylene	Stainless	Duotight
5/32				2.8
3/16	2.2-3	2.2		1
1/4	0.65-0.8	0.5	2	0.8
5/16	0.40		0.5	
3/8	0.20		0.2	
1/2	0.025			

DUOTIGHT FITTINGS

- DOUBLE O-RING COLLARS
- INSERT TO CONNECT (NO TORQUE NEEDED)
- QUICK ASSEMBLY/DISASSEMBLY
- DUOTIGHT ARE RATED UP TO 100 PSI
- EVA TUBING IS BPA/PVC FREE (https://www.youtube.com/watch?v=XG1Wv_uJlGo)
- EASY COMPONENT CONFIGURATION
- PURCHASE FROM MORE BEER, WILLIAMS, OR

EVA TUBING SIZE	PRESSURE DROP (PER FOOT)
4 mm ID x 8 mm OD	2.8 psi
5 mm ID x 8 mm OD	1 psi
6 mm ID x 9.5 mm OD	0.8 psi

ADJUSTING DISPENSING

- FLAT BEER – PRESSURE TOO LOW, TEMPERATURE TOO LOW, OR DIRTY GLASSWARE
- CLOUDY BEER – TEMPERATURE NOT STABLE, OLD BEER, DIRTY LINES
- FOAMY BEER – PRESSURE TOO HIGH, TEMPERATURE TOO HIGH, BEER LINE HAS KINKS OR OBSTRUCTIONS

LOWERING KEG PRESSURE

- PULL PRESSURE RELIEF
- ROCK KEG BACK AND FORTH LINES TO RELEASE DISSOLVED CO2
- ALLOW BEER TO STABILIZE IDEALLY OVER SEVERAL HOURS
- USE SPARINGLY AS USING PRESSURE RELIEF WILL GENERATE FOAM AND FOAM GENERATION MAY NOT BE RECOVERABLE

Beer Line Components

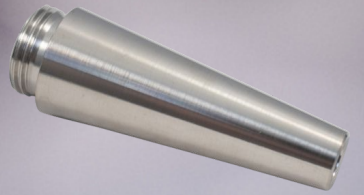
RUBBER O-RING

PICNIC TAP

STANDARD FAUCET

PERLICK FAUCETS

INTERTAP/NUKATAP FAUCETS



- PERLICK/INTERTAP ARE FORWARD SEALING FAUCETS – MINIMIZES OXYGEN EXPOSURE, MORE HYGENIC
- PERLICK/INTERTAP CAN INCLUDE FLOW CONTROL VALVES TO ADJUST RESISTANCE
- INTERTAP/NUKATAP HAVE

KEG MAINTENANCE

GAS BODY CONNECT

LIQUID BODY CONNECT

QUICK DISCONNECT

GAS DIP TUBE

LIQUID DIP TUBE

O-Ring Location	Supplier	Part Number
Gas Body Connect	McMaster Carr	9396K24
Liquid Body Connect	McMaster Carr	9452K23
Quick Disconnect	McMaster Carr	9396K18
Dip Tubes	McMaster Carr	90025K368
Lid	McMaster Carr	9396K926

LID GASKET

FOOD GRADE GREASE

JOCKEY BOX COMPONENTS

FIBER WASHER

USE IN GAS REGULATOR CONNECTION TO TANK

FLARE WASHER

USE IN GAS OR LIQUID LINE CONNECTION TO SANKE TAP NOT NEEDED FOR QUICK DISCONNECT

RUBBER GASKET

USE IN LIQUID LINE CONNECTION TO JOCKEY BOX

JOCKEY BOX SETUP

- SETUP GAS LINES FIRST
- SETUP LIQUID LINES
- TURN ON GAS LINES
- SET GAS PRESSURE TO HIGHER THAN KEG PRESSURE (MIN 20 PSI)
- CHECK TAPS ARE CLOSED
- ATTACH GAS COUPLER TO KEG (YOU SHOULD HEAR GAS GOING IN)
- ATTACH LIQUID COUPLER TO KEG
- OPEN TAP AND DUMP FIRST POUR
- AJUST PRESSURE TO GET GOOD FLOW

JOCKEY BOX TEARDOWN

- UNTAP KEG
- DISCONNECT GAS LINES FIRST
- DISCONNECT LIQUID LINE
- OPEN TAP TO RELIEVE RESIDUAL PRESSURE
- CLOSE CO2 TANK
- BLEED OFF GAS PRESSURE IN LINES
- DISCONNECT FITTINGS (DUOTIGHT PUSH ON COLLAR TO RELEASE LINE FROM TAP/FITTING)
- USE HOSE ADAPTER TO FLUSH LINES WITH WATER USING A HOSE
- PLACE WET COMPONENTS IN WET BAG